



# CONSERVATION AND COASTAL MANAGEMENT ELEMENT



# TABLE OF CONTENTS

Introduction	1
Inventory and Analysis	1
Level of Service	87
Planning Area Analysis	87
Summary	89

## LIST OF TABLES

1 Ecological Communities	4
2 Permitted Domestic and Industrial Surface Wastewater Facilities	33
3 NPDES Stormwater Facilities	37
4 US EPA TMDLs	45
5 Vegetative Communities	55
6 Priority Wetland Areas	59
7 Biodiversity Hot Spot Areas	60
8 Significant Wetlands	63
9 Developments Near Wetlands	71
10 Pinellas Trail Usage	72
11 Population-At-Risk, Dunedin	79
12 Evacuation Population, Dunedin	79
13 Public Shelter Demands, Dunedin	80
14 Public Shelter Demands, Pinellas County	80
15 Clearance Times, Pinellas County, 2006	82
16 Facilities in CSA	85

## LIST OF FIGURES

1 Submerged Grassbeds	2
2 Ecological Communities	16
3 Major Drainage Basins and Facilities	17
4 Elevations	18
5 Vegetative Cover	20
6 Flood Zones	21
7 Hurricane Vulnerability Area and Coastal Planning Area	23
8 Soils	25
9 Water Quality	29
10 Surface Water Dischargers	32
11 Shellfish Harvesting Areas	35
12 Marine Characteristics	47
13 Recreational Fishing Sites	48
14 Major Freshwater Bodies	49
15 Wetlands Legend	50
15 Wetlands	51
16 SWFWMD Identified Wetlands	52

17	Wetlands Connectivity	54
18	Strategic Habitat Conservation Areas and Priority Wetlands	57
19	Biodiversity Hot Spots	58
20	Significant Wetlands	62
21	Historic and Archaeological Sites	67
22	Waterfront and Waterway Access	69
23	Bridges and Causeways	73
24	Example of Results of SLOSH Model	77
25	Coastal Storm Area	78
26	Evacuation Routes and Shelters	81
27	Repetitive Loss Areas	84

## INTRODUCTION

The City of Dunedin maintains little or no distinction between general conservation and coastal management. Mainland and inland conservation practices directly influence management of tidally affected lands and waters and vice versa. For the purposes of investigation, though, the City can be broken up into various segments. These segments do not exist in isolation, however; each influences the others in some manner.

## INVENTORY AND ANALYSIS

The barrier islands include Caladesi Island State Park and Honeymoon Island State Recreation Area. Both are owned by Florida Department of Environmental Protection (DEP), and together, they are called a Gulf Island Geo-Park. They are called barrier islands because they protect the mainland from storm winds and tides. The windward side exemplifies South Florida Coastal Strand ecological community. The beach supports the marine habitats of Red Drum, Black Drum, Sheepshead, Southern Flounder, Florida Pompano, Gulf Menhaden and Spanish Sardine. The leeward side supports estuarine and Mangrove Swamp communities, and harbors Red and Black Drum, Spotted Seatrout and Mangrove Snapper

Lying between the barrier islands and the mainland is St. Joseph's Sound. It ranges in width from 1.5 miles to 2.5 miles. Dunedin Causeway extends through the Sound from Ward Island westward to Honeymoon Island; Dunedin Causeway Boulevard extends from Alternate US 19 westward 2.5 miles to Honeymoon Island allowing direct access from the mainland. Three bridges assist in flushing the Sound, one of them being a bascule bridge which crosses the Intracoastal Navigational Waterway. The Causeway is undeveloped dredged and filled land used for unstructured recreational purposes.

The Royal Stewart Arms condominium complex is the only private development located on Honeymoon Island. Ward Island, on the eastern end of the Causeway, is developed with commercial and multi-family residential activities.

Hurricane Pass separates Caladesi and Honeymoon Islands. It supports deep water pleasure craft moving between the Intracoastal Waterway and Gulf of Mexico. Dunedin Pass bisects the south end of Caladesi Island and Clearwater Beach Island. It is not currently maintained and subject to continual shoaling. In order for the Pass to be viable again, it would need to be dredged. However, a study by Pinellas County in 1994 suggested that it would cost \$2.6 million (in 1994 dollars) for the initial scouring and would require maintenance dredging every two years. Additionally, the water quality in this area is better than in other areas, with substantial seagrass coverage (Figure 1).

East of the Sound is the mainland shoreline. The Dunedin Marina area is the only intensively developed area in the southern half of City. The original saltwater marshes and mangrove swamps have been replaced by rip-rap stabilization for erosion control, although mangroves do exist along Edgewater Drive shoreline. The northern half of the City shoreline is entirely seawalled, dredged and filled residential and commercial land. Private marinas, restaurants and hotel/motels are all present in this area. With an average width of .5 miles between Intracoastal Waterway and mainland, the submerged lands support very few marine flora and fauna habitats.

Within this mainland shoreline is the upland coastal floodplain and watershed. It is highly urbanized, and includes the City Marina, Community Redevelopment Area and tourist accommodations. It encompasses the major portion of Cedar Creek Basin, and takes in Hammock Park. This is an 80 acre "State Natural Feature." An isolated Wetland Hardwood Hammock, it is not commonly



CONSERVATION  
AND  
COASTAL  
MANAGEMENT

FIGURE 1

# SUBMERGED GRASSBEDS

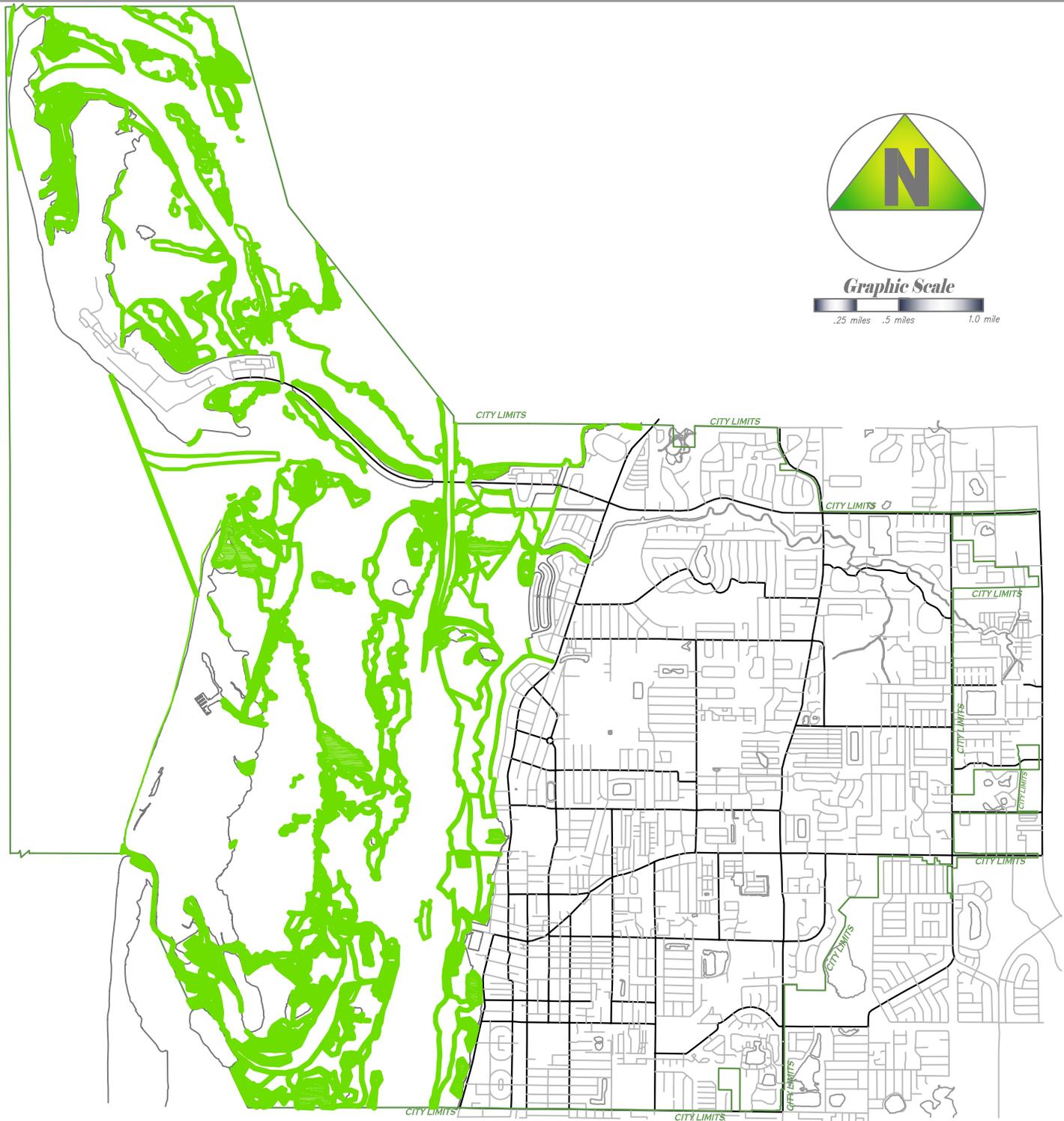
LEGEND



APPROXIMATE LOCATION OF  
SUBMERGED GRASSBEDS



Graphic Scale



associated with Pinellas County

Traveling inland, the topography rises to just over 70 feet above sea level. Single and multi-family residential uses predominate, with commercial along the primary arterials and some collectors. This existing development supplanted the plagued Pinellas citrus industry. Older ecological communities are dispersed throughout City, and include Sand Pine Scrub, Longleaf Pine-Turkey Oak Hills, South Florida Flatwoods, Cabbage Palm Flatwoods, and Swamp Hardwoods. Ecological Communities are listed in Table 1, and shown graphically in Figure 2 (with the first four communities have been combined for depiction purposes). Many of the communities may not be “intact” but they are spread throughout the City.

The “highlands” are drained by three basins: Cedar Creek, which draws through the central watershed to the coastal floodplain; Spring Branch, located in southeast Dunedin and discharges into Clearwater’s Stevenson’s Creek; and Curlew Creek, in the northern and eastern areas, consisting mostly of pinelands and scattered hardwoods.

Cedar Creek itself connects to Jerry Lake a 31-acre lake, south of Main Street and just east of the City limits. The entire tract is 81-acres, and a portion consists of Hardwood Swamp. Designated as a stormwater management preserve, it is owned by Southwest Florida Water Management District (SWFWMD). However, no projects are planned until previous owner has become deceased. The upland area is Preservation, with surrounding land use categories (within and without the City) including Recreation/Open Space, Institutional, Residential Suburban, Residential Low, Residential Urban, Residential Medium and Commercial Limited. Because the Residential Medium and Commercial Limited lands contiguous to the preserve are so small, excellent land use buffering currently exists

In the very northern portion of the City is a Salt Marsh, one of very few located south of Tarpon Springs. This type of ecological community is prevalent along the Gulf Coast and tidal rivers north from Pasco County to St. Marks. It includes fish species similar to that of Mangrove Swamp.

Dunedin encompasses five watershed basins (Figure 3). The Coastal Watershed intrudes 1,200 to 1,300 feet in the north and to 3,000 feet in the south. With a size of 440 acres, it is 98% developed, with Community Redevelopment District, Residential Urban, Residential Medium and Commercial General land uses. Although characteristically flat, the elevations in the upper watershed are between 20 and 40 feet, and the elevations in the lower regions are between 10 and 15 feet. In terms of soils, over 50% of the area has a low runoff potential. The stormwater empties directly into St. Joseph’s Sound as sheet runoff and through minor outfalls. One City-owned lake, Lake Paloma, is located within the basin. (Elevations are shown in Figure 4.)

Cedar Creek runs roughly from along Cedar Creek south to Main Street in northern Dunedin. The 1,230 acres is nearly 100% developed, according to the 2003 Master Drainage Plan (MDP). The flat western section and gently sloping eastern section are home to several hydrogeological features, including Lake Sperry, Lake Suemar, and Hammock Park. Cedar Creek and one tributary, 2.1 miles long, are the major outfalls. They empty into St. Joseph’s Sound. Major land uses include Residential Urban, Recreation/Open Space, Residential Medium, and Commercial General. Elevations toward the east reach up to 55 feet, while closer to the coast they are 5 to 10 feet. Less than 40% of the area, as defined by soils, has a low runoff potential.

Spring Branch Basin is 1,472.4 acres in size and 98% developed. Less than half the area, in terms of soils, having a low runoff potential, the stormwater empties into the Stevenson’s Creek outlet to St. Joseph’s Sound in Clearwater. The topography is gently sloping, the higher elevations in the east reaching 55 feet. Howell Tract Swamp and few small lakes are recharge areas. Land use



**TABLE 1  
ECOLOGICAL COMMUNITIES**

COMMUNITY	O C C U R - R E N C E	DESCRIPTION			LAND USE INTERPRETATIONS		ENDANGERED AND THREATENED SPECIES WHICH MAY OCCUR	KNOWN POLLUTION PROBLEMS	POTENTIAL FOR CONSERVATION. USE OR PROTECTION	EFFECT OF FUTURE LAND USES
		SOILS	VEGETATION	ANIMALS	ENVIRONMENTAL VALUE AS A NATURAL SYSTEM	RANGELAND/WILDLIFELAND/ WOODLAND/URBANLAND				
<b>S o u t h Florida Coastal Strand</b>	Along the Atlantic Ocean south of Brevard County and along Gulf of Mexico south of Pasco County; individual communities large in size, narrow and long, parallel to coastal beaches; also along bays and sounds; generally encompasses area affected by salt sprays from ocean, Gulf and salt water bays ; located mostly along windward side of Caladesi Island.	Soil: Nearly level to strongly sloping, deep, mostly well to excessively drained with some moderately well drained or somewhat poorly drained. Coarsely textured throughout. Canaveral and Palm Beach soils. Includes areas mapped as Coastal Beach and Beach Ridges.	Low growing grasses, vines and herbaceous plants with few trees or large shrubs. Wind, salt and blowing sand make plant establishment difficult on foredunes. Plants are well adapted and pioneer species. Backdunes often have vegetation similar to sand pine scrub or wetland hardwood hammock. Trees: Australian pine, <i>Casuarina equisetifolia</i> ; Cabbage palm, <i>Sabal palmetto</i> ; Coconut palm, <i>Cocos pucifera</i> ; Sand live oak, <i>Quercus virginiana</i> var. <i>maritima</i> . Shrubs: Bay cedar, <i>Suriana maritima</i> ; Coco plum, <i>Chrysobalanus icaco</i> ; Inkberry, <i>Scaevola plumieri</i> ; Marslielder, <i>Iva imbricata</i> ; Sawpalmetto, <i>Serenoa repens</i> ; Silverleaf croton, <i>Croton punctatus</i> ; Spanish bayonet, <i>Yucca sloifolia</i> ; Sea grape, <i>Coccoloba uvifera</i> . Herbaceous Plants and Vines: Bay bean, <i>Canavalia maritima</i> ; Beach morning-glory, <i>Ipomoea pes-caprae</i> ; Cucumberleaf sunflower, <i>Helianthus debilis</i> ; Sea purslane, <i>Sesuvium portulacastrum</i> ; Greenbriars, <i>Smilax</i> spp.; Wild grape, <i>Vitis</i> spp. Grasses and Grasslike Plants: Bitter panicum, <i>Panicum amarum</i> ; Marshbay cordgrass, <i>Spartina patens</i> ; Sandbur, <i>Cenchrus</i> spp.; Seaoats, <i>Uniola paniculata</i> ; Seashore paspalum, <i>Paspalum vaginatum</i> ; Seashore saltgrass, <i>Distichlis spicata</i> ; Low panicum, <i>Panicum</i> spp.	Shorebirds, terns and gulls found on or near beach. Community provides good food sources and nesting sites. Small mammals found on coastal dunes; larger mammals occur behind foredunes. Mammals: Bobcat, fox, rabbits, skunks, raccoon, mice. Birds: American kestrel, pelicans, gulls, terns, shorebirds, songbirds. Reptiles: Alligator, frogs, lizards. Nesting grounds for sea turtles; crab numerous near shorelines.	Coastal Strand highly endangered. Privately owned but undeveloped in demand. Coastal Strand important in regulating wave action; unplanned structures alter process of breaking away of one beach and building up another. Dune clearing/leveling causes erosion through removal of native vegetation. Destruction of vegetation occurs during recreational activities; dead root systems no longer hold soil together and build dunes.	Rangeland: Not generally used for rangeland. Wildlifeland: Well suited for shorebirds, gulls, terns. Native grasses and legumes good food sources and nesting sites. Nesting ground for sea turtles. Suited for mice, raccoons, bobcats, foxes and skunks; also songbirds Woodland: Not generally used for woodland Urbanland: Better drained areas inland have few limitations for urban development; areas adjacent to water may be subject to coastal dune and beach erosion, especially where construction alters natural processes and destroys excessive amounts of native vegetation. Plants native to community should receive preference for beautification: trees include cabbage palm, coco plum, Florida thatch palm, Florida silver palm, Florida cherry palm, live oak, pigeon plum, redbay, slash pine, magnolia, wild tamarind, tree hibiscus, sand pine; shrubs include beargrass, prickly pear cactus, sea grape, coontie, coral bean, yaupon holly, lantana, marshelder, partridge pea, sawpalmetto, spanish bayonet, waxmyrtle; grasses include sea oats, marshbay cordgrass, bitter panicum, seashore saltgrass, Gulf bluestem, seashore paspalum, seashore dropseed, common bermudagrass, shore-dune panicum; herbs and vines include beach morning-glory, fiddle-leaf morning-glory, blanket flower, largeleaf pennywort, sea purslane, greenbriars, wild grape.	Herbaceous Plants and Vines: Beach star, <i>Remires maritima</i> ; small-flowered lily-thorn, <i>Catesbaea parviflora</i> (Keys). Mammals: Pallid beach mouse, <i>Peromyscus polionotus decoloratus</i> ; Goff's pocket gopher, <i>Geomys pinetis goffi</i> . Birds: Arctic Peregrine falcon, <i>Falco peregrinus tundrius</i> ; Eastern brown pelican, <i>Pelecanus occidentalis carolinensis</i> ; Southeastern snowy plover, <i>Charadrius alexandrinus tenuirostris</i> ; Flora scrub jay, <i>Aphelocoma coerulescens coerulescens</i> ; Least tern, <i>Sterna antillarum</i> ; Roseate spoonbill, <i>Ajaia ajaia</i> . Reptiles: Atlantic green turtle, <i>Chelonia mydas mydas</i> (Atlantic coast only); Atlantic hawksbill turtle, <i>Eretmochelys imbricata imbricata</i> ; Atlantic loggerhead turtle, <i>Caretta caretta caretta</i> ; Atlantic ridley turtle, <i>Lepidochelys kempi</i> ; Leatherback turtle, <i>Dermochelys coriacea</i> .	Would come from day users of Caladesi Island.	Barrier island is owned and managed by the State of Florida. Very significant recreational area, catering to thousands of visitors each year. City has assigned Recreation/Open Space land use designation on island.	Very minimal effect as only recreational uses and appurtenant structures can be expanded



TABLE 1 (CONTINUED)

COMMUNITY	OCCURRENCE	DESCRIPTION			LAND USE INTERPRETATIONS		ENDANGERED AND THREATENED SPECIES WHICH MAY OCCUR	KNOWN POLLUTION PROBLEMS	POTENTIAL FOR CONSERVATION. USE OR PROTECTION	EFFECT OF FUTURE LAND USES
		SOILS	VEGETATION	ANIMALS	ENVIRONMENTAL VALUE AS A NATURAL SYSTEM	RANGELAND/WILDLIFELAND/ WOODLAND/URBANLAND				
<b>Sand Pine Scrub</b>	Throughout Florida; most commonly found inland from coast and in central portion of state; individual communities generally several hundred acres in size. One of four ecological communities grouped together and spread throughout the City. Would not be considered an "intact" community as it is very much urbanized and subject to impacts of development and urban activity	Nearly level to strongly sloping land, deep acid, somewhat poorly drained and coarse textured; water movement rapid through soil. Archbold, Daytona, Duette, Hobe, Paola, Pomello, Resota, St. Lucie, Satellite, Welaka.	Typically even-aged sand pine trees with dense understory of oaks, sawpalmetto and other shrubs. Ground cover scattered; large areas of light colored sand noticeable. Sand pine may be scattered or absent with oaks dominating. Satellite soils, with high water table for part of year, support scrubby growth but myrtle oak, Chapman oak, and sand pine become infrequent; gallberry becomes prominent. Trees: Bluejack oak, <i>Quercus incana</i> ; Chapman oak, <i>Quercus chapmanii</i> ; Myrtle oak, <i>Quercus myrtifolia</i> ; Sand live oak, <i>Quercus virginiana</i> var. <i>germinata</i> ; Sand pine, <i>Pinus clausa</i> . Shrubs: Dwarf huckleberry, <i>Gaylussacia dumosa</i> ; Gopher apple, <i>Chrysobalanus oblongifolius</i> ; Prickly pear, <i>Opuntia</i> spp.; Sawpalmetto, <i>Serenoa repens</i> . Herbaceous Plants and Vines: Grassleaf goldenaster, <i>Heterotheca graminifolia</i> ; Deermosa, <i>Cladonia</i> spp.; Cat greenbriar, <i>Smilax glauca</i> . Grasses and Grass-like Plants: Yellow indian-grass, <i>Sorghastrum nutans</i> ; Low panicum, <i>Panicum</i> spp.	-Adapted to high temperatures and droughty conditions. Low wildlife food production. Dense vegetation good escape cover. Palmetto and oaks provide good food when fruiting; gopher apple also good wildlife food. Mammals: Deer. Birds: Florida mouse, Towhee, great crested flycatcher, scrub jay, Bachman's sparrow. Reptiles: Black racer, gopher frog, gopher tortoise, scrub lizard, sand skink. Amphibians: Gopher frog	Sand pine is fire-based community: understory vegetation dense and creates pathway for fire to crowns of trees. Fire normally happens every 20 to 40 years. Sand pines have low fire resistance; sand pine cones require heat of fire to open and release seeds; helps to form even-aged stands. Without occasional fire, community becomes type of upland hammock community. Important in aquifer recharge. Uncontrolled fire and damage to vegetation by excessive foot or vehicle travel have adverse effects on community.	Rangeland: Limited potential for producing native forage; not used by livestock if other communities available. Air dry plant material from 1,500 to 3,000 pounds per acre; 15 to 40-plus acres per animal needed dependent on amount and type of forage. Relative percentage by weight: 40% grasses, 40% trees and shrubs, 20% herbaceous plants and vines. Wildlifeland: Suited for deer and turkey. Birds: warblers, rufous-sided towhees, quail; native legumes provide food. Woodland: Low potential for commercial wood production; severe equipment limitations, moderate seedling mortality, excessively well-drained and infertile soil conditions. Sand pine is commercial species; potential annual growth of about 0.5 cords per acre in north Florida and 0.4 cords per acre south of Hernando County. Urbanland: Few limitations to well-drained areas. Satellite soils have water table at 20 inches for part of year and has limitations. Vegetation difficult to establish due to infertile, coarse textured and droughty surface soils; intensive vegetation establishment and maintenance methods, including irrigation, needed for best results. Wind erosion a problem without vegetation; water erosion control and water retention facilities not usually needed. Plants native to community should receive preference for beautification and landscaping: trees include live oak, sand live oak, sand pine, turkey oak, Eastern red cedar; shrubs include Adam's needle, coral bean, Carolina holly, gopher apple, pawpaw, prickly pear cactus, rosemary, sawpalmetto, shining sumac; herbaceous plants include aster, beebalm, croton, blanketflower, blazing star, goldenaster, goldenrod, lupine, morning glory, sunflower.	Shrubs: Four-petal pawpaw, <i>Asimina tetramera</i> ; Pigmy Fringetree, <i>Chionanthus pygmaea</i> . Herbaceous Plants and Vines: Curtis milkweed, <i>Asclepias curtissii</i> ; Dancing-lady orchid, <i>Ocidum variegatum</i> . Mammals: Florida mouse, <i>Peromyscus floridanus</i> ; Goff's pocket gopher, <i>Geomys pinetis goffi</i> . Birds: Florida scrub jay, <i>Aphelocoma coerulescens coerulescens</i> . Reptiles: Blue-tailed mole skink, <i>Eumeces egregius lividus</i> ; Sand skink, <i>Neoseps reynolds</i> ; Short-tailed snake, <i>Stilosome extenuatum</i>	As this is one of four ecological communities grouped together and is spread throughout the City, known pollution problems will come from urban activities. Litter, oils, pet wastes, household substances (e.g., paints, solvents).	This community is spread throughout the City and would be subject to the pressures from urban development. City's landscaping ordinance protects trees by requiring property owners to obtain permits before removing trees and requiring replacement in many cases. Communities serve as recreation and open space oases in the urban environment.	Of all of the ecological communities, this conglomeration would be the most affected due to it being spread throughout the City. As noted above, this ecological community cannot be considered "intact" due to the encroachment of urban development. Landscaping ordinance does preserve trees. City is near build-out condition, with very few large tracts left



TABLE 1 (CONTINUED)

COMMUNITY	OCCURRENCE	DESCRIPTION			LAND USE INTERPRETATIONS		ENDANGERED AND THREATENED SPECIES WHICH MAY OCCUR	KNOWN POLLUTION PROBLEMS	POTENTIAL FOR CONSERVATION. USE OR PROTECTION	EFFECT OF FUTURE LAND USES
		SOILS	VEGETATION	ANIMALS	ENVIRONMENTAL VALUE AS A NATURAL SYSTEM	RANGELAND/WILDLIFELAND/ WOODLAND/URBANLAND				
<b>Long Leaf Pine-Turkey Oak Hills</b>	Throughout Florida; commonly found in central part of state north of Lake Placid and in panhandle; vary widely in size and limited numbers of other communities may occur within it. One of four ecological communities grouped together and spread throughout the City. Would not be considered an “intact” community as it is very much urbanized and subject to impacts of development and urban activity.	Nearly level to strongly sloping, deep, acid. Moderately well to excessively drained; coarse textured in upper part and moderately fine textured or moderately coarse textured in lower part. Alpin, Bonifay, Candler, Chiefland, Cocoa, Deland, Eustis, Hurricane, Kershaw, Lake, Lakeland, Orlando, Tavares, Troup	Longleaf pine exists as an over-story in mature stands; where pines have been removed, oaks predominate. Scattered shrubs and bare areas. Trees: Longleaf pine, <i>Pinus palustris</i> ; Turkey oak, <i>Quercus laevis</i> . Herbaceous Plants and Vines: Aster, <i>Aster</i> spp.; Blazing star, <i>Liatis tenuifolia</i> ; Bracken fern, <i>Pteridium aquilinum</i> ; Butterfly pea, <i>Centrosema virginianum</i> ; Butterfly pea, <i>Clitoria mariana</i> ; Elephant’s foot, <i>Elephantopus</i> spp.; Grassleaf goldenaster, <i>Heterotheca gramini-folia</i> ; Partridge pea, <i>Cassia</i> spp.; Pineland beggarweed, <i>Desmodium strictum</i> ; Sandhill milkweed, <i>Asclepias humistrata</i> ; Showy crocalaria, <i>Crotalaria spectabilis</i> ; Wild indigo, <i>Baptista</i> spp. Grasses and Grasslike Plants: Curtiss dropseed, <i>Sporobolus curtessi</i> ; Hairy panicum, <i>Panicum anceps</i> ; Yellow indiagrass, <i>Sorghastrum nutans</i> ; low panicum, <i>Panicum</i> spp.; Pinewoods dropseed, <i>Sporobolus junceus</i> .	Adapted to high temperature and drought. Many are burrowers to prevent water loss and protect against temperature. Mammals: Fox squirrel, pocket gopher, white-tailed deer. Birds: Bobwhite quail, ground dove, rufous-sided towhee. Reptiles: Gopher tortoise, fence lizard.	Open forest community influenced by fire, heat and drought; fire occurs frequently and natural vegetation adapted to withstand its effects. Grasses cover large areas, provide fuel for fire and prevent competing hardwoods from regenerating. Longleaf pine cannot tolerate hardwood competition; fire allows pine to remain dominant. Water moves rapidly through most of soil to aquifer with little runoff and minimal evaporation.	Rangeland: Natural fertility due to adverse soil conditions. Cattle do not utilize community if other communities are available. Air dry plant material from 2,000 to 4,000 pounds per acre; 10 to 35-plus acres per animal needed dependent on amount and type of forage; little or no grazing if canopy exceeds 60 percent. Relative percentage by weight: 60% grasses, 20% trees and shrubs, 20% forbs. Wildlifeland: Suited for deer and turkey, especially for use as escape cover. Songbirds include warblers, towhees, crested flycatcher and quail; native legumes provide food. Timber harvest improves wildlife food values through increase of amount and types of herbaceous plants and sprout production. Woodland: Moderate equipment limitation and seedling mortality. Sand pine, slash pine, loblolly pine and longleaf pine are good commercial species; potential annual growth is 1.2, 1.2, 1.0 and 0.6 cords per acre respectively; areas south of a line from Hernando County in the west to Orange County in the east has a potential productivity 18 percent lower. Urbanland: Few limitation to urban development. Irrigation required for best results during dry seasons. Wind erosion a problem during and after construction if vegetation not present; water erosion problem on steeper slopes. Native plants should receive preference; trees include American holly, chickasaw plum, longleaf and slash pine, live oak, Southern redcedar, sand pine, and turkey and bluejack oak; shrubs include Adam’s needle, American Beautyberry, Carolina holly, coontie, coral bean, Florida Chinkapin, pawpaw, prickly pear cactus, sawpalmetto, shining sumac, and yaupon; herbaceous plants include aster, beebalm, crocalaria, blanketflower, blazing star, goldenaster, lupine, morning glory, goldenrod and sunflower.	Shrubs: East coast coontie, <i>Zamia umbrosa</i> ; Florida coontie, <i>Zamia floridana</i> . Herbaceous Plants and Vines: Godfrey’s blazing star, <i>Liatis provincialis</i> . Mammals: Florida panther, <i>Felis concolor coryi</i> ; Florida mouse, <i>Peromyscus floridanus</i> . Birds: Southeastern kestrel (Sparrow hawk), <i>Falco sparverius paulus</i> ; Red-cockaded woodpecker, <i>Picoides borealis</i> . Reptiles: Blue-tailed mole skink, <i>Eumeces egregius lividus</i> ; Eastern indigo snake, <i>Drymarchon copsis couperi</i> ; Short-tailed snake, <i>Stilosoma extenuatum</i> .	As this is one of four ecological communities grouped together and is spread throughout the City, known pollution problems will come from urban activities. Litter, oils, pet wastes, household substances (e.g., paints, solvents).	This community is spread throughout the City and would be subject to the pressures from urban development. City’s landscaping ordinance protects trees by requiring property owners to obtain permits before removing trees and requiring replacement in many cases. Communities serve as recreation and open space oases in the urban environment.	Of all of the ecological communities, this conglomeration would be the most affected due to it being spread throughout the City. As noted above, this ecological community cannot be considered “intact” due to the encroachment of urban development. Landscaping ordinance does preserve trees. City is near build-out condition, with very few large tracts left.



TABLE 1 (CONTINUED)

COMMUNITY	O C C U R - R E N C E	DESCRIPTION			LAND USE INTERPRETATIONS		ENDANGERED AND THREATENED SPECIES WHICH MAY OCCUR	KNOWN POLLUTION PROBLEMS	POTENTIAL FOR CONSERVATION. USE OR PROTECTION	EFFECT OF FUTURE LAND USES
		SOILS	VEGETATION	ANIMALS	ENVIRONMENTAL VALUE AS A NATURAL SYSTEM	RANGELAND/WILDLIFELAND/ WOODLAND/URBANLAND				
<b>S o u t h Florida Flatwoods</b>	Throughout south and central Florida; northern limit approximately on line from Levy County on west to St. Johns County on east; covers more land than any other in south Florida; may comprise several thousand acres; typically interspersed with smaller communities of other types, especially wetlands. One of four ecological communities grouped together and spread throughout the City. Would not be considered an "intact" community as it is very much urbanized and subject to impacts of development and urban activity.	Nearly level, deep, acid, poorly to somewhat poorly drained; coarse textured throughout or coarse textured in upper part and moderately coarse or moderately fine textured in lower part. Water movement very gradual to natural drainage-ways, swamps, marshes and ponds; rainy season may have water on or near soil surface. Soils include Braden, Eaton, Electra, Elred, Heights, Immokalee, Lawnwood, Myakka, Nettles, Palmetto, Pomona, Smyrna and Waveland.	Slight differences in plant composition from wetter to drier areas. Typically scattered pine trees with understory of sawpalmetto and grasses; some areas in extreme south Florida have few, if any, trees and are called prairies or dry prairies. Trees: Live oak, <i>Quercus virginiana</i> ; Slash pine, <i>Pinus elliottii</i> ; South Florida slash pine, <i>Pinus elliottii</i> var. <i>densa</i> . Shrubs: Dwarf huckleberry, <i>Gaylussacia dumosa</i> ; Gallberry, <i>Ilex glabra</i> ; Sawpalmetto, <i>Serenoa repens</i> ; Tarflower, <i>Befaria racemosa</i> ; Shining sumac, <i>Rhus copallina</i> , Waxmyrtle, <i>Myrica cerifera</i> . Herbaceous Plants and Vines: Chalky bluestem, <i>Andropogon capillipes</i> ; Creeping bluestem, <i>Schizachyrium stoloniferum</i> ; Lopsided indiagrass, <i>Sorghastrum secundum</i> ; Fall panicum, <i>Panicum dichotomiflorum</i> ; Low panicum, <i>Panicum</i> spp.; Pineland threeawn, <i>Aristida stricta</i> .	Larger animals found in areas where flatwoods join other communities; ecotones provide nesting sites, den sites, food and cover. Mammals: Armadillo, eastern cottontail rabbit, cotton rat, deer, skunks, raccoon, opossum. Birds: Bachman's sparrow, Bobwhite quail, brown-headed nuthatch, meadowlark, pileated woodpecker, pine warblers, red-bellied woodpecker, rufous-sided towhee, yellow-throated warblers. Reptiles: Eastern diamond-back rattlesnake, pygmy rattlesnake, yellow ratsnake. Amphibians: Oak toad, chorus frog, pinewoods tree frog.	Fire and water provide major stress; fire controls hardwoods, promotes natural regeneration of pine; fire removal causes successional move to hardwood community. Original areas of longleaf pine have been logged. Native forage production good with proper management. Good wildlife values; important as wildlife buffer zone between urban areas occurring on better drained sites. Water control and improved management techniques facilitated use of flatwoods for improved pasture, vegetables, citrus and urban development, especially in south Florida.	Rangeland: Most important community for production of cattle on native range. Air dry plant material from 3,000 to 6,000 pounds per acre; 3 to 14-plus acres per animal needed dependent on amount and type of forage; little or no grazing if canopy exceeds 60 percent. Relative percentage by weight: 75% grasses, 15% trees and shrubs, 10% herbaceous plants. Wildlifeland: Well suited for deer, quail, turkey, warblers, bobcat, skunks opossums and raccoons. Fair for squirrels. Poorly suited for dove. Woodland: Moderate equipment limitation and seedling mortality. Slash pine good commercial species; potential annual growth is 0.9 cords per acre; potential for longleaf pine is 0.5 cords per acre; areas south of a line from Hernando County in the west to Orange County in the east has a potential productivity 18 percent lower. Urbanland: Subject to high water tables during rainy seasons; water management systems required for urban uses. Erosion and sedimentation and wind erosion problems without vegetation. Native plants used require minimum establishment and maintenance; trees include American holly, cabbage palm, common persimmon, live oak, longleaf pine, slash pine; shrubs include American beautyberry, coontie, coral bean, partridge pea, pawpaw, sawpalmetto, shining sumac, tarflower, southern waxmyrtle; herbaceous plants include blazing star, Catesby's lily, grassleaf goldenaster, hibiscus, iris, meadowbeauty, sunflower, zephyrlily. Most important urban wildlife are songbirds.	Mammals: Florida panther, <i>Felis concolor coryi</i> ; Mangrove fox squirrel, <i>Sciurus niger avicennia</i> . Birds: Crested caracara, <i>Polyborus plancus</i> ; Florida grasshopper sparrow, <i>Ammodramus savannarum floridanus</i> ; South-eastern kestrel (Sparrow hawk), <i>Falco sparverius paulus</i> ; Red-cockaded woodpecker, <i>Picoides borealis</i> ; Bald eagle, <i>Haliaeetus leucocephalus</i> . Reptiles: Eastern indigo snake, <i>Drymarchon corais couperi</i> .	As this is one of four ecological communities grouped together and is spread throughout the City, known pollution problems will come from urban activities. Litter, oils, pet wastes, household substances (e.g., paints, solvents).	This community is spread throughout the City and would be subject to the pressures from urban development. City's landscaping ordinance protects trees by requiring property owners to obtain permits before removing trees and requiring replacement in many cases. Communities serve as recreation and open space oases in the urban environment.	Of all of the ecological communities, this conglomeration would be the most affected due to it being spread throughout the City. As noted above, this ecological community cannot be considered "intact" due to the encroachment of urban development. Landscaping ordinance does preserve trees. City is near build-out condition, with very few large tracts left.



TABLE 1 (CONTINUED)

COMMUNITY	OCCURRENCE	DESCRIPTION			LAND USE INTERPRETATIONS		ENDANGERED AND THREATENED SPECIES WHICH MAY OCCUR	KNOWN POLLUTION PROBLEMS	POTENTIAL FOR CONSERVATION, USE OR PROTECTION	EFFECT OF FUTURE LAND USES
		SOILS	VEGETATION	ANIMALS	ENVIRONMENTAL VALUE AS A NATURAL SYSTEM	RANGELAND/WILDLIFELAND/ WOODLAND/URBANLAND				
<b>Cabbage Palm Flatwoods</b>	Throughout south Florida, and in central Florida to limited extent; most often occurs adjacent to coastal planning area, major drainageways and lakes. One of four ecological communities grouped together and spread throughout the City. Would not be considered an "intact" community as it is very much urbanized and subject to impacts of development and urban activity.	Nearly level land; poorly to somewhat poorly drained, shallow to deep, coarse to fine textured in subsoil; water movement gradual to and through natural drainageways, swamps, ponds and marshes associated with community; water table on or near soil surface during rainy season. Soils include Broward, Ft. Drum, Matmon and Pinellas.	Water relationships affect plant composition. Typically scattered pine and cabbage pine with understory of palmetto and grasses. Considerable uniformity and openness. Trees: Cabbage palm, <i>Sabal palmetto</i> ; Slash pine, <i>Pinus elliotii</i> . Shrubs: Sawpalmetto, <i>Serenoa repens</i> ; Tarflower, <i>Befaria racemosa</i> ; Waxmyrtle, <i>Myrica cerifera</i> . Herbaceous Plants and Vines: Caesar weed, <i>Urena lobata</i> ; Creeping beggarweed, <i>Desmodium incanum</i> ; Deer tongue, <i>Trilisa odoratissima</i> ; Gay feather, <i>Liatrix gracillis</i> ; Greenbriar, <i>Smilax auriculata</i> . Grasses and Grasslike Plants: Creeping bluestem, <i>Schizachyrium stoloniferum</i> ; Lopsided indiagrass, <i>Sorghastrum secundum</i> ; Saltmarsh windmillgrass, <i>Estachys glauca</i> ; Stiffleaf windmillgrass, <i>Estachys petraea</i> ; Pineland threeawn, <i>Aristida stricta</i> .	Larger animals found where flatwoods join other communities. Mammals: Cotton mice, cotton rat, cottontail rabbit, bobcat, deer, opossum, raccoon, striped skunks. Birds: Bachmans sparrow, bobwhite quail, red-shouldered hawk, rufous-sided towhee. Reptiles: Diamondback rattlesnake, pygmy rattlesnake, black racer, yellow rat snake. Amphibians: Chorus frog, cricket frog, oak toad.	Fire controls hardwoods; removal of fire causes succession to hardwood community, the type dependent on soil conditions.	Rangeland: Air dry plant material from 4,500 to 9,000 pounds per acre; 3 to 14-plus acres per animal needed dependent on amount and type of forage; little or no grazing if canopy exceeds 60 percent. -Relative percentage by weight: 70% grasses and grasslike plants, 15% trees and shrubs, 15% herbaceous plants. Wildlifeland: Offer good food and cover. Food value from palm and palmetto fruit, pine mast and acorns. Well suited for deer and turkey and migrating birds during winter. Woodland: Moderate equipment limitation and seedling mortality. Slash pine and loblolly pine good commercial species; potential annual growth is 1.2 an 1.0 cords per acre; areas south of a line from Hernando County to Orange County has a potential productivity 18 percent lower. Urbanland: High water tables during rainy season; limitations for urban development; water management systems required for urban uses. Erosion, sedimentation and wind erosion problems in unvegetated areas. Native plants require minimum effort: trees include American holly, cabbage palm, common persimmon, live oak, longleaf pine, slash pine; shrubs include American beautyberry, coontie, coral bean, partridge pea, pawpaw, sawpalmetto, shining sumac, tarflower, southern waxmyrtle; herbaceous plants include blazing star, Catesby's lily, grassleaf goldenaster, hibiscus, iris, meadowbeauty, sunflower and zephyrlily. Most common urban wildlife is songbirds.	Herbaceous Plants and Vines: Virginia chain fern, <i>Woodwardia virginica</i> . Mammals: Florida panther, <i>Felis concolor coryi</i> ; Mangrove fox squirrel, <i>Sciurus niger avicennia</i> . Birds: Southeastern kestrel, <i>Falco sparverius paulus</i> ; bald eagle, <i>Haliaeetus leucocephalus</i> . Reptiles: Eastern indigo snake, <i>Drymarchon corais couperi</i> .	As this is one of four ecological communities grouped together and is spread throughout the City, known pollution problems will come from urban activities. Litter, oils, pet wastes, household substances (e.g., paints, solvents).	This community is spread throughout the City and would be subject to the pressures from urban development. City's landscaping ordinance protects trees by requiring property owners to obtain permits before removing trees and requiring replacement in many cases. Communities serve as recreation and open space oases in the urban environment.	Of all of the ecological communities, this conglomeration would be the most affected due to it being spread throughout the City. As noted above, this ecological community cannot be considered "intact" due to the encroachment of urban development. Landscaping ordinance does preserve trees. City is near build-out condition, with very few large tracts left.



TABLE 1 (CONTINUED)

COMMUNITY	OCCURRENCE	DESCRIPTION			LAND USE INTERPRETATIONS		ENDANGERED AND THREATENED SPECIES WHICH MAY OCCUR	KNOWN POLLUTION PROBLEMS	POTENTIAL FOR CONSERVATION, USE OR PROTECTION	EFFECT OF FUTURE LAND USES
		SOILS	VEGETATION	ANIMALS	ENVIRONMENTAL VALUE AS A NATURAL SYSTEM	RANGELAND/WILDLIFELAND/ WOODLAND/URBANLAND				
<b>Wetland Hardwood Hammock</b>	East and west of Central Florida Ridge; predominates in region from Hillsborough County to Wakulla County. Wetland Hardwood Hammock located in Hammock Park and is not generally associated with Pinellas County	Wetland forest on poorly drained soils; evergreen appearance; dominated by laurel, live oak, magnolia and cabbage palm; low and nearly level topography. Somewhat poorly and poorly drained soil; loamy subsoils and sandy surfaces. Soils include Aripeka, Coxville, Herod, Matmon, Megget, Nutall, Oleno, Portsmouth and Plummer.	Luxurious growth with large diversity. Trees: Cabbage palm, <i>Sabal palmetto</i> ; Hawthorns, <i>Craetaegus</i> spp.; Laurel oak, <i>Quercus laurifolia</i> ; Live oak, <i>Quercus virginiana</i> ; Red bay <i>Persea borbonia</i> ; Red maple, <i>Acer rubrum</i> ; Sweetgum, <i>Liquidambar styraciflua</i> ; Water oak, <i>Quercus nigra</i> ; Magnolia, <i>Magnolia grandiflora</i> . Shrubs: Waxmyrtle, <i>Myrica cerifera</i> ; Witchhazel, <i>Hamamelis virginiana</i> ; Sawpalmetto, <i>Serenoa repens</i> Herbaceous Plants and Vines: Cinnamon fern, <i>Osmunda cinnamomea</i> ; Crossvine, <i>Anisostochus capreolata</i> ; Poison ivy, <i>Toxicodendron radicans</i> ; Royal fern, <i>Osmunda regalis</i> ; Spanish moss, <i>Tillandsia usneoides</i> ; Virginia creeper, <i>Parthenocissus quinquefolia</i> ; Wild grape, <i>Vitis</i> spp.; Yellow jessamine, <i>Gelsemium sempervirens</i> Grasses and Grasslike Plants: Longleaf uniola, <i>Chasmanthium sessiliflorum</i> ; Low panicum, <i>Panicum</i> spp.	Mammals: Bobcat, deer, skunk, mink, opossum, otter, raccoon, wild hog, gray squirrel. Birds: Mississippi kite, owls, turkey, red-shouldered hawk, woodpeckers, songbirds. Reptiles: Green nole.	High recreational value for hunting, hiking and nature study. Aesthetic benefits. Water quality and quantity control is important benefit.	Rangeland: Not recommended Wildlifeland: One of most productive and diverse wildlife habitats. Good for wild hogs, deer, turkey, black bear, gray squirrel, woodpeckers, owls, furbearers and reptiles and amphibians. Fair for songbirds. Poor for quail and dove. Woodland: Moderate equipment limitation and seedling mortality. Slash pine and loblolly pine good commercial species; potential annual growth is 1.2 an 1.0 cords per acre, respectively; areas south of a line from Hernando County to Orange County has a potential productivity 18 percent lower. Urbanland: High water tables during rainy season; limitations for urban development; water management systems required for urban uses. Erosion, sedimentation and wind erosion problems in unvegetated areas. Native plants require minimum maintenance: trees include American holly, cabbage palm, dahoon holly, fringetree, hawthorns, live oak, loblolly bay, loblolly pine, longleaf pine, red maple, slash pine, southern magnolia, red cedar, sugarberry, swamp chestnut oak, sweetgum, water oak; shrubs include American beautyberry, shining sumac, yaupon holly, sawpalmetto, waxmyrtle; herbaceous plants include aster, blackeyed Susan, cone flowers, dayflower, rose-mallow, meadowbeauty and sunflower.	Herbaceous Plants and Vines: Adder's tongue fern, <i>Cheiroglossa palms</i> ; Auricled spleenwort, <i>Asplenium auritum</i> ; Climbing dayflower, <i>Commelina gigas</i> ; Cuplet fern, <i>Dennstaedtia bipinnata</i> . Mammals: Florida black bear, <i>Ursus americanus floridanus</i> ; Florida panther, <i>Felis concolor coryi</i> .	Would come mostly from recreational users through litter or food.	Hammock Park is maintained and preserved by the City's Leisure Services Department. Recreation/Open Space land use designation applied to park. Attracts many users through picnic shelters, boardwalks and extensive trails.	Hammock itself is protected through application of Recreation/Open Space land use. Surrounding land use is mostly residential or recreational, with some institutional. Area is nearly built-out with only small infill development left.



TABLE 1 (CONTINUED)

COMMUNITY	OCCURRENCE	DESCRIPTION			LAND USE INTERPRETATIONS		ENDANGERED AND THREATENED SPECIES WHICH MAY OCCUR	KNOWN POLLUTION PROBLEMS	POTENTIAL FOR CONSERVATION, USE OR PROTECTION	EFFECT OF FUTURE LAND USES
		SOILS	VEGETATION	ANIMALS	ENVIRONMENTAL VALUE AS A NATURAL SYSTEM	RANGELAND/WILDLIFELAND/ WOODLAND/URBANLAND				
<b>Oak Hammocks</b>	Originally perceived as a separate and viable ecological community. Oak hammocks could be more properly designated as either Wetland Hardwood Hammocks or as Upland Hardwood Hammocks. Please refer to those sections for the proper discussion.									



TABLE 1 (CONTINUED)

COMMUNITY	OCCURRENCE	DESCRIPTION			LAND USE INTERPRETATIONS		ENDANGERED AND THREATENED SPECIES WHICH MAY OCCUR	KNOWN POLLUTION PROBLEMS	POTENTIAL FOR CONSERVATION. USE OR PROTECTION	EFFECT OF FUTURE LAND USES
		SOILS	VEGETATION	ANIMALS	ENVIRONMENTAL VALUE AS A NATURAL SYSTEM	RANGELAND/WILDLIFELAND/ WOODLAND/URBANLAND				
<b>Freshwater Marsh and Ponds</b>	Throughout Florida; vary widely in size. Inferred occurrence near Jerry Lake and Tooke's Lake in the Planning Area. Possible occurrence elsewhere near lakes and ponds, but no local ecological survey available.	Appears as an open expanse of grasses, sedges and rushes; soil saturated or covered with surface water for two or more months during year; small sawgrass areas included. Nearly level and very poorly drained; coarse textured or organic surfaces underlain by clay or sand. Soils include Basinger depressional, Brighton, Charlotte ponded, Dania, Everglades, Felda depressional, Iberia, Kaliga, Lauderhill, Monteverde, Micco, Ocoee, Okeechobee, Sanibel, Tequesta and Torry.	Eight major different types of freshwater marshes; may be composed of sections of different major types: Flag marshes dominated by pickerelweed; Sawgrass marshes; Arrowhead marshes; Fire flag and other non-grass herbs marsh; Cattail marsh; Spike-rush marsh; Bulrush marsh; Maidencane marsh. Shrubs: St. Johns wort, <i>Hypericum</i> spp.; Primrose willow, <i>Ludwigia</i> spp.; Elderberry, <i>Sambucus canadensis lacinutu</i> . Herbaceous Plants: Arrowhead, <i>Sagittaris</i> spp.; Blue flag, <i>Iris hexagona savannarum</i> ; Cattail, <i>Typha</i> spp.; Fire flag, <i>Thalia geniculata</i> ; Pickerelweed, <i>Pontederia cordata</i> and <i>Pontederia lanceolata</i> ; Smartweed, <i>Polygonum</i> spp.; Pennywort, <i>Hydrocotyle</i> spp. Grasses and Grasslike Plants: Beak rushes, <i>Rhychospora</i> spp.; Blue maidencane, <i>Amphicarpum muhlenbergianum</i> ; Bottlebrush threeawn, <i>Aristida spiciformia</i> ; Bulrushes, <i>Scirpus</i> spp.; Caric sedges, <i>Carex</i> spp.; Clubhead cutgrass, <i>Leersia hexandra</i> ; Common reed, <i>Phragmites</i> spp.; Flat sedge, <i>Cyperus</i> spp.; Maidencane, <i>Panicum hemitomon</i> ; Rush, <i>Juncus</i> spp.; Sawgrass, <i>Cladium jamaicensae</i> ; Spike rushes, <i>Eleocharis</i> spp.; Umbrella grass, <i>Fuirena</i> spp.; Wild millet, <i>Echinochloa</i> spp.	Excellent habitats provided. Mammals: Otter, mink, raccoon, marsh rabbit, white-tailed deer, Florida water rat. Birds: Herons, egrets, bitterns, ibis, sandhill cranes, rails, limpkins, gallinules, snipe, killdeer, Florida duck, red-winged blackbirds, caracara, marsh hawk, red-shouldered hawk, swallow-tailed kite. Reptiles: Amphiuma, dwarf salamander, sirens, frogs (cricket frogs, bullfrog, leopard frog), turtles (mud turtle, red-bellied turtle, chicken turtle), snakes (horn, water, swamp, brown, cottonmouth, ribbon), alligator.	Serve as filter system for rivers and lakes. Fire and water level fluctuations have greatest impacts; marsh-prairie systems will move to woody community if fire prohibited or if water level drops permanently. Highly endangered.	Rangeland: Air dry plant material from 5,000 to 10,000 pounds per acre; 3 to 13-plus acres per animal needed dependent on amount and type of forage. Relative percentage by weight: 80% grasses and grasslike plants, 5% trees and shrubs, 15% herbaceous plants. Wildlifeland: Provides excellent habitat for many wetland wildlife species. Woodland: Not recommended for commercial woodland unless drainage provided. Urbanland: Subject to periodic flooding; limitations for urban development; elaborate water management systems required for urban uses  -Erosion and sedimentation problems in unvegetated areas. Native plants require minimum maintenance: trees include buttonbush, coastal plain willow, persimmon; shrubs include elderberry, waxmyrtle; herbaceous plants include golden canna, cardinal flower, coneflower, rose-mallow, iris, marsh pink, meadowbeauty. Most important urban related wildlife are wading birds, waterfowl, fish and water-adapted reptiles and mammals.	Mammals: Everglades mink, <i>Mustels vason evergladensis</i> ; Key Vaca raccoon, <i>Procyon lotor auspicatus</i> (middle Florida keys only); Silver rice rat, <i>Oryzomys argentatus</i> . Birds: Cape Sable seaside sparrow, <i>Ammodramus maritimus mirabilis</i> ; Crested caracara, <i>Polyborus plancus</i> ; Florida sandhill crane, <i>Grus canadensis pratensis</i> ; Snail kite, <i>Rostrhamus sociabilis</i> ; Wood stork, <i>Mycteria americana</i> Reptiles: American alligator, <i>Alligator mississippiensis</i> ; Florida ribbon snake, <i>Thamnophis sauritis sackeni</i> (Keys population only); Key mud turtle, <i>Kinosternon bauri bauri</i> (Keys population only).	As this community could be potentially spread throughout the City and is proximate to residential areas, known pollution problems will come from urban activities. Litter, oils, pet wastes, household substances (e.g., paints, solvents).	As this community could be spread throughout the City, it would be subject to the pressures from urban development. Retention requirements by both the City and regional agencies would limit and minimize stormwater runoff into lakes and ponds. Lakes and ponds themselves act as retention facilities, filtering runoff. Water-oriented ecological communities serve as recreation and open space oases in the urban environment. Jerry Lake is owned by the Southwest Florida Water Management District (SWFWMD). Used as a water management facility.	Because it is potentially spread through the City, this would be greatly affected by further development. Most of City has already developed "around" these areas, however. Regulations and requirements limit the impacts on wetland areas. City is near build-out condition with very few large tracts left.



TABLE 1 (CONTINUED)

COMMUNITY	OCCURRENCE	DESCRIPTION			LAND USE INTERPRETATIONS		ENDANGERED AND THREATENED SPECIES WHICH MAY OCCUR	KNOWN POLLUTION PROBLEMS	POTENTIAL FOR CONSERVATION. USE OR PROTECTION	EFFECT OF FUTURE LAND USES
		SOILS	VEGETATION	ANIMALS	ENVIRONMENTAL VALUE AS A NATURAL SYSTEM	RANGELAND/WILDLIFELAND/ WOODLAND/URBANLAND				
<b>Swamp Hardwoods</b>	Throughout Florida, except for extreme southeast portion of state; found bordering rivers and in basins which are either submerged or saturate part of the year. Swamp Hardwoods located throughout City near lake areas.	Vegetation primarily deciduous trees; periodic flooding; does not include cypress swamps or bottomland hardwood areas. Nearly level and very poorly drained soils; dark colored; coarse to medium textured surfaces underlain by finer textured material or are organic. Soils include Bayboro, Bladen, Bluff, Dorovan, Grady, Mantachie, Myatt, Pantego and Wexconnet.	Characterized by hardwoods, particularly deciduous. Trees: Bald cypress, <i>Taxodium distichum</i> ; Blackgum, <i>Nyssa sylvatica</i> ; Red maple, <i>Acer rubrum</i> ; Sweetbay, <i>Magnolia virginiana</i> ; Water ash, <i>Fraxinus carolinensis</i> . Shrubs: Buttonbush, <i>Cephalanthus occidentalis</i> ; Dahoon holly, <i>Ilex cassine</i> . Herbaceous Plants and vines: Cinnamon fern, <i>Osmunda cinnamomea</i> ; Lizard's tail, <i>Saururus cernuus</i> ; Royal fern, <i>Osmunda regalis</i> ; Wild pine, <i>Tillandsia fasciculata</i> .	Adapted to wet conditions and must withstand periodic flooding. Mammals: Black bear, bobcat, deer, gray squirrel, mink, otter, raccoon. Birds: Barred owl, hawks, horned owl, pileated woodpecker, turkey, wood duck, chickadees, titmice, yellow-billed cuckoo, limpkin, Acadian flycatcher, woodcock, hooded warbler, cedar waxwing, wren and various songbirds. Reptiles: Turtles, various snakes.	Periodic flooding essential; dominant factor for providing needed nutrients. Of great value for maintaining good water quality and quantity. If water cycle maintained, community will tolerate disturbance. If water table lowered or periodic water not available, system will change. Highly endangered due to sensitivity to water cycle changes. Improper channelization, drainage and impoundment are damaging. Natural storage areas for floodwater.	Rangeland: Has little or no use as rangeland. Wildlifeland: Provides excellent habitat for large variety of wildlife species. Well suited for waterfowl, reptiles, amphibians and mammals. Woodland: Not generally used for commercial woodland production; limited harvest of hardwoods. High potential for commercial woodland production on areas with adequate surface drainage; severe equipment limitations and seedling mortality problems. Slash pine, loblolly pine, eastern cottonwood; potential annual growth of 1.5, 1.2 and 0.8 cords per acre, respectively; potential production 18% less for areas south of Hernando County. Urbanland: Subject to periodic flooding; severe limitations for urban development; elaborate water management systems required for urban uses. Often difficult to establish vegetation on steep channel side slopes; without vegetation, erosion and sedimentation are problem. Native plants require minimum maintenance: trees include American holly, Atlantic white cedar, cabbage palm, loblolly bay, Eastern redcedar, red maple, sweetgum, sweetbay, water oak and willow; shrubs include buttonbush, dahoon holly, elderberry, sawpalmetto, swamp azalea, swamp privet, waxmyrtle; herbaceous plants include aster, dayflower, iris, pine-lily, and rose-mallow. Most important urban wildlife are waterfowl and water-adapted reptiles and mammals.	Herbaceous plants and vines: Dwarf spleenwort, <i>Asplenium pumilum</i> ; Hanging club moss, <i>Lycopodium dichotum</i> ; Harper's beauty, <i>Harperocallis flava</i> . Mammals: Florida black bear, <i>Ursus americanus floridanus</i> ; Florida panther, <i>Felis concolor coryi</i> . Birds: Bachman's warbler, <i>Vermivora bachmanii</i> ; Ivory-billed woodpecker, <i>Campephilus principalis</i> ; Bald eagle, <i>Haliaeetus leucocephalus</i> . Reptiles: American alligator, <i>Alligator mississippiensis</i> .	As this community is spread throughout the City and is proximate to residential areas, known pollution problems will come from urban activities. Litter, oils, pet wastes, household substances (e.g., paints, solvents).	This community is spread throughout the City and would be subject to the pressures from urban development. City's landscaping ordinance protects trees by requiring property owners to obtain permits before removing trees and requiring replacement in many cases. Water-oriented ecological communities serve as recreation and open space oases in the urban environment.	Because it is spread through the City, this would be greatly affected by further development. Most of City has already developed "around" these areas, however. As with Sand Pine Scrub/Long Leaf Pines-Turkey Oak Hills/South Florida Flatwoods/Cabbage Palm Flatwoods conglomeration, this may not be considered an "intact" ecological community due to the encroachment of urban development. City is near build-out condition with very few large tracts left.



TABLE 1 (CONTINUED)

COMMUNITY	OCCURRENCE	DESCRIPTION			LAND USE INTERPRETATIONS		ENDANGERED AND THREATENED SPECIES WHICH MAY OCCUR	KNOWN POLLUTION PROBLEMS	POTENTIAL FOR CONSERVATION, USE OR PROTECTION	EFFECT OF FUTURE LAND USES
		SOILS	VEGETATION	ANIMALS	ENVIRONMENTAL VALUE AS A NATURAL SYSTEM	RANGELAND/WILDLIFELAND/ WOODLAND/URBANLAND				
<b>Upland Hardwood Hammock</b>	Commonly in north central Florida and sparingly in north and west Florida; largest communities near Brooksville, Gainesville and Ocala. Xeric Oak Scrub located on Caladesi Island on windward side behind beaches.	Thick stands of shade tolerant hardwoods and few pines; occurs on rolling terrain with nearly level or strong slopes; moderately moist regimes without excessive water or drought conditions. Somewhat poorly and well drained soils; coarse-textured throughout or coarse-textured in upper part with moderately coarse-textured to moderately fine-textured subsoils. Soils include Blichton, Bonneau, Flemington, Fort Meade, Gainesville, Hernando, Mabel, Millhopper, Shubuta and Zuber.	Hardwoods dominate with few pines. Trees: Black cherry, <i>Prunus serotina</i> ; Eastern hophornbeam, <i>Ostrya virginiana</i> ; Flowering dogwood, <i>Cornus florida</i> ; Hawthorns, <i>Crataegus</i> spp.; Laurel oak, <i>Quercus laurifolia</i> ; Laurelcherry, <i>Prunus caroliniana</i> ; Live oak, <i>Quercus virginiana</i> ; Loblolly pine, <i>Pinus taeda</i> ; Longleaf pine, <i>P. palustris</i> ; Slash pine, <i>P. elliottii</i> ; Pignut hickory, <i>Carya glabra</i> ; Southern magnolia, <i>Magnolia grandiflora</i> ; Sweetgum, <i>Liquidambar styraciflua</i> ; Water oak, <i>Quercus nigra</i> . Shrubs: American beautyberry, <i>Callicarpa americana</i> ; Arrowwood, <i>Viburnum dentatum</i> ; Sparkleberry, <i>Vaccinium arboreum</i> ; Waxmyrtle, <i>Myrica cerifera</i> . Herbaceous Plants and Vines: Aster, <i>Aster</i> spp.; Cat greenbriar, <i>Smilax glauca</i> ; Common greenbriar, <i>Smilax rotundifolia</i> ; Crossvine, <i>Bignonia capreolata</i> ; Partridge berry, <i>Mitchella repens</i> ; Partridge pea, <i>Cassia</i> spp.; Poison ivy, <i>Toxicodendron radicans</i> ; ragweed, <i>Ambrosia artemisiifolia</i> ; Spanish moss, <i>Tillandsia usneoides</i> ; Virginia creeper, <i>Parthenocissus quinquefolia</i> ; Wild grape, <i>Vitis</i> spp.; Yellow jessamine, <i>Gelsemium sempervirens</i> ; Dotted horsemint, <i>Minarda punctata</i> ; Blackberry, <i>Rubus</i> spp. Grasses and Grasslike Plants: Switchgrass, <i>Panicum virgatum</i> ; Low panicum, <i>Panicum</i> spp.	Mammals: Raccoon, opossum, southern flying squirrel, gray squirrel, gray fox, bobcat, white-tailed deer, armadillo. Birds: Bluebird, bluejay, cardinal, cedar waxwing, chickadee, chuck-wills widow, great crested flycatcher, eastern phoebe, eastern mockingbird, loggerhead shrike, mourning dove, palm warbler, summer tanager, robin, rufous-sided towhee, turkey, tufted titmouse, woodpeckers, wrens.	Occur on some of the soils that are well suited for variety of uses. May undergo considerable stress and change. Aesthetic benefits in interior. Valuable for watershed protection; hardwood products prized for residential development.	Rangeland: Soil's moisture holding capacity and natural fertility relatively high; good quality forages can be produced. Air dry plant material varies from 3,000 to 4,500 pounds per acre. Little or no grazing values when forest canopy cover exceeds 60 percent. Relative percentage of annual vegetative production by weight is 50% grasses, 30% trees and 20% forbs. Wildlifeland: Acorns, nuts, fruits, buds, berries make good habitat for deer, turkey, squirrel, black bear, and songbirds. Good for raccoons and opossums. Fair for reptiles. Poor for bobwhite quail, dove and most amphibians. Woodland: High potential for commercial woodland production. Slash pine and loblolly pine good commercial species; potential annual growth is 1.5 and 1.2 cords per acre, respectively. Longleaf pine has potential annual growth of 0.8 cords per acre. Urbanland: Moderately well to well drained areas have few limitations for urban development; attractive area for residential development. Erosion can be a problem on steeper slopes. Native plants require less maintenance: trees include American holly, cabbage palm, laurel cherry, chickasaw plum, common persimmon, dogwood, fringetree, live oak, loblolly pine, longleaf pine, redbud, red maple, slash pine, magnolia, redcedar, swamp chestnut oak, sweetgum, water oak; shrubs include American beautyberry, beargrass, coral bean, elderberry, lantana, strawberry bush, shining sumac, waxmyrtle. Most important urban wildlife includes songbirds and squirrel; undisturbed areas provide good escape cover for deer, turkey, raccoon.	Herbaceous Plants and Vines: Auricled spleenwort, <i>Asplenium auritum</i> ; Dwarf spleenwort, <i>Asplenium pumilum</i> ; Sinkhole fern, <i>Blechnum occidentale</i> . Mammals: Florida black bear, <i>Ursus americanus floridanus</i> ; Florida panther, <i>Felis concolor coryi</i> . Reptiles: Eastern indigo snake, <i>Drymarchon corais couperi</i> .	Would come from day users of Caladesi Island.	Barrier island owned and managed by the State of Florida. Very significant recreational area, catering to thousands of visitors each year. City has assigned Recreation/Open Space land use designation on Caladesi island.	Very minimal effect as residential development on Caladesi Island can not take place.



TABLE 1 (CONTINUED)

COMMUNITY	OCCURRENCE	DESCRIPTION			LAND USE INTERPRETATIONS		ENDANGERED AND THREATENED SPECIES WHICH MAY OCCUR	KNOWN POLLUTION PROBLEMS	POTENTIAL FOR CONSERVATION. USE OR PROTECTION	EFFECT OF FUTURE LAND USES
		SOILS	VEGETATION	ANIMALS	ENVIRONMENTAL VALUE AS A NATURAL SYSTEM	RANGELAND/WILDLIFELAND/ WOODLAND/URBANLAND				
<b>Salt Marsh</b>	Along Atlantic and Gulf Coasts and inland along tidal rivers. Salt Marsh occurs along coast of St. Joseph's Sound and inland in northern part of City east of Alternate US 19.	Appears as open expanse of grasses, sedges and rushes; usually matrix of interconnected shallow natural channels aiding tidal influx. Level, very poorly drained soils, muck or sandy clay loams underlain by loamy sand or organic soils underlain by clay or sand or are clayey throughout. High sulfur content. Soft soils will not support weight of man or large animal. Tidal action causes saturation of soil. Soils include Bohicket, Homosassa, Lacochee, Ticonia, Turnbull, Weekiwachee.	Dependent on tolerance of tidal action and salinity. Herbaceous Plants and Vines: Sea blite, <i>Guaeda linearis</i> ; Sea purslane, <i>Sesuvium portulacastrum</i> . Grasses and Grasslike Plants: Big cordgrass, <i>Spartina cynosuroides</i> ; Black needlerush, <i>Juncus roemerianus</i> ; Gulf cordgrass, <i>Spartina spartinae</i> ; Marshbay cordgrass, <i>Spartina patens</i> ; Olney bulrush, <i>Scripus americanus</i> ; Seashore dropseed, <i>Sporobolus virginicus</i> ; Seashore paspalum, <i>Paspalum vaginatum</i> ; Seashore saltgrass, <i>Distichlis spicata</i> ; Shoregrass, <i>Monanthochoie littoralis</i> ; Smooth cordgrass, <i>Spartina alterniflora</i> .	Mammals: Deer, otter, raccoon Birds: Brown pelicans, coots, egrets, gulls, terns, seaside sparrow, waterfowl. Reptiles: Alligator, diamondback terrapin, saltmarsh snake.	Transition zone from terrestrial to oceanic life on low energy coastline. Stabilize and protect shorelines, especially during storm tides. Productive natural ecological system.	Rangeland: Potential to produce significant amounts of cordgrass, saltgrass and other grasses and forbs. Air dry plant material from 4,000 to 8,000 pounds per acre; 6 to 15-plus acres per animal needed dependent on amount and type of forage. Relative percentage by weight: 90% grasses, 5% trees and shrubs, 5% herbaceous plants and vines. Wildlifeland: Good habitat for wildlife. Maintained by natural forces and tidal action and periodic hurricanes. Storm-caused "open" water may result in habitat more favorable to waterfowl, furbearers and wading birds. Woodland: Not suited to commercial wood production. Urbanland: Subject to high water table and periodic flooding; limitations for urban development; very elaborate water management systems required for urban uses. Erosion and sedimentation problems in unvegetated areas. Native plants require minimum maintenance: trees and shrubs include black mangrove, button mangrove, necklace pod, sea oxeye, southern redcedar, white mangrove; herbaceous plants include aster, goldenrod; grasses include cordgrasses, seashore dropseed, seashore saltgrass. Most important urban related wildlife are waterfowl and water-adapted reptiles and mammals.	Mammals: West Indian manatee, <i>Trichechus manatus latirostris</i> . Birds: Eastern brown pelican, <i>Pelicanus occidentalis carolinensis</i> ; Cape Sable seaside sparrow, <i>Ammodramus maritimus mirabilis</i> (Collier, Monroe, and Dade Counties); Dusky seaside sparrow, <i>Ammodramus maritimus nigrescens</i> (Brevard County); Least tern, <i>Sterna antillarum</i> ; Arctic peregrine falcon, <i>Falco peregrinus tundrius</i> ; Roseate tern, <i>Sterna dougallii</i> ; Bald eagle, <i>Haliaeetus leucocephalus</i> ; Wood stork, <i>Mycteria americana</i> . Reptiles: American alligator, <i>Alligator mississippiensis</i> ; Atlantic green turtle, <i>Chelonia mydas mydas</i> ; Atlantic hawksbill turtle, <i>Eretmochelys imbricata imbricata</i> ; Florida ribbon snake, <i>Thamnophis sauritus sackeni</i> (Lower Keys population); Atlantic saltmarsh water snake, <i>Nerodia fasciata taeniata</i> .	Pollution would come from stormwater runoff into St. Joseph's Sound and from recreational activities associated with water usage.	As stormwater runoff is improved, salt marshes would be protected. Water activities may cause impacts to marsh areas. Pinellas County aquatic preserve designation conceived to prohibit further encroachment of structures along coastline, not just around salt marshes.	Upland land uses would provide most of the impacts due to pollution of stormwater runoff.



TABLE 1 (CONTINUED)

COMMUNITY	OCCURRENCE	DESCRIPTION			LAND USE INTERPRETATIONS		ENDANGERED AND THREATENED SPECIES WHICH MAY OCCUR	KNOWN POLLUTION PROBLEMS	POTENTIAL FOR CONSERVATION, USE OR PROTECTION	EFFECT OF FUTURE LAND USES
		SOILS	VEGETATION	ANIMALS	ENVIRONMENTAL VALUE AS A NATURAL SYSTEM	RANGELAND/WILDLIFELAND/ WOODLAND/URBANLAND				
<b>Man-grove Swamp</b>	Primarily along saltwater shorelines from Levy and Volusia Counties southward; normally mild wave action in form of backbays and estuary fringes. Located mostly on Caladesi and Honey Moon Islands. Smattering of mangroves along coastline, particularly along Edgewater Drive in southern part of City.	Ten to twenty foot thicket of freshly-leaved woody plants; red mangrove is most seaward emergent plant; prop roots characteristic of red, while black and white species send up modified vertical roots. Level, very poorly drained soils, peat or fine sand underlain by sand or clays. Tidal action saturates soil with saltwater and inundation. Soils include Bessie, Hallandale Tidal, Turnbull Variant.	Red, black and white mangrove three most frequent species. Trees: Black mangrove, <i>Avicennia germinans</i> ; Button mangrove, <i>Conocarpus erectus</i> ; Red mangrove, <i>Rhizophora mangle</i> ; White mangrove, <i>Laguncularia racemosa</i> . Herbaceous Plants: Leather fern, <i>Acrostichum aureum</i> ; Sea oxeye, <i>Borrchia arborescens</i> ; Sea purslane, <i>Sesuvium portulacastrum</i> .	Mammals: Everglades mink, raccoon. Birds: Boat-tailed grackle, blue heron, belted kingfisher, gulls, hawks, great white heron, brown pelican, little blue heron, vireos, prairie warbler, mangrove cuckoo, roseate spoonbill, osprey, wood stork, southern bald eagle, white ibis, little green heron, Louisiana heron. Reptiles: American alligator, crocodile, rat snake.	Important for shoreline protection and stabilization. Evidence that mangroves serve in land-building by trapping sediments. Most important function is that of changing detrital base accumulating underneath into estuarine production and higher marine life. Dredge and filling has altered swamps; adjacent activities may affect flow patterns and plant composition.	Rangeland: No potential. Wildlifeland: Mangroves are hardy plants. Provide nesting sides for many birds. Woodland: No commercial use, but some potential for use of mangroves in landscaping coastal building developments. Urbanland: Subject to high water table and periodic flooding; very severe limitations for urban development; very elaborate water management systems required for urban uses. Erosion, and sedimentation problems in unvegetated areas. Native plants require minimum maintenance: trees and shrubs include black mangrove, button mangrove, necklace pod, sea oxeye, southern red cedar, white mangrove; herbaceous plants include aster, goldenrod; grasses include cordgrasses, seashore dropseed, seashore saltgrass and shoregrass. Most important urban related wildlife are waterfowl and water-adapted reptiles and mammals.	Birds: Arctic Peregrine falcon, <i>Falco peregrinus tundrius</i> ; Bald eagle, <i>Haliaeetus Leucocephalus</i> ; Eastern brown pelican, <i>Pelicanus occidentalis carolinensis</i> ; White-crowned pigeon, <i>Columba leucocephalia</i> ; Wood stork, <i>Mycteria americana</i> . Reptiles: American crocodile, <i>Crocodylus acutus</i> ; American alligator, <i>Alligator mississippiensis</i> ; Florida ribbon snake, <i>Thamnophis sauritus sackeni</i> ; Key mud turtle, <i>Kinosternon bauri bauri</i> . Herbaceous Plants: Powdery catopsis, <i>Catopsis berteroniana</i> ; Prickly-apple, <i>Cereus gracilis</i> ; Worm-vine orchid, <i>Vanilla barbellata</i> .	Pollution would come from stormwater runoff into St. Joseph's Sound and from recreational activities associated with water usage.	As stormwater runoff is improved, mangrove swamps would be protected. Water activities may cause impacts to swamp areas. Pinellas County aquatic preserve designation conceived to prohibit further encroachment of structures along coastline, not just around mangrove swamps.	Upland land uses would provide most of the impacts due to pollution of stormwater runoff.





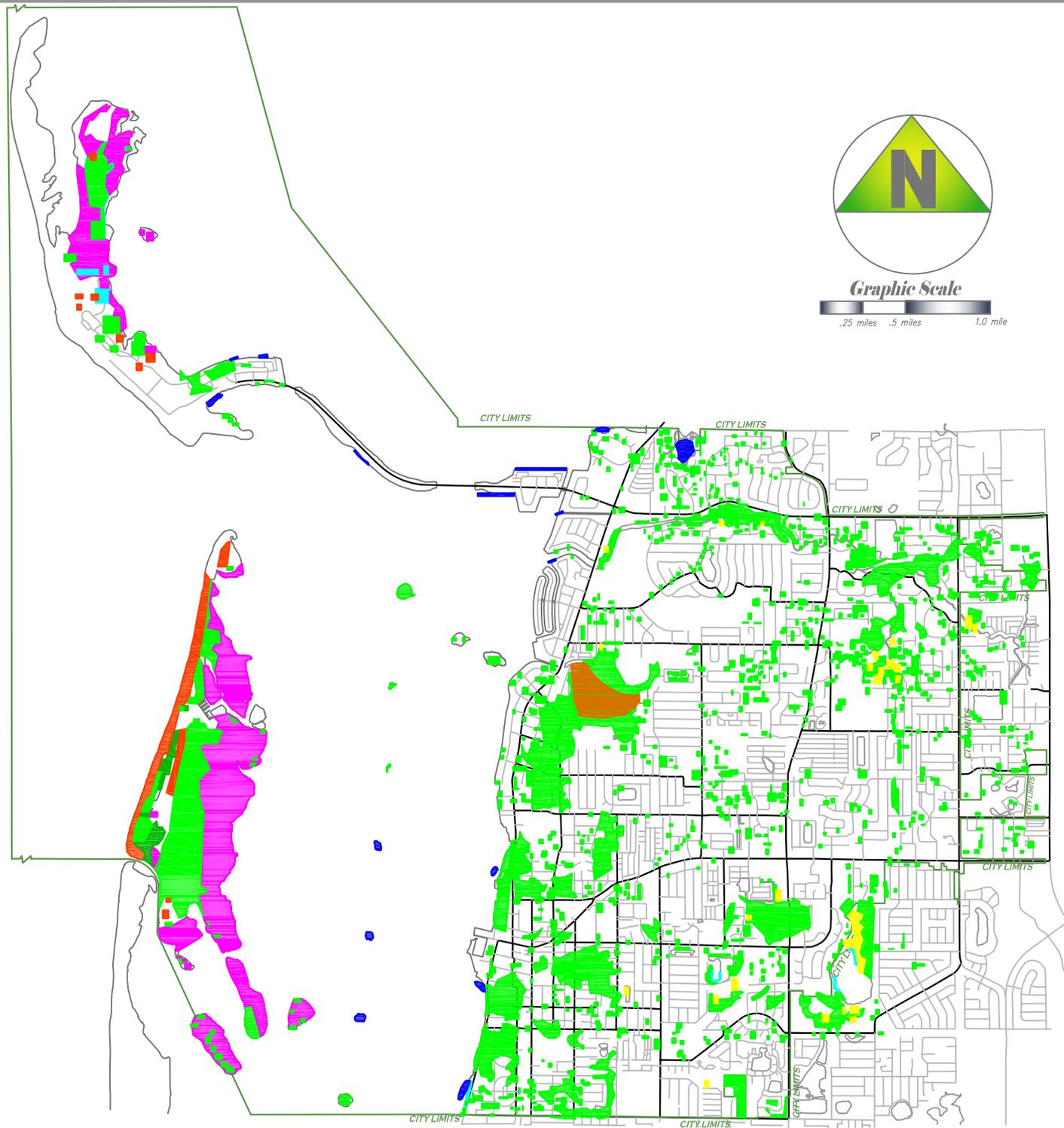
CONSERVATION AND COASTAL MANAGEMENT

FIGURE 2

ECOLOGICAL COMMUNITIES

LEGEND

-  SALT MARSH
-  WETLAND HARDWOOD HAMMOCK
-  SAND PINE SCRUB  
LONGLEAF PINE-TURKEY OAK HILLS  
SOUTH FLORIDA FLATWOODS  
CABBAGE PALM FLATWOODS
-  MANGROVE SWAMP
-  UPLAND HARDWOOD HAMMOCK
-  SOUTH FLORIDA COASTAL STRAND
-  SWAMP HARDWOODS
-  FRESHWATER MARSH



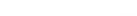
SOURCE: FLORIDA GAME AND FRESH WATER FISH COMMISSION, 1987, 1994; DUNEDIN PLANNING & DEVELOPMENT, 1996

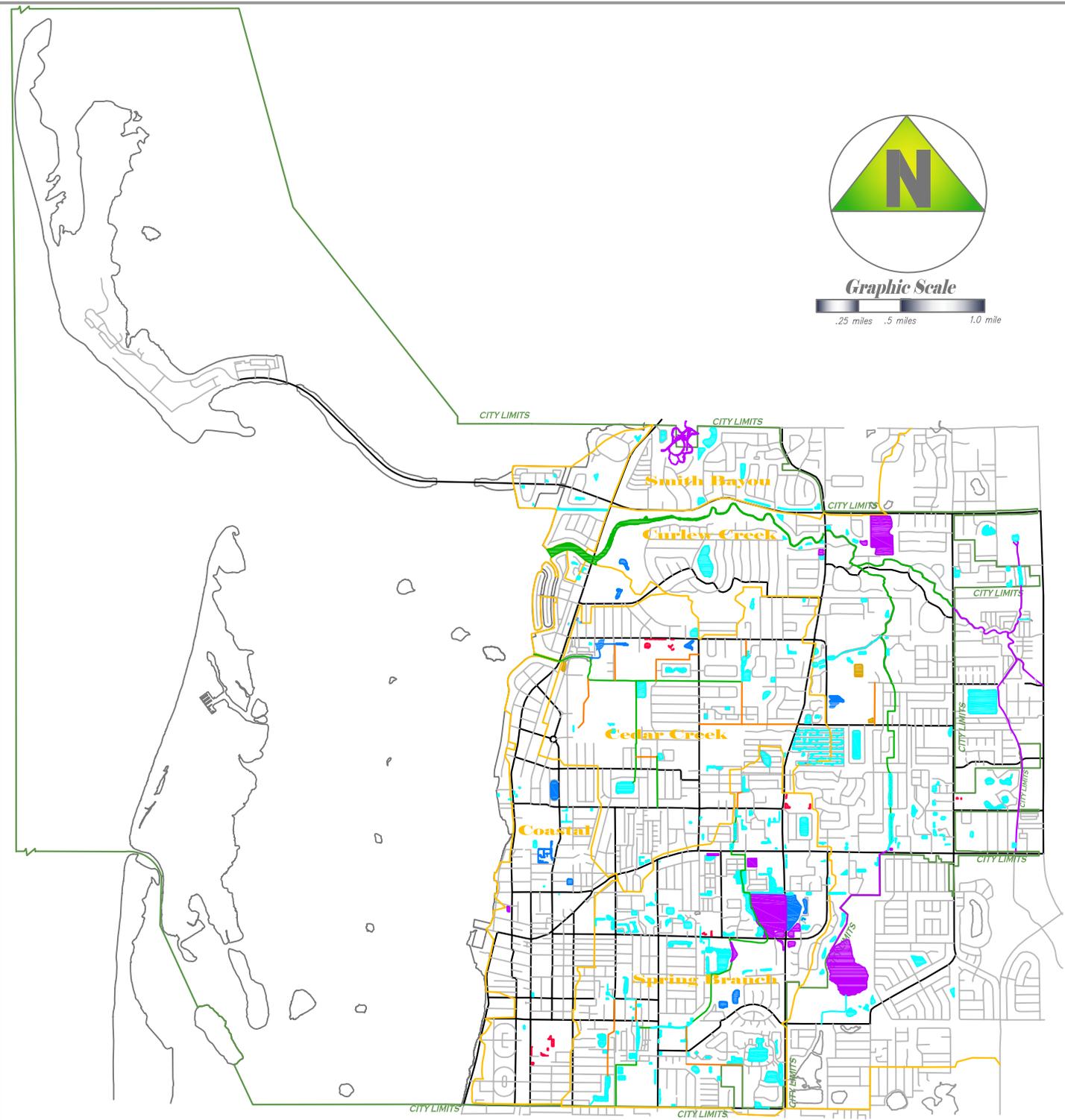


CONSERVATION AND COASTAL MANAGEMENT

FIGURE 3  
MAJOR DRAINAGE BASINS AND FACILITIES

LEGEND

-  BASIN BOUNDARY
-  **Coastal** BASIN NAME
-  MAJOR DRAINAGE SYSTEM
-  MINOR DRAINAGE SYSTEM
-  STATE OR COUNTY FACILITIES
-  CITY-OWNED FACILITIES
-  CITY RETENTION PONDS
-  CITY DETENTION PONDS
-  PRIVATE SYSTEMS



SOURCE: DUNEDIN ENGINEERING SECTION; DUNEDIN STORMWATER DIVISION, 2007



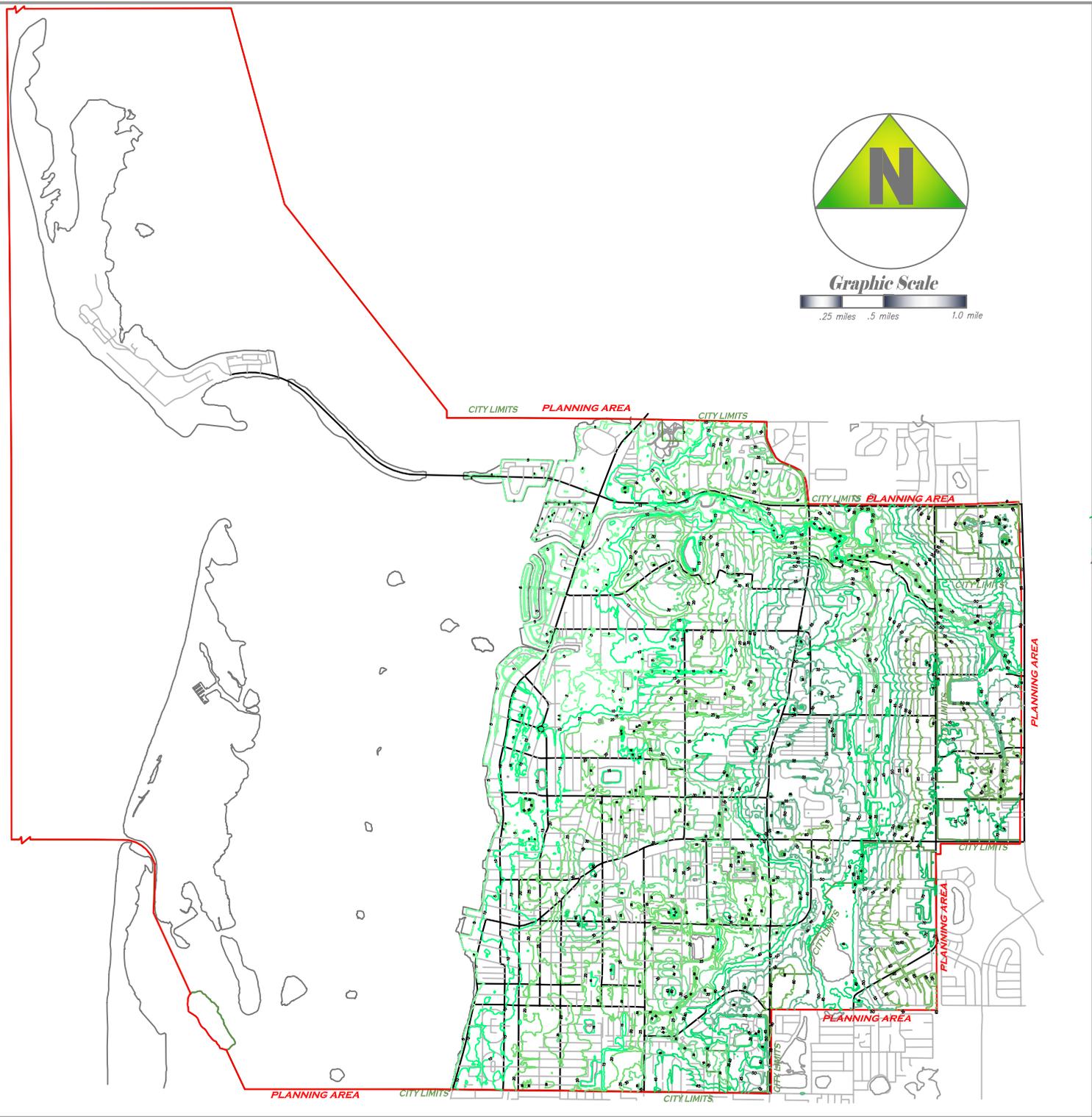
CONSERVATION AND COASTAL MANAGEMENT

FIGURE 4

ELEVATIONS

LEGEND

- 1 TO 9 FEET
- 10 TO 19 FEET
- 20 TO 29 FEET
- 30 TO 39 FEET
- 40 TO 49 FEET
- 50 TO 59 FEET
- 60 TO 69 FEET
- 70 TO 79 FEET
- 80 TO 89 FEET
- 90 TO 99 FEET
- 100 TO 104 FEET



Graphic Scale



is characterized by Residential Urban, Residential Medium, Residential High, Commercial General, Institutional and Recreation/Open Space.

Curlew Creek/Jerry Branch takes in northern and eastern Dunedin. The “A” portion is approximately 1,550 acres in size, while the “B” section takes in a supplemental 1,650 acres from the Jerry Branch and Southwest Florida Water Management District’s Jerry Lake headwaters and a nearly combined equivalent area in the county extending eastward across US 19. Nearly built out (99%), it encompasses nearly all of the unincorporated Planning Area. The southeast basin is flat and the remainder is gently sloping, with eastern elevations reaching 95 feet. Jerry Lake and surrounding wetlands, Scott’s Lake, Resort Lake, Pine Lake, and Lake Saundra are all located here. Twenty-three outfall pipes empty into Curlew Creek and its three tributaries (which cumulatively are 11 miles long). Again, St. Joseph’s Sound is the receiving body. Land use consists primarily of Residential Suburban, Residential Urban, Residential Medium, Preservation, Recreation/Open Space, and General Commercial. Less than one-third of the area, by soils, has a low runoff potential.

The vegetative cover through the City is shown in Figure 5, and the ecological communities are shown in Figure 2. The Sand Pine Scrub, Longleaf Pine-Turkey Oak Hills, South Florida Flatwoods and Cabbage Palm Flatwoods communities have been combined as Pinelands/Hardwood Forest vegetative cover categories. The City has no biologists on staff, but these results appear plausible. The results are interpretive, though, and subject to further discussion and refinement. In order to develop the assessment in Table 1, extensive use was made of *26 Ecological Communities of Florida* published by the Soil and Water Conservation Society. The information here is general in nature, but has been made specific where such knowledge exists. Species lists are general, reflecting that extensive local knowledge on existing plants and animals is limited. Although they are listed in Table 1, there are no known occurrences of larger mammals such as bear and panther in the City. There have been sightings of coyotes.

Pinellas County is a designated aquatic preserve. By Pinellas County Code, “The submerged lands included within the boundaries of Pinellas County...with the exception of those privately held submerged lands lying landward of established bulkhead line, are hereby declared to be an aquatic preserve.... It is the intent of the legislature that such bodies of water be preserved, insofar as possible, in an essentially natural condition so that their ecological and aesthetic values may endure for the enjoyment of future generations.... The aquatic preserve established...shall include the submerged bottom lands and the water column upon such lands as well as all publicly owned islands within the boundaries of the preserve.” This designation limits the sale or transfer of the ownership of the submerged lands, and limits dredging, structures (other than docks) and other physical alterations.

With regard to beaches and dunes, Dunedin Causeway is the only real beach under the jurisdiction of the City. However, there are no dunes on the beach, the Causeway being Made Land. While there are no documented erosion and accretion statistics, sand apparently has shifted from one area to another. The Causeway is protected somewhat through the effect of Honeymoon Island acting as a barrier island, but erosion continues through wave action. The beach was renourished in 2000 in conjunction with the dredging of Hurrigan Pass. In terms of usage, though, the western and southern portion of the Causeway is utilized more than the northern portion.

As has been noted above, much of the City is in the floodplain (Figure 6). Because of this, the City is part of the National Flood Insurance Program (NFIP), which is administered by the Federal Emergency Management Agency (FEMA). The NFIP prescribes government-sponsored insurance for tidal and freshwater shorelines and land subject to flood hazards through rising water and/

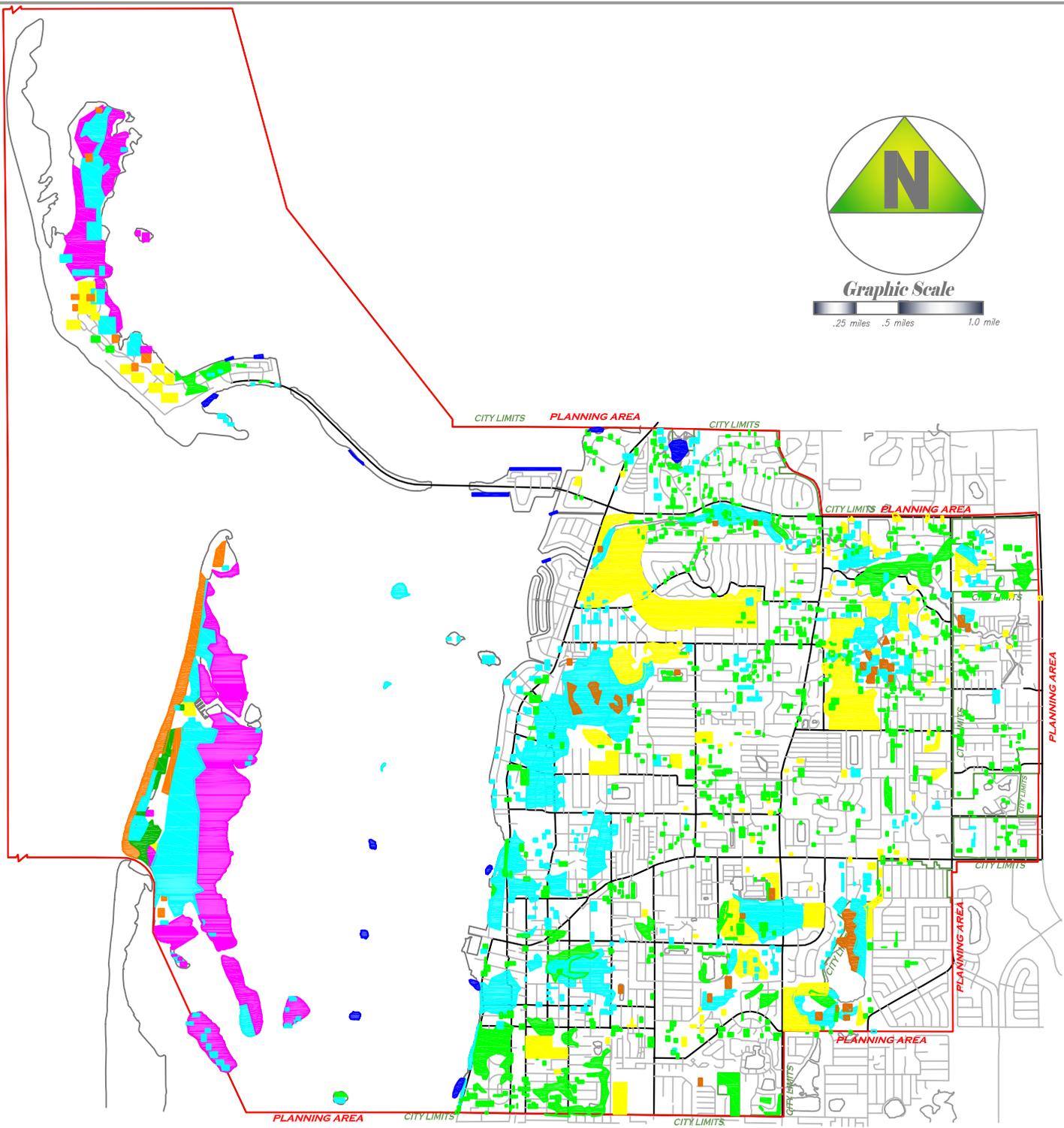


CONSERVATION AND COASTAL MANAGEMENT

FIGURE 5 VEGETATIVE COVER

LEGEND

-  GRASSLAND
-  COASTAL SALT MARSH
-  HARDWOOD SWAMP
-  HARDWOOD HAMMOCKS AND FORESTS
-  PINELANDS
-  MANGROVE SWAMP
-  XERIC OAK SCRUB
-  COASTAL STRAND



SOURCE: FLORIDA GAME AND FRESH WATER FISH COMMISSION, 1987, 1994; DUNEDIN PLANNING & DEVELOPMENT, 2008



# CONSERVATION AND COASTAL MANAGEMENT

## FIGURE 6

# FLOOD ZONES

### LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A  
ZONE AE NO BASE FLOOD ELEVATIONS DETERMINED

ZONE AE BASE FLOOD ELEVATIONS DETERMINED

ZONE AO FLOOD DEPTHS OF 1 TO 3 FEET (USUALLY SHEET FLOW ON SLOPING TERRAIN); AVERAGE DEPTHS DETERMINED. FOR AREAS OF ALLUVIAL FAN FLOODING, VELOCITIES ALSO DETERMINED

ZONE VE COASTAL FLOOD WITH VELOCITY HAZARD (WAVE ACTION); BASE FLOOD ELEVATIONS DETERMINED

ZONE X AREAS OF 500-YEAR FLOOD; AREAS OF 100-YEAR FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 100-YEAR FLOOD

(EL 15) BASE FLOOD ELEVATION IN FEET WHERE UNIFORM WITHIN ZONE

### OTHER AREAS

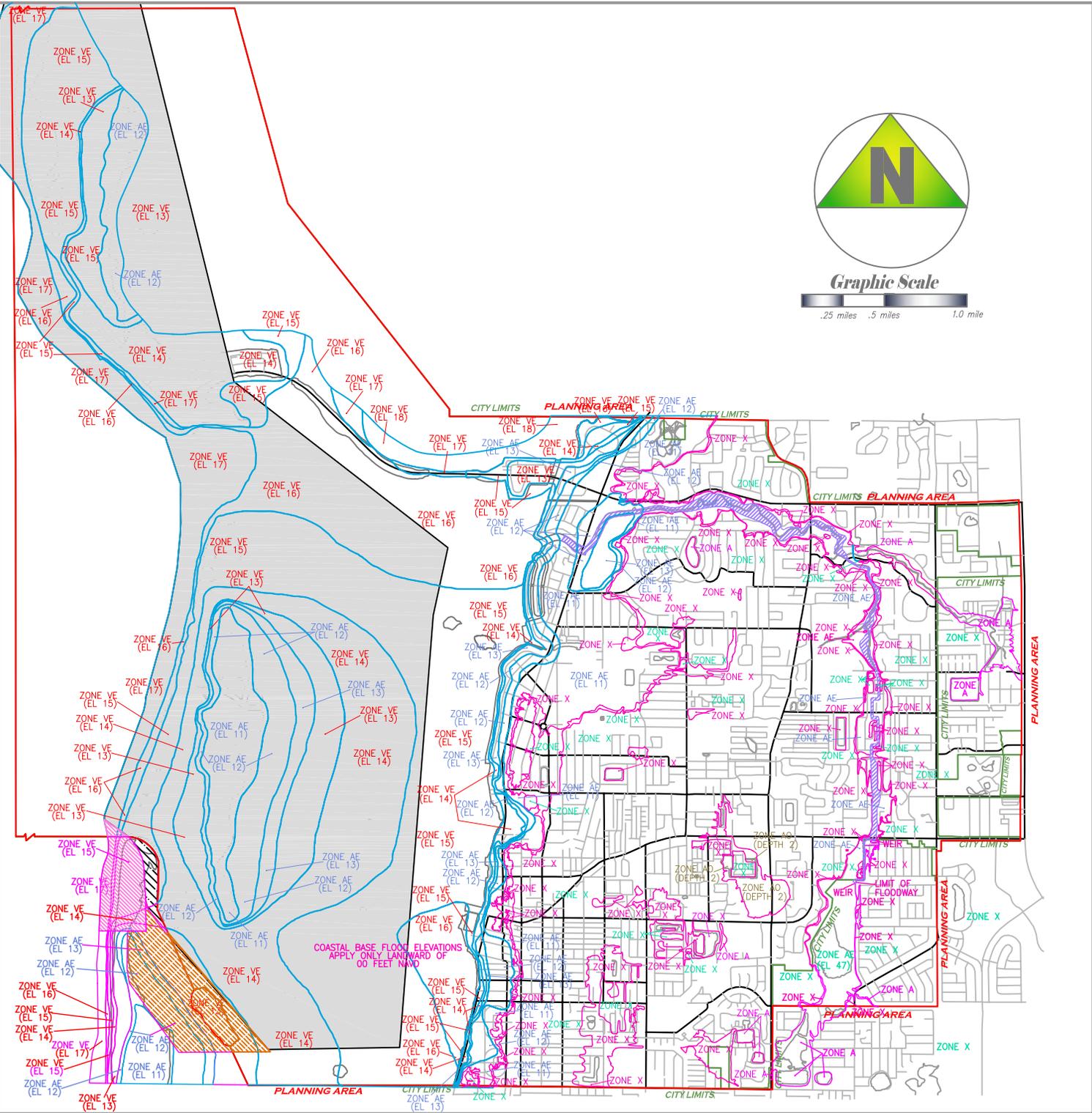
ZONE X AREAS DETERMINED TO BE OUTSIDE 500-YEAR FLOODPLAIN

FLOODWAY AREAS IN ZONE AE

### UNDEVELOPED COASTAL BARRIERS

IDENTIFIED 1983	IDENTIFIED 1990 OR LATER	OTHERWISE PROTECTED AREAS IDENTIFIED 1991 OR LATER

SOURCE: FEDERAL EMERGENCY MANAGEMENT AGENCY, 2003



or wave impacts. Special building codes and restrictions attached thereto are designed to mitigate damages through flooding. Six zones have been identified:

- ΓA: Areas of 100-year flooding where no base flood elevations have been determined.
- ΓAE: Areas of 100-year flooding where the base flood elevations are determined.
- ΓAO: Areas of 100-year flooding with flood depths of 1 to 3 feet.
- ΓVE: Areas of 100-year coastal flood with wave action
- ΓX: Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot; or areas determined to be outside 500-year floodplain.

The base flood elevation (BFE) is the height of the base flood. For the FIRM maps, the base flood is the 100-year flood. If a BFE of 13 feet, for example, has been estimated, that means that a 100-year flood can be expected to reach 13 feet above sea level. By constructing structures to a height of at least 13 feet means that the living area of such a building would not be inundated by a 100-year flood.

On the barrier islands, the Gulf-exposed shorelines have been designated as VE zones while the some of the area adjacent to St. Joseph’s Sound designated as AE zone. The buildings and infrastructure on the islands include essential services, shelters and recreational facilities. Royal Stewart Arms, built on the leeward side of Honeymoon Island, is the only private development warranting possible natural disaster assessment, With 472 units and approximately 1000 residents, it was built prior to FEMA requirements, and is prone to flood damage. It would require the evacuation of residents prior to the arrival of a severe storm.

The VE-zoned Dunedin Causeway is the only means of evacuation for barrier island inhabitants. It is also where water and sewer lines have been placed to provide for services catering to Honeymoon Island visitors.

Along the mainland shoreline, the VE zone extends 300 to 500 feet inland. The AE Zone is narrow in southern half of City but broadens out to .5 miles in width along northern half. This is largely due to Cedar Creek, Curlew Creek and the salt marsh near the northern City Boundary. Farther inland, Zone AE penetrates to the eastern City limits, and the lower portions of the Curlew Creek-Jerry Branch channels are subject to rising tidal waters. The majority of the floodplain is designated as X, with isolated pockets of AE zone adjacent to drainage paths.

Much of Zones VE and AE are designated as a Hurricane Vulnerability Area (HVA). This includes water, wastewater, electrical/telephone/cable television lines, roadway pavement and bridges and sidewalks serving the islands, City inland coastal subdivisions and part of the Community Redevelopment District; Curlew Creek, Cedar Creek and Jerry Branch drainageways. Also in this area are the City’s wastewater treatment facility; City Marina, a water storage tank on State Road (SR) 586; twenty wastewater lift stations and attached force mains and parks and recreation facilities. The HVA is shown in Figure 7. Other municipal services structures (e.g., City Hall, Fire Department Stations) are in Zone X.

No change is being projected in the existing and substantially developed land uses. Most uses and services are protected against heavy wave action, but some flooding can be expected along the mainland coast during severe weather. Water intrusion is possible into the wastewater collection system. Storm surge may cause damage at the City Marina and further erode the Edgewater Drive shoreline. There are improvements slated for facilities located within the coastal floodplain, including refurbishment of the bascule drawbridge (Pinellas County Water Navigation Authority),





CONSERVATION AND COASTAL MANAGEMENT

FIGURE 7 HURRICANE VULNERABILITY AREA AND COASTAL PLANNING AREA

LEGEND

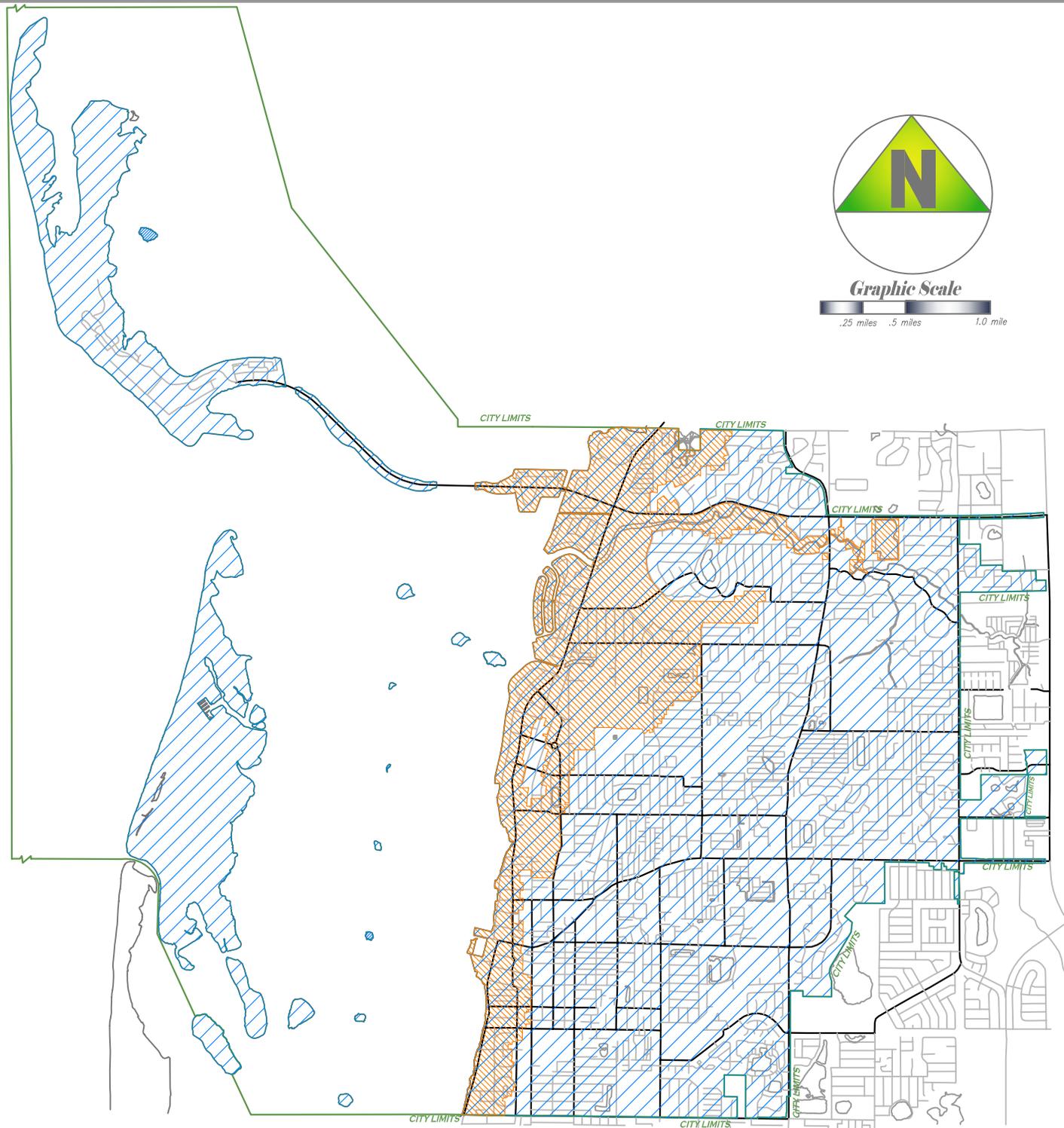


HURRICANE VULNERABILITY AREA



COASTAL PLANNING AREA

(HVA CORRESPONDS TO UPLAND LIMITS OF EVACUATION LEVEL THREE)



multi-lane improvements to SR 586 (Florida Department of Transportation (FDOT)), and repair of wastewater lines (City).

An outgrowth of NFIP activities is the Community Rating System (CRS). This program allows local communities that are performing certain tasks relating to flood protection to claim credits; the amount of the credit allows a commensurate reduction in flood insurance premiums for residents in the community. The City performs the following tasks:

**Elevation certificates:** The City maintains elevation certificates for all post-FIRM (Flood Insurance Rate Map) structures. This means that every new structure, and every rebuilt structure more than 50% destroyed or remodelled, must obtain an elevation certificate and meet FEMA standards.

**Map information:** The City provides flood elevation information to individuals, real estate personnel and insurance companies. Direct mailings are made to real estate companies, financial institutions and insurance companies notifying them that service is available. Over 130 postcards were sent out in 2006.

**Open Space Preservation:** Credit can be claimed for the amount of floodprone property preserved as publicly owned or controlled open space. Areas of Hammock Park, Golf Course, Edgewater Park and Edgewater Drive are eligible, along with most of Honeymoon Island and all of Caladesi Island.

**Stormwater Management:** Credit can be claimed for having regulations which demand that post-development runoff not exceed pre-development runoff.

**Drainage System Maintenance:** The City's regular drainage system maintenance program inspects and removes debris from channels and floodways thus preventing obstructions and ensures free-flowing water.

**Flood Protection Library:** The Dunedin Public Library maintains many documents on flooding, flood protection and flood insurance.

Originally achieving a Class Nine rating, the City has improved its status, becoming a Class Seven in May of 2007. This results in a 15% percent reduction in flood insurance premiums.

Pinellas County has developed marina siting criteria that include performance standards. These standards center around existing and planned land use, environmental considerations, and economic considerations. The City should consider appropriately these criteria in any local study of future marina locations.

There are seven soil types that make up primary associations found in Dunedin (and their depiction is found in Figure 8):

**St. Lucie fine sands with a shell substratum, the Tidal Swamp-Tidal Marsh Association and Coastal Beaches.** These are found on Caladesi and Honeymoon Islands.

**Man-made mixed clay, hard rock, shells and shell fragments transported or dredged and filled;** found on the southern portion of Honeymoon Island.

**Made Land** is found on Dunedin Causeway. Its hard, rocky surface has no dunes or dune systems, and slopes gently into the water. Some erosion has occurred, with sand moving from one place on the Causeway to another; some sand is suspected to be from Honeymoon Island. The Causeway was renourished in 2000. Much of the mainland facing St. Joseph's Sound in northern part of City is also Made Land.

**Urban Land,** composed of the Astatula complex, the Immokalee complex, and the



# CONSERVATION AND COASTAL MANAGEMENT

## FIGURE 8

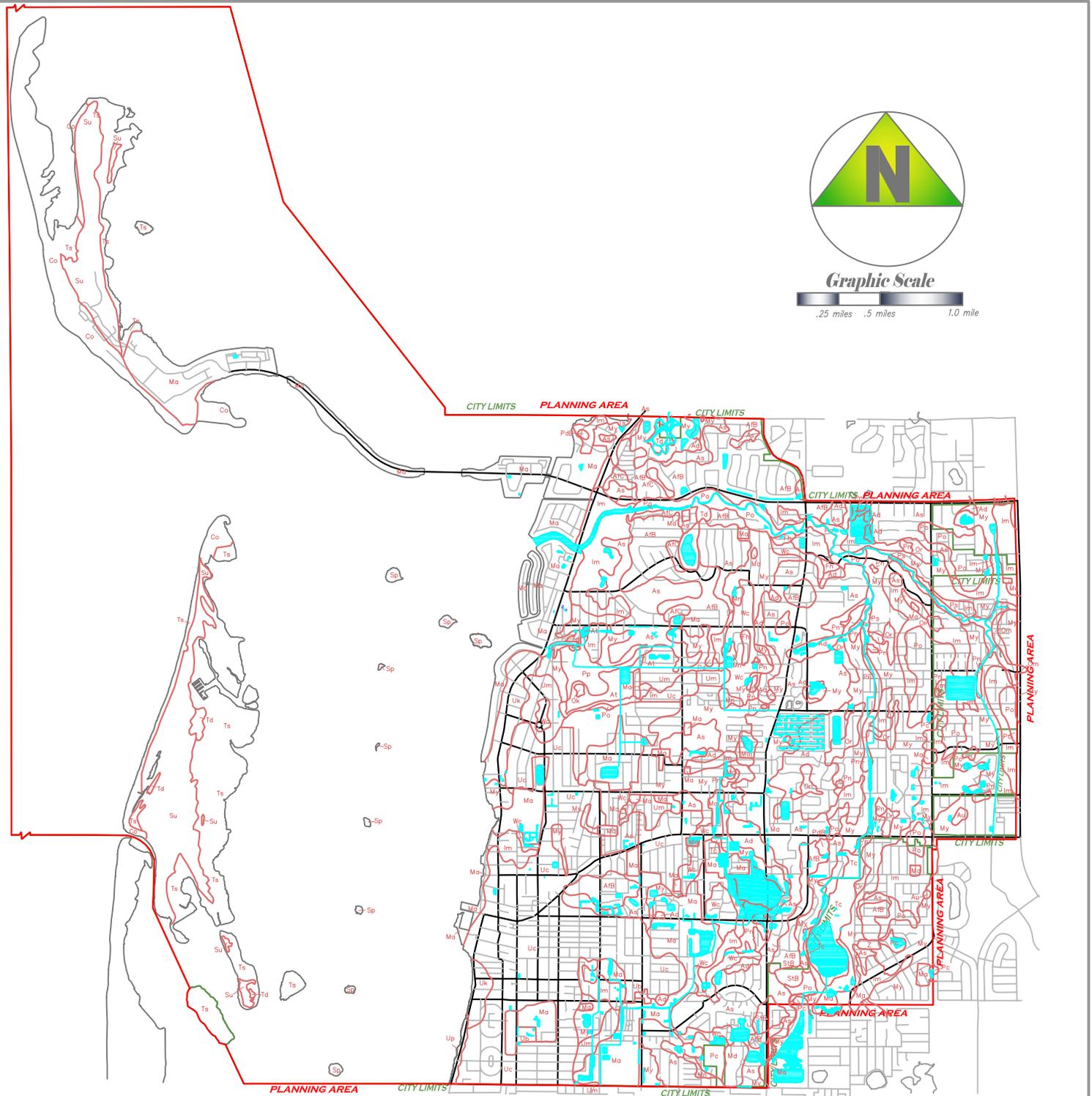
# SOILS

### LEGEND

- Ad ADAMSVILLE FINE SAND
- AfB ASTATULA FINE SAND, 0 TO 5% SLOPES
- AfC ASTATULA FINE SAND, 5 TO 12% SLOPES
- As ASTATULA FINE SAND, MODERATELY DEEP WATER TABLE
- Au ASTOR FINE SAND
- Ch CHARLOTTE FINE SAND
- Co COASTAL BEACHES
- Ed ELRED FINE SAND
- Fd FELDA FINE SAND
- Fe FELDA FINE SAND, PONDED
- Fh FELLOWSHIP LOAMY FINE SAND
- Im IMMOKALEE FINE SAND
- Ma MADE LAND
- Md MADE LAND, SANITARY FILL
- Mn MANATEE LOAMY FINE SAND
- My MYAKKA FINE SAND
- Ok OKEECHOBEE MUCK
- Om OLDSMAR FINE SAND
- Or ORLANDO FINE SAND, WET
- Pc PALM BEACH SAND
- Pc PAMLICO MUCK
- PdB PAOLA FINE SAND, 0 TO 5% SLOPES
- Pf PINELLAS FINE SAND
- Pn PLACID FINE SAND
- Po POMELLO FINE SAND
- Pp POMPANO FINE SAND
- Ps POMPANO FINE SAND, PONDED
- Sp SPOIL BANKS
- StB ST. LUCIE FINE SAND, 0 TO 5% SLOPES
- StC ST. LUCIE FINE SAND, 5 TO 12% SLOPES
- Su ST. LUCIE FINE SAND, SHELL SUBSTRATUM
- Tc TERRA CEIA MUCK, MODERATELY DEEP VARIANT
- Td TIDAL MARSH
- Ts TIDAL SWAMP
- Ub URBAN LAND
- Uc URBAN LAND-ASTATULA COMPLEX
- Uk URBAN LAND, IMMOKALEE COMPLEX
- Um URBAN LAND, MYAKKA COMPLEX
- Up URBAN LAND, POMELLO COMPLEX
- Uw URBAN LAND, WABASSO COMPLEX
- Wa WABASSO FINE SAND
- Wc WAUCHULA FINE SAND
- Z GRAVEL PIT

WATER FEATURE (MAY BE PERMANENTLY OR INTERMITTENTLY INUNDATED)

SOURCE: SOIL CONSERVATION SERVICE, US DEPARTMENT OF AGRICULTURE, UNIVERSITY OF FLORIDA



Myakka complex is found in the southern mainland coast.

¶The Astatula-St. Lucie Association has a nearly level to gently sloping terrain. It has excessively drained and deep sandy acid soils

¶The Myakka-Immokalee-Pomello Association has poorly drained to moderately well drained sandy soils. Its layers are weakly cemented with organics at shallower depths.

¶The Astatula-Adamsville Association is found at the base of and on the uplands. Formed from thick deposits of marine sands, they range from poorly to excessively drained sandy soils.

Because of the amount of vegetation most soil erosion occurs along the shoreline. DEP's draft *Strategic Beach Management Plan for the Southwest Gulf Coast Region* identifies the Pinellas Barriers subregion (which extends from Anclote Key to the southwest channel entrance to Tampa Bay) County as having 39.3 miles of beach shoreline. Of this, 23 miles are critically eroded and , of that, 13.2 miles have been restored and maintained.

In late 2007, the Honeymoon Island Beach Restoration was begun. According to the Pinellas County Department of Environmental Management's website,

The project involved debris removal or material larger than 12" in diameter, nourishment of 2500 [feet] of shoreline along the central island shoreline, and construction a low-profile, granite erosion control structure.... Approximately 150,000 cubic yards of sand was dredged from the Hurricane Pass ebb shoal.

Along Causeway Beach, some erosion has occurred as sand has shifted from one area to another. Sand was added to the Causeway in 2000. Along the Edgewater Drive shoreline, wave action appears to continue to destroy upland land mass. This alleged erosion is gradually reducing the size of the parkland and threatens Alternate US 19. FDOT performed an emergency revetment in 1991, and a draft Dredge and Fill Permit Application was prepared in 1994 by the then Community Services Department. The application called for 4,100 feet of geo-textile fabric overlaid with concrete rubble. The work involves the excavation of 1,300 cubic yards and the filling of nearly 5,000 cubic yards to stabilize the shoreline. Budget constraints have prevented Public Works Department from reviewing and submitting the application to DEP. In 1994, an estimated \$8,000 permit fee would be needed for the life of the permit. Draft versions of Dunedin's One Cent Optional Sales Tax Extension projects included this revetment work, but they were later dropped.

The EAR noted that the necessity for this project has been questioned, and proposed that the policy relating to the shoreline revetment be rewritten to provide for a study to determine whether or not erosion is occurring and, if so, the most efficacious manner of stabilizing it.

Inasmuch as "silt happens," it is a natural occurrence and is caused by creek waters picking up the fine grains along the shoreline and depositing them farther downstream. Rainfall, in the form of stormwater runoff, can aggravate this situation by not only carrying particles into streams and water bodies but also by increasing the flow within channels. Occasional gravitational collapse of the channel walls further exacerbates the situation. Only when this siltation impedes the use or enjoyment of certain natural features is erosion perceived as a problem.

As already noted, the areas near the mouths of Curlew Creek and Cedar Creek silt up from time to time. As the creek waters slow, the silt is released from the flow and deposited on the creek bed. The silt accumulates to the point where navigability is impaired.

Of course, this siltation can occur farther upstream, changing the nature of the creek shoreline itself. As urban development has increased the impervious surface, a commensurate intensification in stormwater runoff has occurred. This is why new significant new development is required to construct retention and/or detention ponds; storing the water or releasing it more slowly, particularly if it is coupled with water quality treatment techniques, is much better for the environment.

The City has grappled with this situation for many years. The priority for stormwater projects has been the containment of liquid and the reduction of flooding rather than addressing the erosive effects of moving water. This has changed somewhat in the last few years: as noted above, the Master Drainage Plan, particularly the projects related to Curlew Creek, has addressed projects that do more than hold water. The proposed off-line detention is expected to reduce the flows in Curlew Creek, thus reducing the erosion. Additionally, the Hammock Park Restoration Project also has implications for curtailing erosion.

In addressing erosion, it should be kept in mind that the City must maintain all of the drainage facilities that fall under its jurisdiction. Vegetation is the first choice in shoreline stabilization, followed by hardfacing (gabions or rip-rap), if permissible. The last choice is piping, also if permissible. The City has also utilized fabrics to stanch the erosion. This is consistent with objectives and policies within the Stormwater Sub-element to preserve natural drainage facilities and discourage man-made modifications in natural drainageways. This is somewhat contradictory as it relates to erosion. Hardfacing or channelizing natural drainageways would reduce siltation by removing the source of the silt. However, this comes at the expense of the environment. Keeping channels in their natural state will invite a certain amount of erosion. The issue becomes one of trade-offs.

When sedimentation reaches significant proportions, it is sometimes appropriate to take action. The City has performed dredging in the past, the Dunedin Marina having been cleaned out several times already. (The bulk of the siltation, apparently, is not from the stormwater that drains into the marina basin, but rather due to the lack of the flushing action from St. Joseph's Sound. Waves carry particles in through the narrow mouth of the marina and the silt cannot escape back out.) Elsewhere, during the late 1990s, the City entered into an assessment program to assist the residents of the Harborview subdivision. The City hired a contractor to dredge the canals in this neighborhood and then billed the property owners. While this did remove the sedimentation, there were aspects of the experience that the City wishes not to repeat.

Privately, the owners of Pirate's Cove Marina dredged a portion of the mouth of Curlew Creek during 2005.

Creeks and streams are not the only water bodies subject to the erosive effects of water. As will be discussed in more detail in the Conservation and Coastal Management Element, the Edgewater Drive shoreline has apparently suffered from wave action for years. This, however, is not specifically related to stormwater conditions and its effects.

It should be evident from the foregoing analysis that stormwater, flooding, water quality, and sedimentation are all closely connected. This environmental interconnection is reflected in SWFWMD's policy to encourage local governments to approach watershed management in a more holistic manner. This includes not only stormwater quality but also flood protection and the preservation of natural systems. (It should be noted that water supply is also generally a component, but that it would not be relevant here as Dunedin obtains its potable water from underground sources rather than surface water.)

Section 62-302.700, *Florida Administrative Code (FAC)* identifies Outstanding Florida Wa-

ters. These are waters which are of exceptional recreational and/or ecological significance and are afforded the highest protection possible. No new direct discharges to surface waters are allowed unless ambient water quality is maintained, and new indirect discharges are allowed only if water quality is not significantly degraded. Outstanding Florida Waters include Caladesi Island State Park, Honeymoon Island State Recreation Area and Pinellas County's aquatic preserve waters. Estuarine waters in the Dunedin area are classified as Class III waters, designated for recreation, propagation and maintenance of healthy, well-balanced populations of fish and wildlife.

There are seven major wetland areas in and around Dunedin, including the barrier island coastal and estuarine systems, the tidal flats and grass beds of St. Joseph's Sound, the northern City Boundary area's salt marshes, the Curlew Creek-Jerry Branch riverine basin, the Cedar Creek riverine channel and hammock, the marshland enclave north of Virginia Street, and SWFWMD's Jerry Lake preserve. Other wetlands are scattered throughout the City in the form of lakes and ponds.

The mainland shoreline itself has had a great deal of dredge and fill construction prior to any wetlands protection legislation. For example, within St. Joseph's Sound, dredging from the Intra-coastal Waterway eastward has destroyed marine vegetation beds and feeding habitats for fish. Further, seawalls have purged shoreline ecosystems and has increased turbidity. Finger island site planning has degraded the Sound's ability to flush pollutants. The Sound has received significant nonpoint source nutrient loadings from residential land use activities. Finally, point sources impacting St. Joseph's Sound include the City's Wastewater Treatment Plant and Coca-Cola North America.

Other activities contributing to the situation in St. Joseph's Sound include marina facilities. Marker 1 Marina on Ward Island currently accommodates over 150 wet storage slips and refueling dockage. A redesign will provide over a total of 164 slips, and a high and dry storage facility capable of handling over 300 boats is under construction. Pirates Cove Marina at Curlew Creek and Alternate US 19 has service facilities and dry storage. The City Marina at the west end of Main Street includes dockage for 194 vessels, has commercial unloading to a wharf-front seafood market, and provides a trailered boat launching ramp. It is an enclosed tidal basin, which means that fuel, lubricants and other pollutants accumulate due to inadequate flushing.

As noted above, the southern portion of the City's shoreline has been stabilized through rip-rap. However, the lack of filtration fabrics and vegetation appears to have reduced the effectiveness of this stabilization method and has created water clarity problems. Further, the unrestricted discharge of 53 drainage outfall pipes affects clarity, turbidity and pollutant content.

There are several aspects relating to the water quality in St. Joseph's Sound. The City, being a co-permittee "for the design, implementation, operation and maintenance of the ambient water quality monitoring program," contracts with Pinellas County. The Department of Environmental Management performs monitoring annually throughout county. According to Pinellas County, "Most of the County's 30 upland drainage basins covered by its [National Pollutant Discharge Elimination System (NPDES)] permit contain at least one fixed sample site just upstream of the freshwater/saltwater mixing zone within streams and drainage systems."

Making use of the draft *Ambient Monitoring Program Annual Report 2003-2004* from Pinellas County Environmental Management, and the on-line Pinellas County Water Atlas, the following observations can be made:

FCurlew Creek and Cedar Creek are both considered to be impaired according to the Impaired Waters Rule (IWR). (Please see Figure 9.) Both water bodies are Class III, meaning that they "must be safe for a variety of recreational purposes





CONSERVATION AND COASTAL MANAGEMENT

FIGURE 9

WATER QUALITY

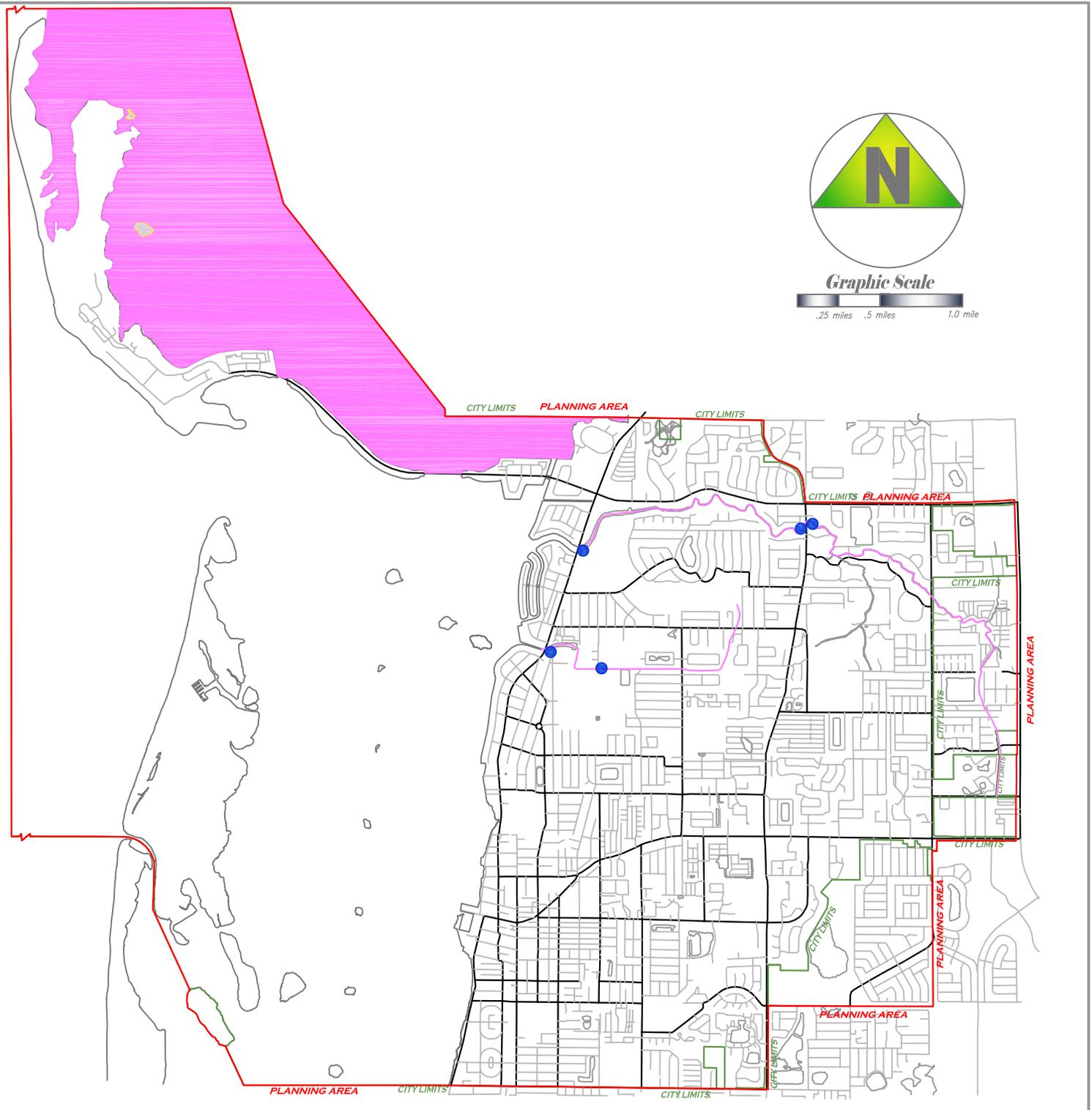
LEGEND



IMPAIRED WATERS



WATER QUALITY MONITORING SITE



including boating, swimming, etc. and also for the purposes of sustaining a well-balanced population of fish and wildlife.” To determine if a water body is impaired, water managers look at water chemistry, physical characteristics (e.g., water clarity, turbidity), and biology (algae, bacteria, plants and wildlife). Both of these creeks are impaired due to the concentrations of dissolved oxygen and nutrients.

The Water Quality Index (WQI) for these two creeks has fluctuated from Poor to Good over the past several years. “The WQI is calculated by averaging the values of most or all of the parameters within five water quality parameter categories: 1) water clarity (measured as turbidity...), 2) dissolved oxygen, 3) oxygen demanding substances (measured as biochemical oxygen, chemical oxygen demand [and/or] total organic carbon), 4) nutrients (measured as total nitrogen, nitrite plus nitrate, [and/or] total phosphorus), and 5) bacteria (total coliform [and/or] fecal coliform).” A WQI of 0 to 45 yields a rating of Good, 45 to 60 is Fair and a value over 60 is considered Poor. Cedar Creek has always been Fair or Good, with its worst score (58) during the October to December 2003 season. Curlew Creek’s worst score (74) occurred during the April to June 2002 period. While the numbers for this period have been improving (to 61 in April to June of 2004), they still result in a rating of Poor.

St. Joseph’s Sound (noted as Clearwater Harbor North on the *Annual Report*) is one of the “open water strata” on the western coast of Pinellas County identified as not being impaired for 2003-2004. In this instance, the water body extends from Memorial Causeway in Clearwater up to Dunedin Causeway. It should be noted that the segment north of Dunedin Causeway (up to the Pinellas/Pasco County line) is designated as impaired for dissolved oxygen.

Water quality, then, continues to be an issue. However, according to the City’s Maintenance Division, inroads have been made due in large part to the City’s efforts to eliminate septic tank systems. The assessment program to put the entire Spanish Trails subdivision on the City’s wastewater system and the annexation and sewerage of the Dunedin Ridge area has successfully reduced the nitrogen and phosphorous concentrations downstream.

Indeed, as part of the NPDES process, the City has had to perform a number of activities and to report on them annually. The following lists recent reported accomplishments (November 2003 through February 2005) in order to improve water quality:

- Dry detention pond inspections: 17
- Wet detention ponds: 6
- Continuous Deflective Separation (CDS) units: 1
- Dry detention pond inspections: 7
- Dry detention pond maintenance: 1
- CDS unit inspections: 1
- CDS unit maintenance: 1
- Wash rack-sediment sump inspections: 16
- Wash rack-sediment sump maintenance: 2
- Swale/ditch/channel inspections: 60,000 linear feet
- Swale/ditch/channel maintenance: 290,004 linear feet
- Inlet/catch basin/grate inspections: 24
- Inlet/catch basin/grate maintenance: 45



Outfall inspections: 21  
Outfall maintenance: 6  
Pipe Inspections: 1,728 linear feet  
Pipe maintenance (cleaning): 1,728 linear feet  
Pipe maintenance (repair/replacement): 2,752 linear feet  
Amount of litter collected in ditches: 194.25 bags  
Total miles of right-of-way maintained: 74.21  
Total miles of residential roads swept: 2,986.5  
Number of school presentations: 160  
Total percentage of storm sewer inlets stenciled or marked: 35%  
Construction site inspections (private sites): 153  
Construction site inspections (municipal sites): 54

There are a number of projects in the Master Drainage Plan that address water quality. Those improvements along Curlew Creek would have a further positive impact on the creek itself. And the Hammock Park Natural Systems Restoration project is specifically designed to reduce stormwater and reclaimed water discharge to Cedar Creek (and ultimately to St. Joseph's Sound) by having Hammock Park act as a natural filter to remove upstream sediments and pollutants. This may also assist with the dissolved oxygen and nutrient concentrations that are impairing the waters. Finally, the City's efforts to install skimmers and pollution control boxes on outfalls to St. Joseph's Sound should also be highlighted. These devices are designed to remove fine and suspended solids, oil, grease, trash and debris, all without blocking the flow of water. The units must be vacuum-cleaned periodically.

One aspect of water quality includes permitted point and nonpoint source surface water discharge. Point source means that wastes are collected and discharged from specific conveyances such as pipes or canals. As shown in Table 2, there are only five permitted point source surface water dischargers within the City. Coca-Cola North America's Industrial Point Source Surface Water Discharge flows directly into St. Joseph's Sound and indirectly to the Gulf of Mexico. Immediately to the south is the City of Dunedin Wastewater Treatment Plant. This Domestic Point Source Surface Water Discharge flows directly into St. Joseph's Sound and indirectly to the Gulf of Mexico. Caladesi Island State Park maintains a small package plant to handle day visitors; it discharges into St. Joseph's Sound. Finally, there is one generic permit for a property at 1480 Main Street to allow for petroleum cleanup. This permit expires in 2012.

There has been one known industrial discharger with no permit: Kellers Sales and Engineering at 940 Douglas Avenue used to discharge into St. Joseph's Sound through the City system. However, this business has been relocated and the site is being considered for redevelopment.

Outside the City limits, but still within the Planning Area, there is only one permitted point source surface water discharger. Utilities, Inc. Wastewater Treatment Plant is also a Domestic Point Source Surface Water Discharger, and the effluent goes directly into Curlew Creek and indirectly into St. Joseph's Sound and Gulf of Mexico. Figure 10 displays location of these permitted dischargers.

Permitted nonpoint source surface water discharges runoff from land surfaces contaminated with various industrial, agricultural, household or roadway residues. There are a number of concerns, including Nitrogen, suspended solids, materials depleting dissolved oxygen, pathogenic bacteria, and pesticides and toxic trace elements. Nitrogen, from nitrogen oxide, is generated by power plants and automobiles. Rainwater dissolves elements out of the air and drops them to the ground for them to become part of surface water runoff. Suspended solids increase turbidity and inhibit light penetration. Oxygen depleting materials can cause fish kills. Pathogenic bacteria restricts wa-





CONSERVATION AND COASTAL MANAGEMENT

FIGURE 10 SURFACE WATER DISCHARGERS

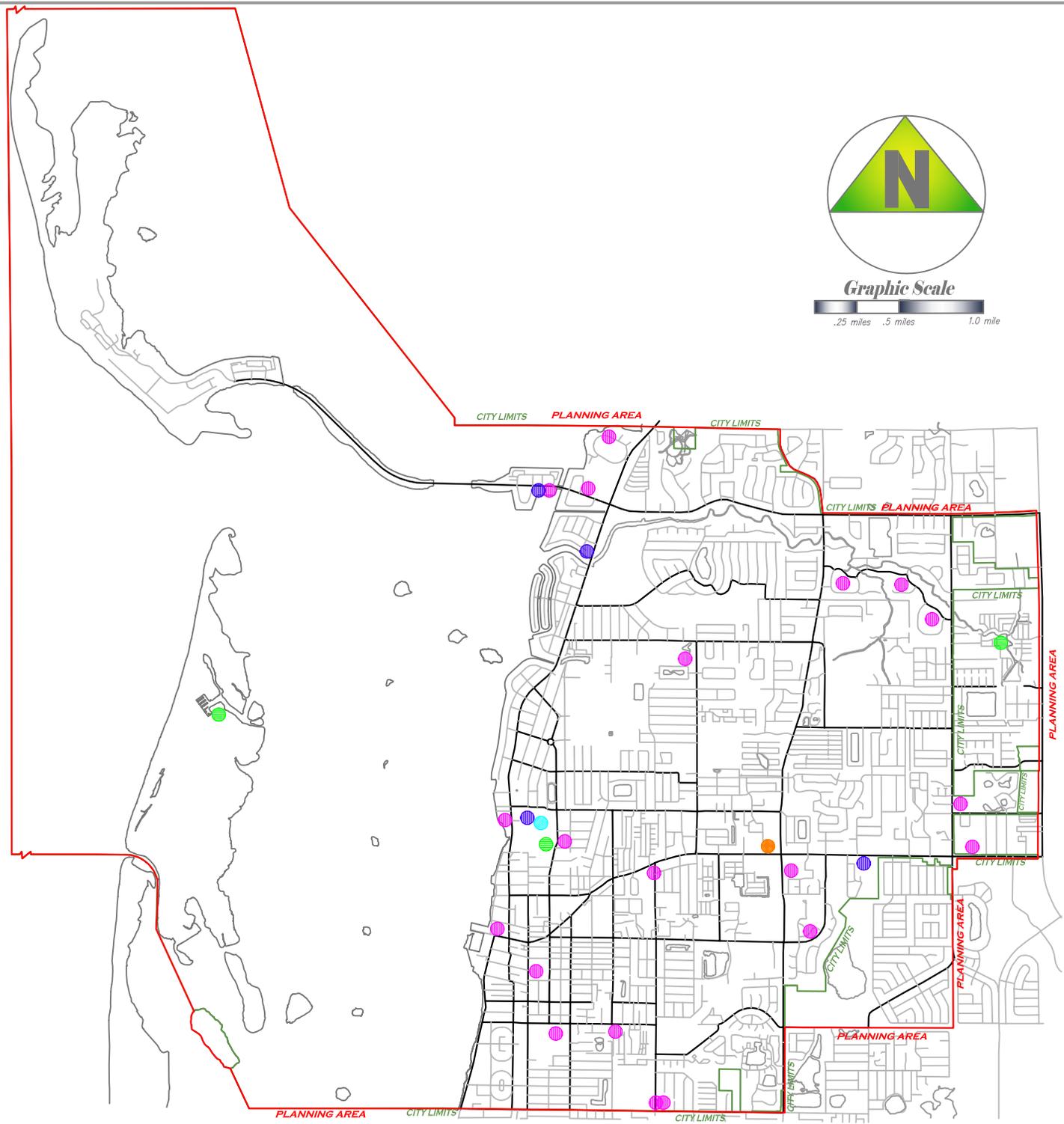
LEGEND

POINT SOURCE DISCHARGERS

- PERMITTED DOMESTIC POINT
- PERMITTED INDUSTRIAL POINT
- PERMITTED CLEANUP

NPDES STORMWATER FACILITIES

- PERMITTED CONSTRUCTION
- PERMITTED MULTI-SECTOR



SOURCE: FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION, 2008

**TABLE 2  
PERMITTED DOMESTIC AND INDUSTRIAL WASTEWATER FACILITIES**

NAME	NPD ES	FACILITY TYPE	STATUS	FACILITY AD- DRESS	OWNERSHIP TYPE	TREATMENT PROC- ESS SUMMARY	CAPACITY (MGD)	ISSUE DATE	EXPIRATION DATE	DESCRIP- TION
<b>Coca-Cola North Amer- ica</b>	Y	Industrial Wastewa- ter	Active	427 San Chris- topher Drive	Any private, non- government organization.	Complete Mix Acti- vated Sludge and re- verse osmosis system.	N/A	3/8/2004	3/7/2009	Wastewater Permit
<b>JM Clearwa- ter Corpora- tion</b>	Y	Petroleum Cleanup GP (long term)	Active	1480 Main Street	Any private, non- government organization.	N/A	N/A	10/10/2007	10/9/2012	Generic Permit
<b>Caladesi Is- land State Park</b>	N	Domestic WWTP	Active	1 Causeway Boulevard	An organization that is an identified part of a Flor- ida state government enti- ty.	Type Iii Extended Aeration	0.005	4/17/2007	4/16/2012	Wastewater Permit
<b>City of Dune- din</b>	Y	Domestic WWTP	Active	1140 Highland Avenue	An organization that is an identified part of a Flor- ida municipality entity.	Advanced Treatment / Type I	6	10/10/2003	10/9/2008	Wastewater Permit
<b>Utilities Inc. (Planning Area)</b>	Y	Domestic WWTP	Active	2299 Spanish Vista Drive	Any private, non- government organization.	Extended Aeration With Final Filters	0.9	2/7/2006	2/6/2011	Wastewater Permit

Source: Florida Department of Environmental Protection, 2008



ter-contact sports and shellfish harvesting (Figure 11). Finally, organic pesticides and toxic trace elements enter the food chain and cause health problems to water creatures and higher predators.

Permits of nonpoint sources appear to be no longer issued. Instead, these appear to be handled through the issuance of NPDES permits. Table 3 and Figure 10 show these permits as currently listed by the FDEP's.

Indeed, FDEP's website notes that

The Nonpoint Source Management Program is responsible for the implementation of the State of Florida's nonpoint source management programs. These programs are implemented cooperatively by the Department of Environmental Protection, Florida's water management districts, other state agencies (i.e., Department of Agriculture and Consumer Services, Department of Health), local governments, and by the public. The goal of these programs is to minimize nonpoint source pollution ("Pointless Personal Pollution") from new land use activities and to reduce pollution from existing activities.... [The] State Nonpoint Source Management Program pursuant to Section 319 of the Federal Clean Water Act. This program brings in about \$9 million per year in federal grant funds that are used to reduce nonpoint sources of pollution in priority SWIM water bodies. Involves development, refinement, and coordinating program implementation which is carried out by various DEP programs along with programs administered by other state agencies, the water management districts and local governments. Emphasis is on technical assistance and public education about pointless personal pollution.

Thus, FDEP appears to be stressing the reduction of nonpoint sources rather than the permitting of such activities.

Assessing the impact of proposed development and redevelopment is not an easy matter. Dunedin is close to build-out, and the effects of urbanization already exist. Problems remain with older drainage systems that do not provide any stormwater treatment and discharge directly into surrounding surface waters. To retrofit these drainage systems and provide retention would be a massively expensive public works project which the City cannot afford. Infill development is practically the only type of development left. As new infill development occurs, it must meet the existing strict stormwater requirements. New development and redevelopment will not be a problem due to their adherence to current runoff condition requirements. No additional "fingerfill" development has been proposed and it is doubtful that it would be approved if proposed. The existing "fingerfill" is minimal (Harborview Villas Subdivision) but is developed with single family homes. It would require tremendous funding to purchase these homes, relocate the current residents, and return shoreline to its natural condition even though this would improve the circulatory conditions and the flushing action of the water.

The only proposed facilities would have a positive impact on estuarine conditions. For example, the replacement, maintenance and expansion of sewer pipes and the rehabilitation of some lift stations will be constructed to current standards. The continued expansion of wastewater services to other areas (as was done for Spanish Trails) should aid in the improvement of water quality by reducing septic tank usage. The existing wastewater treatment plant utilizes tertiary treatment to standards of five milligrams/liter (mg/l) BOD, five mg/l suspended solids, three mg/l nitrogen and one mg/l phosphorous. Reclaimed water pumpage exceeds 2.7 million gallons per day for irrigation. This continues to be expanded, thus reducing discharge from the WWTP.

For potable water, the replacement, maintenance and expansion of water pipes are the only proposed projects. They too will be constructed to current standards, and should not impact estuarine conditions. Brackish wellfield development will continue, with the major impact for discharge being an increase in chloride content. However, the Wastewater Treatment Plant has been con-

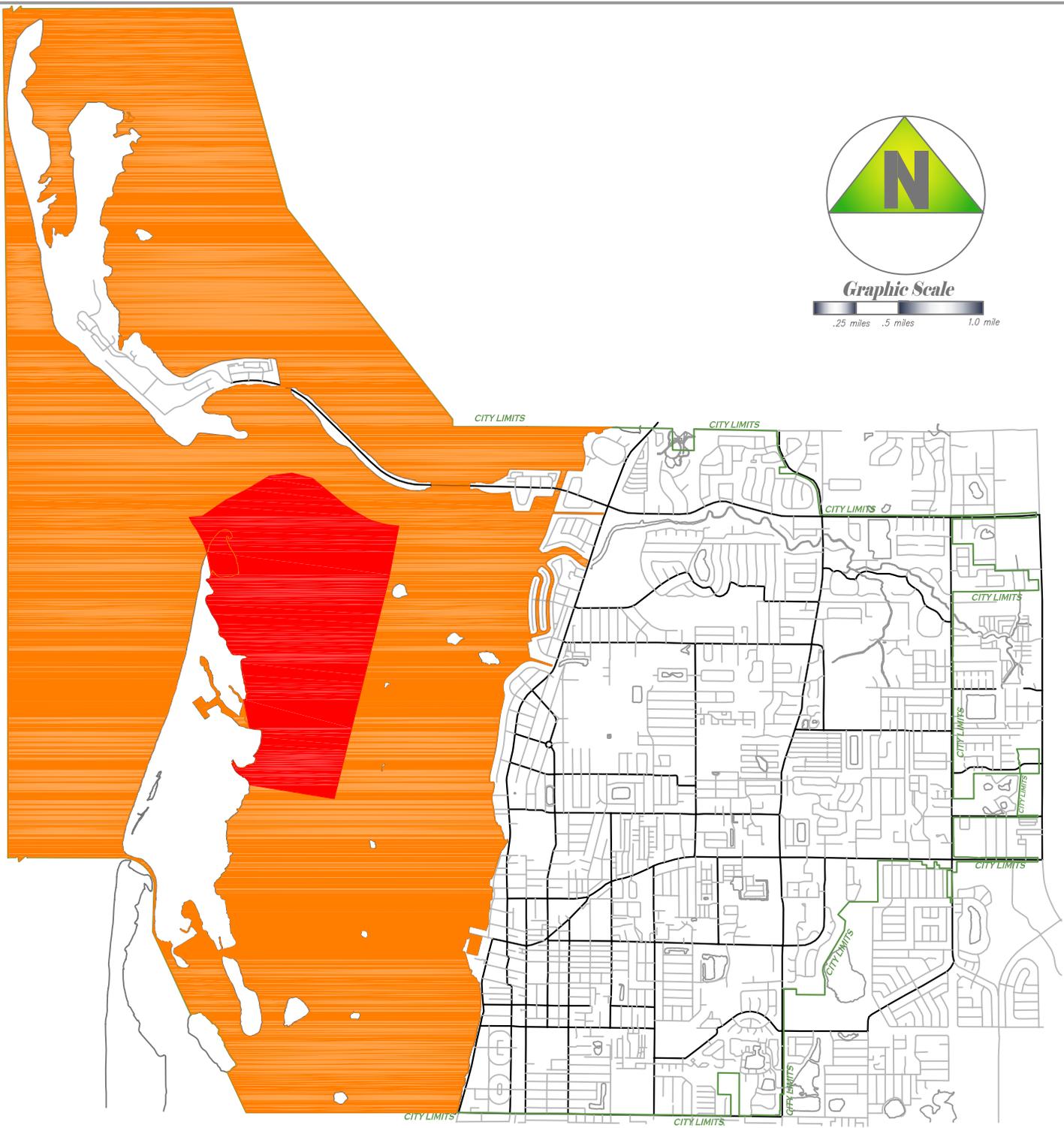


CONSERVATION AND COASTAL MANAGEMENT

FIGURE 11 SHELLFISH HARVESTING AREAS

LEGEND

-  PROHIBITED
-  UNCLASSIFIED (UNAPPROVED)



SOURCE: FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION, 20??

**TABLE 3  
NPDES STORMWATER FACILITIES**

NAME	FACILITY TYPE	STATUS	ADDRESS	OWNERSHIP TYPE	ISSUE DATE	EXPIRATION DATE	DESCRIPTION
<b>200 Main St</b>	Construction Stormwater GP	Active	200 Main Street	Any private, non-government organization.	12/8/2005	12/7/2010	Generic Permit
<b>Coca-Cola Foods Dunedin Plant</b>	Multi-Sector Stormwater GP	Active	427 San Christopher Drive	Any private, non-government organization.	4/7/2006	4/6/2011	Generic Permit
<b>Curtis Fundamental Elementary School at Dunedin</b>	Construction Stormwater GP	Active	531 Beltrees Street	Unknown ownership.	3/7/2008	3/6/2013	Generic Permit
<b>Dunedin Community Center</b>	Construction Stormwater GP	Active	Michigan Boulevard at Pinehurst Road	An organization that is an identified part of a Florida municipality entity.	9/25/2005	9/24/2010	Generic Permit
<b>Fomererly Eckerds</b>	Construction Stormwater GP	Active	2222 SR 580	Any private, non-government organization.	8/30/2002	8/29/2007	Generic Permit
<b>FedEx Express</b>	Multi-Sector Stormwater GP	Active	1881 Main Street	Any private, non-government organization.	6/4/2006	6/3/2011	Generic Permit
<b>Glencairn Townhomes</b>	Construction Stormwater GP	Active	615-631 Douglas Avenue	Any private, non-government organization.	2/10/2006	2/9/2011	Generic Permit
<b>Granada Plaza Publix Redevelopment</b>	Construction Stormwater GP	Active	Main Street at Keene Road	Any private, non-government organization.	6/13/2003	6/12/2008	Generic Permit
<b>Highland Community Villas</b>	Construction Stormwater GP	Active	New York Avenue North of Dexter Drive	Any private, non-government organization.	2/23/2004	2/22/2009	Generic Permit
<b>Marker 1 Marina</b>	Construction Stormwater GP	Active	343 Causeway Boulevard	Any private, non-government organization.	3/16/2007	3/15/2012	Generic Permit
<b>Marker 1 Marina</b>	Multi-Sector Stormwater GP	Active	343 Causeway Boulevard	Any private, non-government organization.	3/29/2008	3/28/2013	Generic Permit
<b>Mediterranean Manor Unit 9-B</b>	Construction Stormwater GP	Active	Mediterranean Circle	Any private, non-government organization.	10/29/2004	10/28/2009	Generic Permit



**TABLE 3 (CONTINUED)  
NPDES STORMWATER FACILITIES**

<b>NAME</b>	<b>FACILITY TYPE</b>	<b>STATUS</b>	<b>ADDRESS</b>	<b>OWNERSHIP TYPE</b>	<b>ISSUE DATE</b>	<b>EXPIRATION DATE</b>	<b>DESCRIPTION</b>
<b>Patricia Avenue Reconstruction</b>	Construction Stormwater GP	Active	Main Street to Union Street	Any private, non-government organization.	7/24/2003	7/23/2008	Generic Permit
<b>Pirates Cove Marina</b>	Multi-Sector Stormwater GP	Active	2400 Bayshore Boulevard	Any private, non-government organization.	4/28/2002	4/27/2007	Generic Permit
<b>Spanish Trails Sanitary Sewer &amp; Reclaimed Water Distribution</b>	Construction Stormwater GP	Active	1/4 Mile S Of Curlew Road	Any private, non-government organization.	5/11/2002	5/10/2007	Generic Permit
<b>Formerly St Joseph Sound Townhomes, now Cherry Laurel Villas (never constructed)</b>	Construction Stormwater GP	Active	Michael Place at Causeway Boulevard	Any private, non-government organization.	5/7/2006	5/6/2011	Generic Permit
<b>Formerly Stirling Recreation Center, now Martin Luther King Jr. Recreation Center</b>	Construction Stormwater GP	Active	550 Laura Lane	Any private, non-government organization.	8/14/2003	8/13/2008	Generic Permit
<b>Suplicki Learning Center</b>	Construction Stormwater GP	Active	2811 Belcher Road	Any private, non-government organization.	4/16/2008	4/15/2013	Generic Permit
<b>Villas of Seagate At St. Joseph Sound</b>	Construction Stormwater GP	Active	1282 And 1320 Bayshore Boulevard	Any private, non-government organization.	4/3/2005	4/2/2010	Generic Permit
<b>Formerly Virginia Gardens, now Townhomes at Weathersfield</b>	Construction Stormwater GP	Active	Virginia Street East of CR 1	Any private, non-government organization.	2/20/2003	2/19/2008	Generic Permit
<b>Walgreen's Dunedin 7918</b>	Construction Stormwater GP	Active	5 Patricia Avenue	Any private, non-government organization.	6/19/2005	6/18/2010	Generic Permit

Source: Florida Department of Environmental Protection, 2008



structed with a bypass for water with such highly concentrated chloride levels. This will require permitting for such discharge into St. Joseph's Sound once the chloride reaches a certain level.

On the stormwater side, current federal, state and local regulatory requirements do not permit design of stormwater facilities that would impact negatively water quality. The NPDES Permit may invoke additional requirements for stormwater runoff. The City has tried to educate its citizenry regarding use of pesticides, fertilizers and auto maintenance products.

For solid waste, the City will maintain its current fleet and expand it when such is required. As solid waste is removed from the City and taken to Pinellas County facilities for disposal, the City has no existing landfill sites that might cause concern. Any new or expanded recycling centers would have minimal, if any, impacts on water quality.

The reclaimed water system is the only capital project associated with Aquifer Recharge. The continued use and expansion of this program should assist in improving estuarine conditions through improved wastewater treatment and through reduction in discharges to St. Joseph's Sound.

On the transportation side, there are no major road widenings scheduled by the City. Any significant reconstruction that results in an increase in impervious area would require additional retention. Construction to existing drainage standards, at the very least, should not worsen water quality. Ongoing sidewalk replacement and construction would increase impervious surface but only minimally.

Other projects that might impact water quality include the Edgewater Drive revetment project, which is currently on hold. The proposed project would stabilize the shoreline through rip-rap and use of a geotextile filter. This would reduce turbidity in this portion of St. Joseph's Sound. The periodic maintenance dredging of the City Marina and/or Cedar or Curlew Creek might also impact water quality. Permits would be required for any such work, potentially limiting elements such as turbidity. The City is not proposing any other major projects such as causeways which would impact water circulation patterns or the accumulation of contaminants in sediments

There are several actions needed to remedy existing pollution problems, many of which the City is already performing. First of all, the City enforces strict stormwater controls for new development and redevelopment. As noted below, the City performs maintenance functions in order to keep the stormwater system in good operating order. The Stormwater Utility Fee, which was increased in 2005, provides funds for the maintenance of the system. The discussion above listed those activities that contribute to water quality. Finally, the Master Drainage Plan projects also contribute to the improvement of stormwater quality. The City undertakes these projects from the list developed in 2003 as funds become available sufficient for their construction. Many of them are replacements for old or deteriorated pipes (e.g., replacing corrugated metal pipe with reinforced concrete pipe in the Hillside park area), and some are specifically water quality projects (e.g., placing skimmers or pollution control boxes on outfall pipes).

The NPDES program speaks specifically to water quality issues through federal regulations. The City joined with Pinellas County and other municipalities in submitting a permit application in mid-1993. The City cited two projects (North Douglas and Lake Paloma, both of which have been completed) and "miscellaneous projects/drainage cleaning" as part of the then existing Capital Improvements Program. The City also cited eight major tasks the City would perform:

IF Modifications to the *Uniform Development Code*, Article 6, Stormwater Management to include sections on unlawful discharges, drainage plans meeting NPDES requirements and temporary erosion and sedimentation controls. These changes were adopted in September of 1993.



ΓContinuation of the ongoing maintenance program, including the cleaning of catch basins, grates and storm sewer pipes, street sweeping, road shoulder repair, continuation of “Adopt-a-Street” litter control program. Also, all new subdivisions have structural controls that include infiltration devices and detention/retention basins.

ΓContinuation of the ongoing structural controls, which means the maintenance of City-owned retention and detention basins. This includes installation in some structures of water quality inlets, skimmers and vegetative filter strips for pretreatment.

ΓContinuation of the ongoing site plan review process. Site plans are reviewed for compliance with stormwater runoff requirements. Temporary erosion and sedimentation controls were added to the site plan requirements

ΓIssuance of the *Urban Stormwater Improvement Guidance* booklet in 1993. This brochure shows property owners how to make structural improvements for pollution prevention, encourages xeriscaping and discusses proper use of and alternatives to chemical pesticides and fertilizers.

ΓContinuation of the ongoing monitoring of the Water and Wastewater Treatment Plants.

ΓContinuation of illicit discharge prohibition. Reports of illicit discharges or dry weather flows will be investigated. Industrial dischargers will be monitored. This will ensure that residents know how to report illicit discharges and prevent improper disposal

The application submittal also showed that the City could easily afford to implement all of these tasks.

Pinellas County, on behalf of itself and participating communities, submitted discharge characterizations based on the EPA sampling requirements and on existing land use. A final joint permit was issued in March of 1997. The City has utilized many of the permit requirements to meet the stormwater quality standards for existing development required in the Stormwater Sub-element.

There are many major federal laws affecting estuarine and water quality, including the following:

ΓThe Resource Conservation and Recovery Act provides “cradle-to-grave” management of hazardous and other solid wastes. It requires permits for hazardous waste treatment, storage and disposal sites.

ΓThe Comprehensive Environmental Response, Compensation and Liability Act of 1980 abates chemical spills or releases of hazardous wastes through removal or clean up, levying of fines and allowance of other enforcement actions by the US EPA.

ΓThe Emergency Planning and Community Right-to-Know Act establishes chemical emergency planning and response programs. The regulations require that certain facilities inform local communities concerning the nature and amount of chemicals present.

ΓThe Clean Water Act ensures water quality for fish and wildlife and for the elimination of discharges of pollutants into waters of the US. States have used certain planning funds to develop groundwater management area protection plans.

ΓThe Federal Insecticide, Fungicide, and Rodenticide Act authorizes EPA to regu-

late pesticide use.

ΓToxic Substance Control Act allows the EPA to regulate the manufacture, processing, use and disposal of toxic chemicals. The EPA may place restrictions on use of chemicals where such could contamination.

There are also a plethora of regulations at the state level:

ΓChapter 5E-1, Florida Administrative Code (FAC) provides for the registration and proper labeling (including instructions for application) of fertilizers, and demands that vehicles transporting fertilizer-pesticide blends be designed to prevent spills and dusting and that the vehicle be marked with caution signs.

ΓChapter 5E-2, FAC provides for the registration, use and application of pesticides, prohibits use or disposal of any pesticide in a manner contrary to label instructions, and regulates the disposal of highly toxic waste pesticides.

ΓChapter 5E-9, FAC provides for licensing and certification requirements for restricted-use pesticide applicators and requires an examination for commercial and public applicators.

ΓChapter 64E-6, FAC stipulates regulations for the siting and construction of “individual sewage disposal systems.” Administered by the Department of Health, it promulgates state policy that every onsite sewage disposal system connect to a publicly-owned or investor-owned wastewater treatment system once it is available. It also specifies soil criteria for location of septic tanks.

ΓChapter 40D-4, FAC allows for SWFWMD to protect recharge areas through the management and storage of surface waters permit system. This requires that post-development discharge conditions on developed sites do not exceed the pre-development conditions.

ΓChapter 40D-40, FAC grants general permits for certain specified surface water management systems not harmful to water resources of SWFWMD, and ensures that discharges from stormwater management systems will meet state water quality standards. Most new development and significant redevelopment must acquire a stormwater management permit (through either SWFWMD or Pinellas County). Literature suggests that detention of stormwater reduces pollutant loadings by 50% to 80%.

ΓChapter 40D-400, FAC. This Rule is entitled “Environmental Resource Permits,” and provides for SWFWMD permitting docks, riprap, roadway crossings, pipelines and the like having impacts on water resources.

ΓChapter 62-25, FAC, is entitled “Regulations of Stormwater Discharge.” Permits are called for only new (after February 1, 1982) stormwater discharge facilities. Design and performance standards are established such that they shall not cause or contribute to violation of water quality standards in waters of the state. Exemptions are provided to one single family dwelling unit, one duplex, one triplex, or one quadruplex providing they are not part of a larger development. The rule delegates permitting responsibility in this area to SWFWMD, and it provides for standards for detention basins, filtration systems, effective grain size, swales and the like.

ΓChapter 62-522, FAC ensures that zones of discharge will not cause violations of groundwater standards, and demands that any installation discharging into ground-

water shall establish a monitoring program. The Department of Environmental Protection (DEP) may order corrective action to the installation.

ΓChapter 62-604, FAC establishes that no wastes are to be discharged into any waters of the state without being given the degree of treatment necessary to protect the beneficial uses of such water, provides for applicability of standards, exemptions, design requirements and wastewater facility expansion, and provides for technology-based effluent limitations and water quality-based effluent limitations for design of domestic wastewater facilities.

ΓChapter 62-604, FAC provides for planning, design, construction, modification or operating standards for new (constructed after January 1, 1982) wastewater collection and transmission facilities as well as minimum design, operation and maintenance standards for these systems.

ΓChapter 62-610, FAC regulates the reuse of reclaimed water, provides guidelines for the design, operation, maintenance and monitoring of land application systems potentially discharging reclaimed water or domestic wastewater effluent to class G-II groundwaters, and addresses different types of land application systems.

ΓChapter 62-611, FAC addresses the use of wetlands for wastewater treatment purposes, prohibits adversely affecting endangered or threatened species through the discharge of reclaimed water to receiving wetlands. Wetlands are not permitted as treatment wetlands except under certain circumstances.

ΓChapter 62-620, FAC establishes procedures to obtain a permit for the construction, modification or operation of a domestic or industrial wastewater facility which discharges into waters of the state.

ΓChapter 62-621, FAC establishes procedures to obtain generic permits to regulate a category of domestic or industrial wastewater facilities if they involve the same or similar types of operations.

ΓChapter 62-625, FAC establishes pretreatment standards to prevent discharges to wastewater facilities and creates a state National Pollutant Discharge Elimination System.

ΓChapter 62-640, FAC provides for the disposal of domestic wastewater residuals as a by-product of the treatment process (sludge).

ΓChapter 62-650, FAC establishes surface water effluent limitations treatment process and that all sources shall meet water quality-based effluent limitations where necessary to meet groundwater quality standards.

ΓChapter 62-660, FAC regulates industrial wastewater, including the runoff from areas receiving pollutants from commercial or industrial storage, handling or processing areas, establishes requirements for the permitting of industrial wastewater facilities and specifies effluent limitations which must be met, and encourages experiments for development of low-energy approaches to advanced treatment of domestic, agricultural and industrial wastes by allowing use of wetlands providing the ecosystem is not adversely affected. It also requires that all non-exempt facilities meet effluent limitations (utilizing many of the US EPA guidelines and standards), and provides controls on pesticide waste degradation systems.

ΓChapter 62-670, FAC establishes wastewater treatment requirements for concentrated animal feedlot operations. Dunedin, though, has no concentrated animal feedlot operations.



Chapter 62-701, FAC regulates permitting, operation and closure of solid waste management facilities, requires that every resource recovery facility or solid waste management facility obtain a permit from DEP (including landfills, waste transfer stations, land application systems, recycling facilities and volume reduction facilities). The rule also establishes processes and standards for the disposal of solid waste through landfilling, incineration, or recycling.

Chapter 62-710, FAC reduces effects of used oil and promotes used oil recycling, and prohibits discharge of used oil into sewers, drainage systems or waters.

Chapter 62-711, FAC provides for the regulation of waste tire storage, collection, transport and disposal and requires that stormwater or floodwater must be diverted away from storage piles.

Chapter 62-730, FAC establishes a hazardous waste management program, and requires permits for construction, operation and closure of hazardous waste treatment, storage, or disposal facilities.

Chapter 62-731, FAC facilitates proper storage, transportation, treatment, disposal, reduction and recovery methods for hazardous wastes and requires each county to conduct a hazardous waste management assessment.

Dunedin adheres to all applicable rules and regulations at the district, state, and federal level. Based on the above listing, regulations appear to provide a great deal of protection for stormwater runoff. Problems can occur at levels below those that are easily regulated, such as the use of fertilizers and pesticides by homeowners or improperly maintained automobiles leaking fluids.

Dunedin's own policies, practices and regulations address many concerns. Most of these are codified through the City's *Code of Ordinances*, the stormwater management portion falling under Chapter 122 Of the *Uniform Development Code (UDC)*:

Section 122-35, *Uniform Development Code (UDC)* requires submittal of a drainage plan for all development.

Section 122-37, *UDC* details the contents of a drainage plan, and stipulates regulations for onsite retention or detention with filtration which are essentially the same as SWFWMD's.

Section 122-38, *UDC* requires that the 100-year stormwater runoff from within the development be safely transported to a designated floodway or area within a designated 100-year floodplain.

Section 122-39, *UDC* provides for standards for floodways.

Section 122-40, *UDC* provides standards for sewer catch basin spacing.

Section 122-41, *UDC* provides piping standards.

Section 122-42, *UDC* provides for finished grade elevations of individual lots and for floor elevations.

Section 122-43, *UDC* provides for temporary erosion/sedimentation controls and construction site control techniques.

Section 122-44, *UDC* makes unlawful the obstruction of the free flow of stormwater in a waterway, channel, ditch or any part of the drainage system or drainage way.

Section 122-46, *UDC* allows the City to inspect all development during construction to ensure that proper stormwater management practices are being followed.

Section 122-88, *UDC* provides for prohibited, permitted and special exception

uses in floodways.

¶Section 122-89, *UDC* provides general standards for the construction of structures in the A- and V-zones.

¶Section 122-90, *UDC* provides specific standards for residential construction, non-residential construction, elevated buildings and manufactured homes in the A-zone.

¶Section 122-91, *UDC* provides specific standards for construction in the V-zone.

¶Section 122-92, *UDC* sets forth minimum floodproofing requirements.

¶Section 122-95, *UDC* requires the City to review subdivision and utility proposals in order to meet specified standards.

¶Section 122-96, *UDC* allows variances to the standards providing certain conditions are met.

¶Section 122-97, *UDC* allows nonconforming structures to continue subject to specific conditions.

There are a number of programs that the City sponsors that have a positive effect on water quality, including the following:

¶The City's Maintenance Program is tasked with cleaning and maintaining on a regular basis catch basins and storm sewer pipes as required in the City's NPDES permit. Street sweeping occurs a minimum of four times per year. Dunedin also has an Adopt-A-Street and an Adopt-a-Park litter control program.

¶Flood Management Projects are related to a City policy that water quality aspects are considered and, where physically and financially feasible, are included in the design and construction of flood management projects. Most major flood management projects require permitting through agencies such as DEP, the US Army Corps of Engineers, Pinellas County (Water and Navigation, Department of Environmental Management) and SWFWMD.

¶With regard to pesticides herbicides and fertilizers, the City encourages citizens to participate in programs such as xeriscaping and the Adopt-A-Street and Adopt-a-Park in order to reduce pollutants. The *Urban Stormwater Improvement Guidance* booklet was designed for use by City departments and City residents to provide information on methods to reduce use of and/or pollutant loading from pesticides, herbicides and fertilizers. The City contracts out all aquatic control applications and requires contractors to have a state permit in order to apply Diquat, Aquathol K, Sonar, 2-4D, Rodeo and Banvel 720.

¶The City monitors the onsite retention/detention basins at the Water Treatment Plant and the Wastewater Treatment Plant.

¶Illicit discharges will be identified through reporting efforts and the validity of the complaint verified. City staff will attempt to trace any pollutants reported back through the municipal stormwater sewer system to its source.

¶Spill Response and Prevention is a two-fold operation. Major spills handled by the City's Fire Department and the Pinellas County Hazardous Materials (HAZMAT) Team when they are reported. The Dunedin Stormwater Division handles minor spills and renders assistance to the above when necessary.

¶For used oil and toxics, Pinellas County has disposal sites throughout county for disposal of oil or toxics. The City's Solid Waste Division periodically sponsors col-

lection days to take in such hazardous wastes from City residents.

ΓExfiltration (seepage) from sanitary sewer system is not a problem. However, infiltration/inflow to the sanitary sewer has been identified as a concern. The City identifies often identifies this I/I through televising sanitary sewer pipes and through a smoke detection system to detect illegal stormwater connections to the wastewater system. The errant pipes are replaced or relined.

Finally, *Dunedin 2025* addresses stormwater drainage by

ΓPreserving the natural drainage facilities.

ΓEstablishing levels of service by basin and channel.

ΓCalling for the adherence to all federal and state stormwater quality regulations.

ΓMandating that drainage deficiencies be corrected.

ΓRequiring strict enforcement of the City's Stormwater Management Ordinance (*UDC*, Chapter 122).

ΓCalling for coordination with SWFWMD for the review and approval of development proposals.

ΓCalling for the upgrading of drainage systems.

ΓRequiring domestic sewage and industrial discharges to achieve best practical technological standards.

Dunedin continues to adhere to all applicable federal, state and district regulations. The City's Stormwater Management Ordinance has served the residents well; it was updated in 1993/94 to meet the intent of NPDES requirements. And as shown above, and in the Stormwater Subelement, the City continues to upgrade when possible its aging stormwater system.

One final word with respect to water quality must be stated. According to the Florida Department of Environmental Protection's website

Section 303(d) of the [federal] Clean Water Act (CWA) requires states to submit lists of surface waters that do not meet applicable water quality standards (impaired waters) after implementation of technology-based effluent limitations, and establish Total Maximum Daily Loads (TMDLs) for these waters on a prioritized schedule. TMDLs establish the maximum amount of a pollutant that a water body can assimilate without causing exceedances of water quality standards. As such, development of TMDLs is an important step toward restoring our waters to their designated uses. In order to achieve the water quality benefits intended by the CWA, it is critical that TMDLs, once developed, be implemented as soon as possible. Chapter 99-223, Law of Florida, sets forth the process by which the 303(d) list is refined through more detailed water quality assessments. It also establishes the means for adopting TMDLs, allocating pollutant loadings among contributing sources, and implementing pollution reduction strategies.

Implementation of TMDLs refers to any combination of regulatory, non-regulatory, or incentive-based actions that attain the necessary reduction in pollutant loading. Non-regulatory or incentive-based actions may include development and implementation of Best Management Practices (BMPs), pollution prevention activities, and habitat preservation or restoration. Regulatory actions may include issuance or revision of wastewater, stormwater, or environmental resource permits to include permit conditions consistent with the TMDL. These permit conditions may be numeric effluent limitations or, for technology-based programs, requirements to use a combination of structural and non-structural BMPs needed to achieve the necessary pollutant load reduction.

The “303(d) list” referred to above was developed in 1998 and included both Cedar Creek and Curlew Creek. However, as this list was refined, these water bodies were discarded from further immediate scrutiny. The priority for TMDL development for these two water bodies has been listed as low and the projected year for TMDL development is shown as 2011.

Indeed, according to the US Environmental Protection Agency (EPA), both Curlew Creek and Cedar Creek appear in their 2002 cycle showing an “Anticipated TMDL Submittal” date of December 31, 2011. Table 4 shows the information supplied by the EPA. (Please note that although these Dunedin water bodies were dropped from the federal “303(d) list,” the results of Pinellas County’s continued water quality monitoring, shown in Figure 9, delineates these waters as impaired.)

TABLE 4 US EPA TMDLS						
WATER-BODY NAME	STATE BASIN NAME	WATERSHED NAME	STATE IMPAIRMENT	PARENT IMPAIRMENT	PRIORITY	ANTICIPATED TMDL SUBMITTAL
<b>Curlew Creek</b>	Crystal River to St. Petersburg	Crystal-Pithlachascotee	Nutrients	None	Low	December 31, 2011
			Coliforms	Pathogens	Low	December 31, 2011
			Dissolved Oxygen	Organic Enrichment/Low Dissolved Oxygen	Low	December 31, 2011
<b>Cedar Creek</b>	Crystal River to St. Petersburg	Crystal-Pithlachascotee	Nutrients	None	Low	December 31, 2011
			Coliforms	Pathogens	Low	December 31, 2011
			Dissolved Oxygen	Organic Enrichment/Low Dissolved Oxygen	Low	December 31, 2011

Source: US Environmental Protection Agency, 2002

According to the City’s Public Works Department, City funding of best management practices for implementing any TMDLs would not commence until 2012. Of course, this presumes that TMDLs would be required for these two water bodies, as well as for St. Joseph’s Sound. As noted above, the water in St. Joseph’s Sound is currently listed as not being impaired. It may be that by the time the creeks are re-assessed, their water quality will be such that TMDLs are not required.

Despite the plethora of objectives and policies relating to water quality mentioned immediately above, it would be advisable to add at least one objective and commensurate policies relating to the implementation of Total Maximum Daily Loads. These statements, though, should be written so as to reference the current indeterminate status of the TMDLs. Certainly,



the City should take every step necessary to meet any required TMDLs, but if none are mandated, then the City can simply continue implementing the NPDES activities.

In order to be prepared for TMDL requirements, objectives and policies relating to them have been added to the adopted plan. Environmentally, improved water quality has far-reaching effects, including benefits to marine grassbeds, marine and avian habitat and estuarine resources. Social benefits can come in the form of better fishing and healthier species that are caught, as well as cleaner water in which to boat and swim. Economic impacts can spread out in the form of items such as increased marine activity (e.g., boat rentals). It should be noted, though, that more marine activity can result in other manner of degradation to the environment (e.g., oil and gasoline spills, additional debris and trash in the water). Marine characteristics are shown in Figure 12. Recreational fishing sites are shown in Figure 13.

Turning from water quality, to water location, there are over 20 major freshwater bodies in City and Planning Area (Figure 14). These range in size from less than one acre to over thirty acres in the City, enclaves and the Planning Area. Many are smaller retention areas which have evolved from the surrounding development; they serve as surface water runoff retention and detention

The *Ecosystem Management Implementation Strategy* (or *EMIS*) places Dunedin in the Springs Coast Ecosystem Management Area (EMA). Conservation lands in this area include Caladesi Island State Park, and the “southernmost reaches of the basin includes St. Joseph Sound [sic], Stevenson Creek, Clearwater Harbor and those portions of Pinellas County that drain westward directly to the Gulf of Mexico.” *EMIS* states that the “Pinellas County portion of this EMA is entirely urbanized and exhibits the worst water quality in the Springs Coast EMA.”

Dunedin has no Surface Water Improvement Management (SWIM) bodies within its City limits. The nearest SWIM bodies are Tampa Bay and Lake Tarpon. Dunedin is part of Northern Tampa Bay Water Resource Assessment Project (WRAP). This is a study of hydrologic conditions undertaken to assess long-term trends in various system characteristics. Data collection and analysis has been carried out to determine the safe yield for not only Tampa Bay WRAP but also the three other WRAPs in SWFWMD’s study area.

In *Save Our Rivers/Preservation 2000*, SWFWMD presents a series of maps making up the “Land Acquisition Site Identification Model.” The examination of the maps lead to several conclusions. First, the acquisition priority was low in the Dunedin area for Water Supply Protection. Second, acquisition priority overall was low in the Dunedin area for Flood Protection, except for along the mainland coast in the vicinity of Dunedin Causeway where it appeared to rate moderately high. Third, acquisition priority overall was low in the Dunedin area for Natural Systems Protection except along the coast where it appeared to rate moderate. Fourth, acquisition priority in the Dunedin area for Management and Acquisition Consideration proved to be moderate. The result was a land acquisition priority map that demonstrated a low priority in the Dunedin area; the closest proposed acquisition project to Dunedin was the Brooker Creek Riverine System in northeast Pinellas County.

Indeed, in SWFWMD’s *Florida Forever Work Plan, Annual Update 2005*, the only property shown in the Dunedin area in the “Land Acquisition Projects within the Tampa Bay/Anclote River Watershed” is Jerry Lake, and this has already been acquired.

Turning to an analysis of the wetlands, (Figures 15 and 16) it cannot be emphasized enough that the City is nearing physical build-out. While wetlands have been preserved throughout the City, they are surrounded by mostly residential, recreational or institutional land uses. The only commercial land uses near wetlands occur along Main Street. These areas are already developed and thus cannot be directed away from wetlands. To examine the area holistically, though, Figure



CONSERVATION AND COASTAL MANAGEMENT

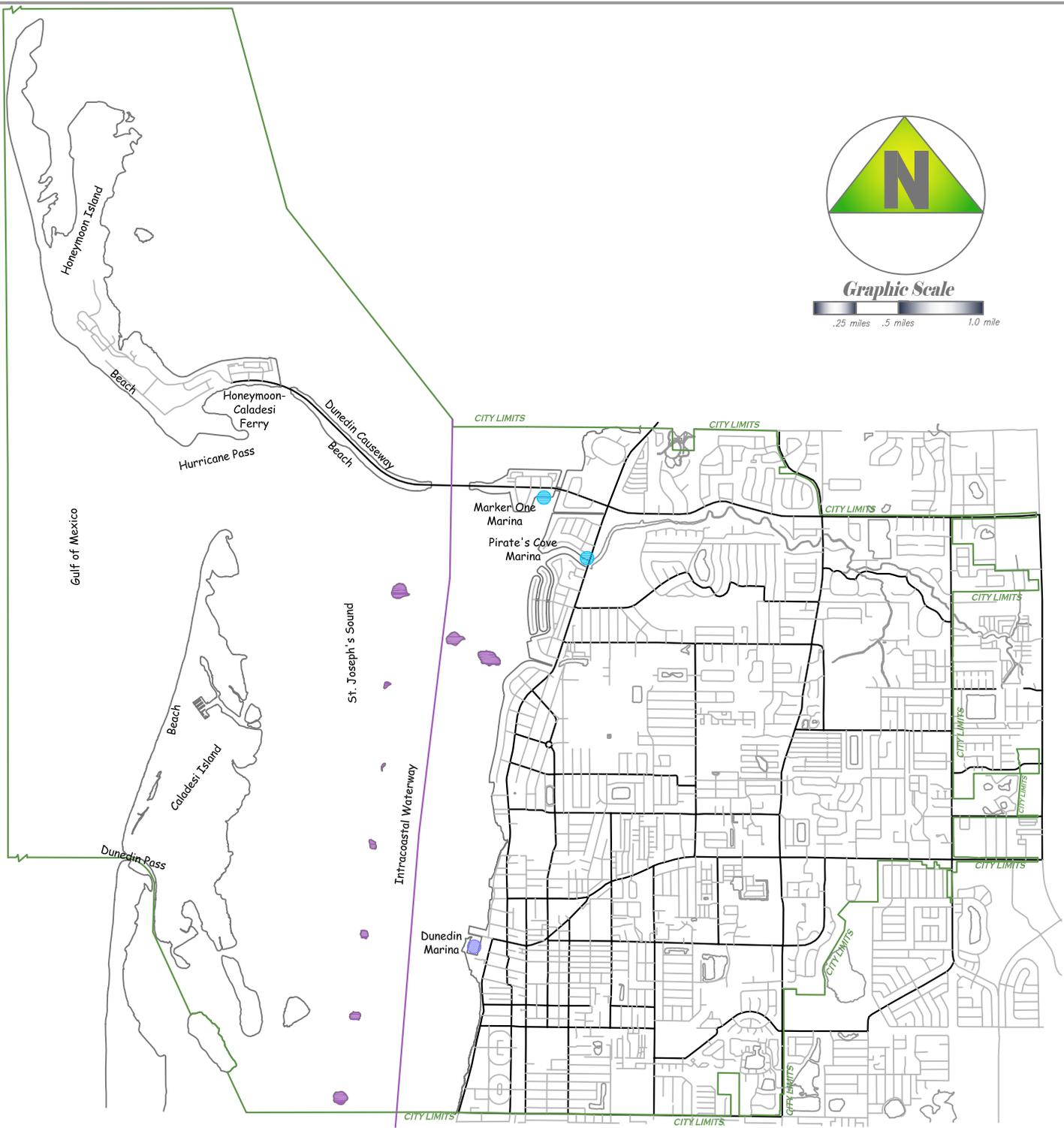
FIGURE 12 MARINE CHARACTERISTICS

LEGEND

Name of Feature NAME OF FEATURE

DREDGE SPOIL ISLANDS

PRIVATE MARINA PUBLIC MARINA





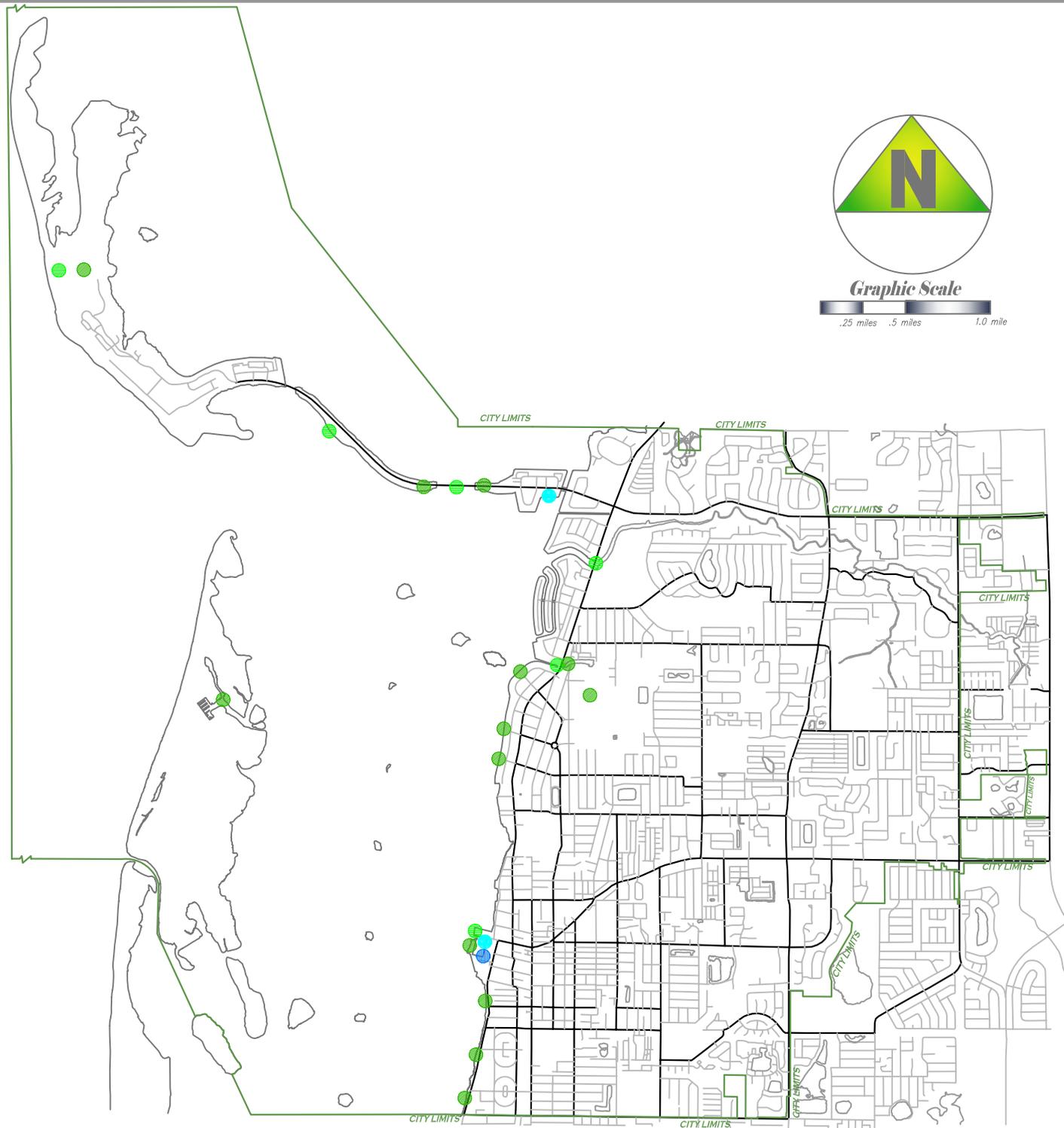
CONSERVATION AND COASTAL MANAGEMENT

FIGURE 13

RECREATIONAL FISHING SITES

LEGEND

- PIER, BRIDGE OR JETTY FISHING
- BEACH OR BANK FISHING
- CHARTER OR PARTY BOATS
- PUBLIC BOAT RAMPS





CONSERVATION AND COASTAL MANAGEMENT

FIGURE 14 MAJOR FRESHWATER BODIES

LEGEND

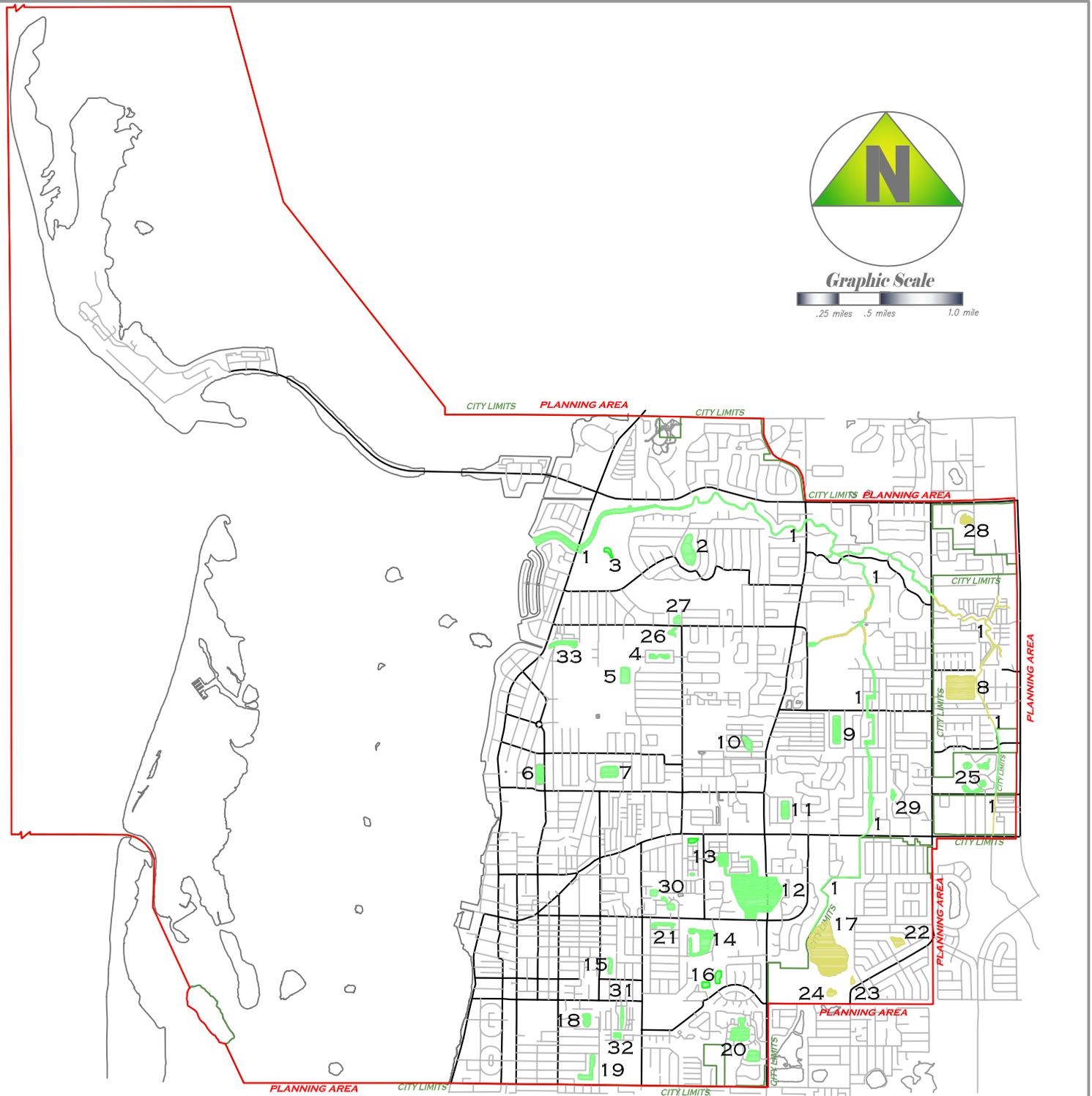
- 1 CURLEW CREEK BASIN
- 2 LAKE SAUNDRA
- 3 DUNEDIN COUNTRY CLUB
- 4 LAKE RHONDA
- 5 LAKE SUEMAR
- 6 LAKE PALOMA
- 7 LAKE SPERRY
- 8 RESORT LAKE
- 9 SCOTS LAKE
- 10 LAKE HIGHLANDER
- 11 LAZY LAKE
- 12 HOWELL TRACT SWAMP
- 13 LAKE HAVEN MOBILE HOME PARK
- 14 TOOKE'S LAKE
- 15 LAKE EARLE
- 16 SCOTSDALE PARK
- 17 JERRY LAKE
- 18 LAKE LOGARTO
- 19 LAKE DIANE
- 20 NORTH LAKE/SOUTH LAKE
- 21 LAKE EBERT
- 22 GREENBRIAR SUBDIVISION
- 23 GREENBRIAR CLUB
- 24 KENT JEWISH CENTER
- 25 CHESAPEAKE APARTMENTS
- 26 WEE LOCH NESS
- 27 SCHNEIDER PROPERTY
- 28 OAK LAKE
- 29 HEATHER RIDGE VILLAS
- 30 HEATHER LAKE
- 31 SKYE LOCH VILLAS
- 32 DUNEDIN MOBILE MANOR
- 33 CEDAR CREEK



IN CITY



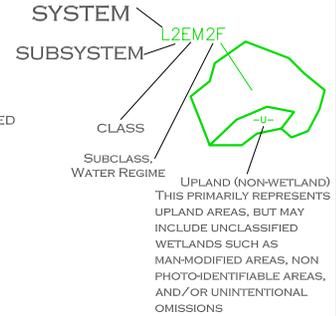
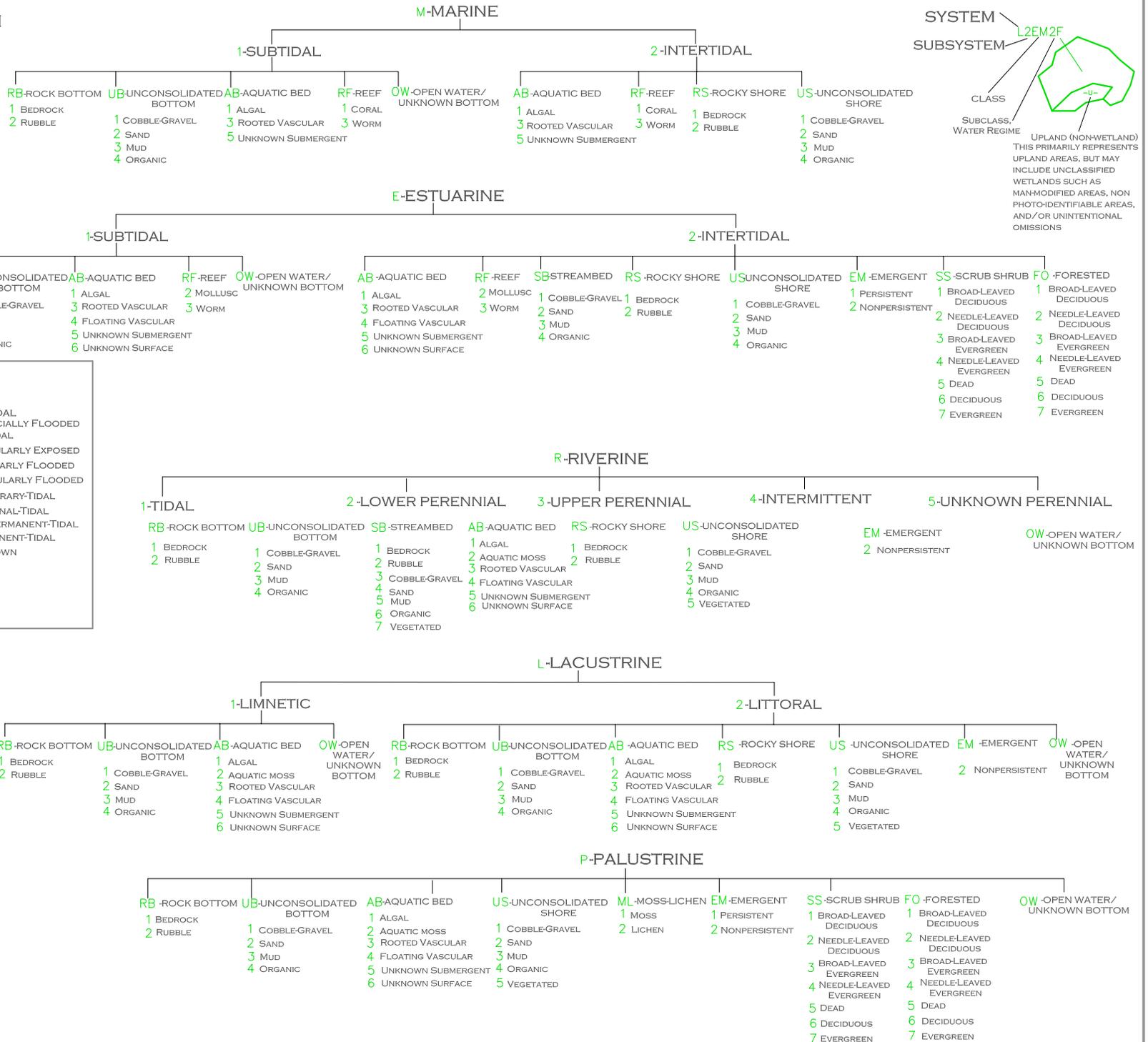
IN PLANNING AREA





CONSERVATION AND COASTAL MANAGEMENT

FIGURE 15 WETLANDS LEGEND



**MODIFIERS WATER REGIME**

NON-TIDAL	TIDAL
A TEMPORARILY FLOODED	K ARTIFICIALLY FLOODED
B SATURATED	L SUBTIDAL
C SEASONALLY FLOODED	M IRREGULARLY EXPOSED
D SEASONALLY FLOODED WELL DRAINED	N REGULARLY FLOODED
E SEASONALLY FLOODED SATURATED	P IRREGULARLY FLOODED
F SEMIPERMANENTLY FLOODED	S TEMPORARY-TIDAL
G INTERMITTENTLY EXPOSED	R SEASONAL-TIDAL
H PERMANENTLY FLOODED	T SEMIPERMANENT-TIDAL
J INTERMITTENTLY FLOODED	V PERMANENT-TIDAL
K ARTIFICIALLY FLOODED	U UNKNOWN
W INTERMITTENTLY FLOODED TEMPORARY SATURATED SEMIPERMANENT	
Z INTERMITTENTLY EXPOSED PERMANENT	
U UNKNOWN	

**MODIFIERS WATER CHEMISTRY**

COASTAL HALINITY	INLAND SALINITY
1 HYPERHALINE	7 HYPERSALINE
2 EUHALINE	8 EUSALINE
3 MIXOHALINE	9 MIXOSALINE
4 POLYHALINE	0 FRESH
5 MESOHALINE	
6 OLIGOHALINE	
0 FRESH	

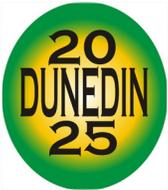
PH MODIFIERS FOR ALL  
 FRESH WATER  
 a ACID  
 † CIRCUMNEUTRAL  
 i ALKALINE

**MODIFIERS SOIL**

g ORGANIC
n MINERAL

**MODIFIERS SPECIAL**

b BEAVER	h DIKED IMPOUNDED
d PARTIALLY DRAINED DITCHED	f ARTIFICIAL SUBSTRATE
f FARMED	s SPOIL
	x EXCAVATED

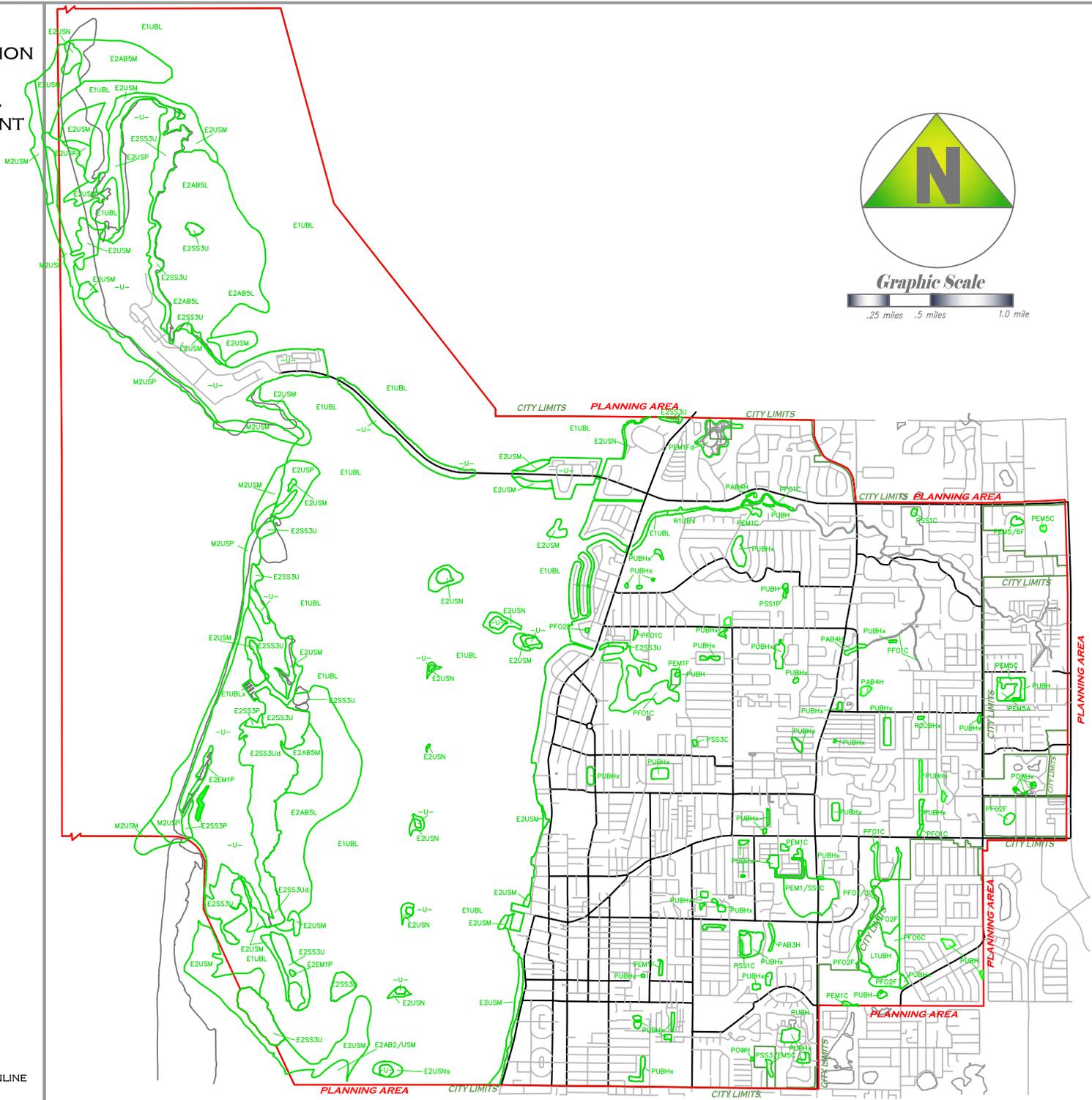


CONSERVATION AND COASTAL MANAGEMENT

FIGURE 15  
WETLANDS

LEGEND

SEE PREVIOUS SHEET



SOURCE: US FISH & WILDLIFE SERVICE: WETLANDS ONLINE MAPPER, 2007

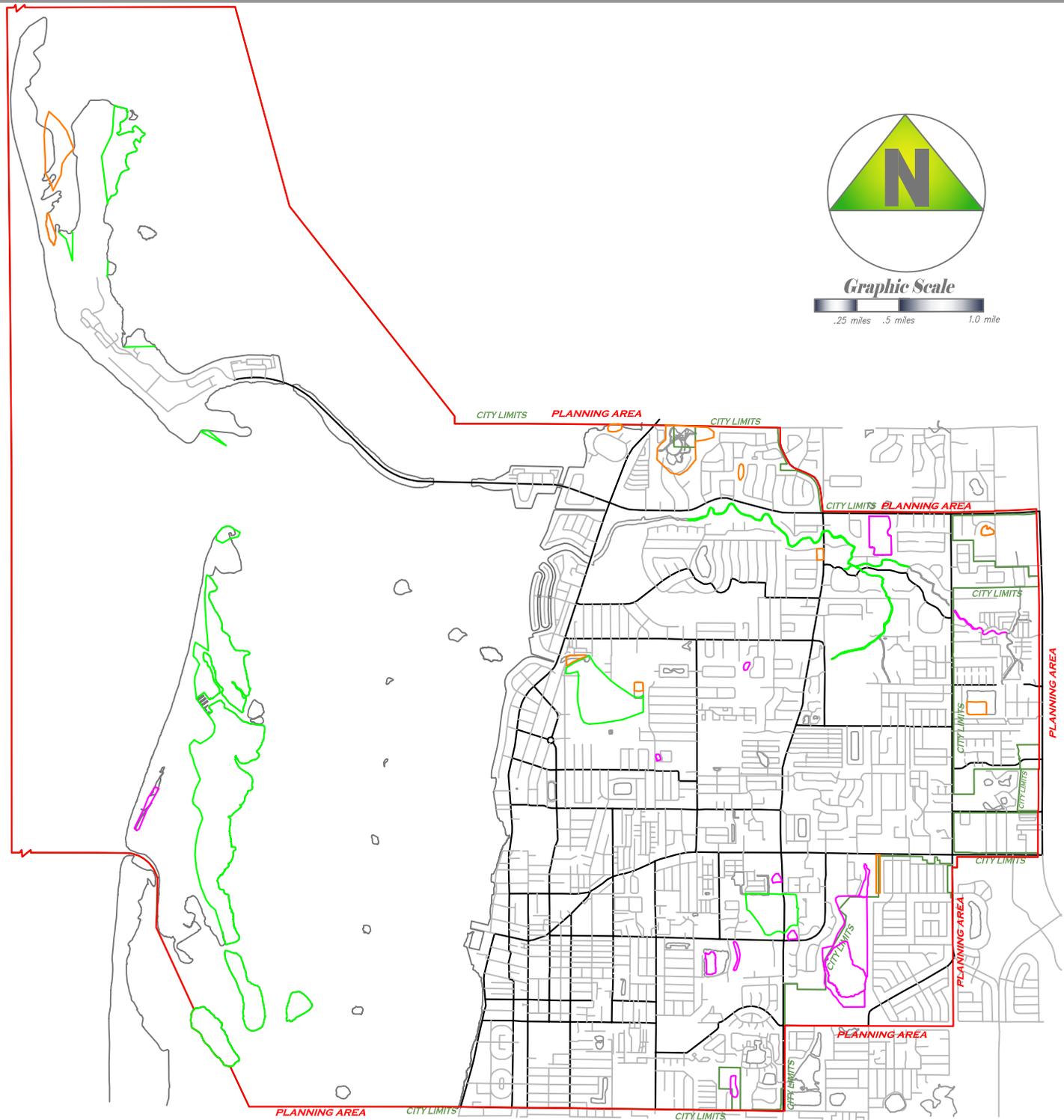


CONSERVATION AND COASTAL MANAGEMENT

FIGURE 16 SWFWMD IDENTIFIED WETLANDS

LEGEND

-  WETLAND HARDWOOD FOREST
-  VEGETATED NON-FORESTED WETLAND
-  WETLAND FORESTED MIXED



SOURCE: SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

17 shows wetlands connectivity. Although some barriers exist (most notably major roads such as Main Street, Keene Road) it is possible for wildlife to migrate from the northern portion of Dunedin to the southern portion. In many instances, culverts allow smaller terrestrial wildlife to travel under major roads. Not all wetlands are connected, though, there being numerous isolated wetlands scattered throughout the City.

Dunedin is populated mostly with estuarine and palustrine types of wetlands. Riverine and lacustrine systems exist but are not very prevalent. Table 5 shows the types of vegetated wetlands found in Dunedin along with their function and tolerance.

Figures 18 and 19 show strategic habitats, priority wetlands and biodiversity hotspots; Tables 6 and 7 show this information in tabular form. Comparing the species overlaps shown in Figures 18 and 19, the vast majority of occurrences transpire in either recreational or residential land. It appears that lower intensity residential uses and open space located throughout the City provide some habitat. With existing development having taken place, the City can only prevent further encroachment into environmentally sensitive areas. To a certain degree, the “damage has already been done” and the City should continue preservation efforts through Recreation/Open Space land use designations, parkland dedication requirements, and Concurrency Management System standards.

Although development has occurred, the City has taken steps to minimize its impacts on some wildlife. In 1990, the City adopted Code provisions to state that “No artificial or private light source shall directly illuminate areas of the primary beach areas or be viewable in such a manner where, as determined by the City [they] will deter adult female sea turtles from nesting or disorient hatchlings.” The section goes on to mandate that existing development will either shield, modify or replace lighting or turn it off from midnight to 7:00 AM during the May 1 to October 31 time period.

Further amelioration through the acquisition of parcels for habitat purposes is questionable. The City’s finances are limited; as noted in the Recreation and Open Space Element, the ability to acquire parkland is limited due to unavailability, price and public sentiment opposed to it. Grants could offset City expenditures, but they are difficult to obtain. The City is desirous of protecting and enhancing not only wetlands but habitats and ecosystems without incurring major capital costs. Toward that end, the following projects and programs can be considered supportive of this fiscally-constrained approach:

- ΓMaintenance and preservation of drainage facilities for use by species.
- ΓRetention and maintenance of existing open space and parklands.
- ΓKeeping the environment clean through programs such as periodic street-cleaning, Adopt-a-Park and Adopt-a-Street.
- ΓEnhancing ecosystems through landscaping requirements and Adopt-a-Tree program.
- ΓEnforcing drainage easement requirements to keep channels free of obstructions.
- ΓPreventing further encroachment by development through Concurrency Management System requirements and SWFWMD and DEP regulations.

Further, the City can perform other tasks, including applying for grants for acquisition or ecosystem enhancement, promoting ecological concepts through public presentations and publications such as the *Urban Stormwater Guidance* booklet, promoting aquatic preserve regulations through publications, and adhering to NPDES Permit requirements.





CONSERVATION AND COASTAL MANAGEMENT

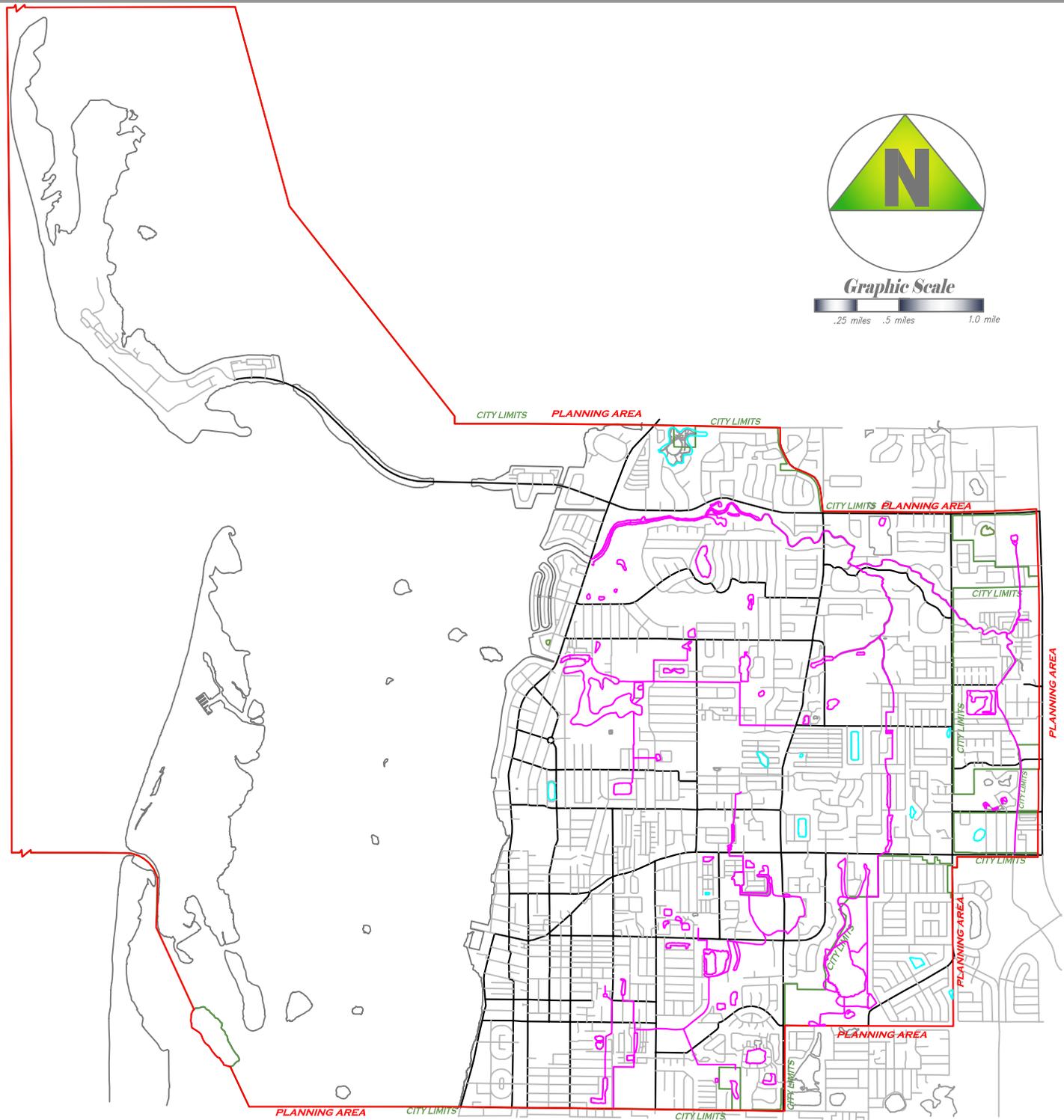
# FIGURE 17 WETLANDS CONNECTIVITY

## LEGEND

-  CONNECTED WETLANDS (ALONG WITH CONNECTORS)
-  ISOLATED WETLANDS



Graphic Scale



**TABLE 5  
VEGETATIVE COMMUNITIES**

VEGETATIVE COMMUNITY/ECOSYSTEM	FUNCTION	TOLERANCE	PRESERVATION ACTIVITIES
<b>Hardwood Wetland/ Hardwood Swamp</b>	Wide diversity of wildlife Purification and nutrient use as upland runoff passes through Air purification Temperature cooling	Development requires water table lowering and interrupting surface flow Transition zones essential	Recreation/Open Space Land Use
<b>Freshwater Marsh Wetland</b>	Runoff filtration and purification Rooted shoreline vegetation and marsh fringe provide continuous open water purification Habitat for diverse wildlife and fish Erosion prevention Aquifer recharge and prevention of saltwater intrusion	No development compatible Transition zones needed to protect marsh viability	Recreation/Open Space Land Use Enforcement of Concurrency Management System requirements
<b>Mangrove Wetland/ Mangrove Swamp</b>	Clean water by trapping silt, nutrients and toxic substances Habitat and feeding area for shorebirds, reptiles and amphibians Together with nearby inshore area, form prime nursery ground for shrimp, mullet, snapper, drum and blue crab Breeding ground for many species of bird	Development directly in mangroves not possible without fill Concentrated freshwater input from outfalls Fills and causeways block tidal flushing Poor quality runoff from urban drainage adversely impacts species through BOD, pesticides and oils Bulkheads along shoreline prevents reestablishment of displaced mangroves	Recreation/Open Space Land Use Continued management of barrier islands by state Enforcement of mangrove cutting regulations Improved stormwater quality
<b>Salt Marsh Wetland/ Coastal Salt Marsh</b>	Store and recycle organic matter Protect uplands against salt water intrusion Long term water quality improvement Protect shoreline from erosion and flooding Habitat for fish and shellfish	Direct development completely incompatible Transition areas and other surrounding uses can also impact adversely	Recreation/Open Space Land Use Improved stormwater quality Prohibit offshore development



**TABLE 5 (CONTINUED)**

VEGETATIVE COMMUNITY/ECOSYSTEM	FUNCTION	TOLERANCE	PRESERVATION ACTIVITIES
<b>Marine Grass Beds</b>	Bottom stabilization Food, refuge and habitat for marine organisms Role in nutrient use and sediment trapping which purifies waters	No development is compatible Surrounding uses can destroy areas by altering salinity and introducing pollutants	Enforcement of Aquatic Preserve requirements Improved stormwater quality Continued State/County caution zones
<b>Beach-Dune System</b>	Recreational Bears brunt of non-hurricane level storms when continuous well-vegetated dunes present In undisturbed system, protects tidal marsh and pine habitat behind them	Dynamic system Should be carefully managed so as not to disturb delicate natural balance	Recreation/Open Space Land Use Continued management of barrier islands by state
Source: <i>Conservation and Coastal Zone Management</i> , 1979; Dunedin Department of Community Services, 1996			





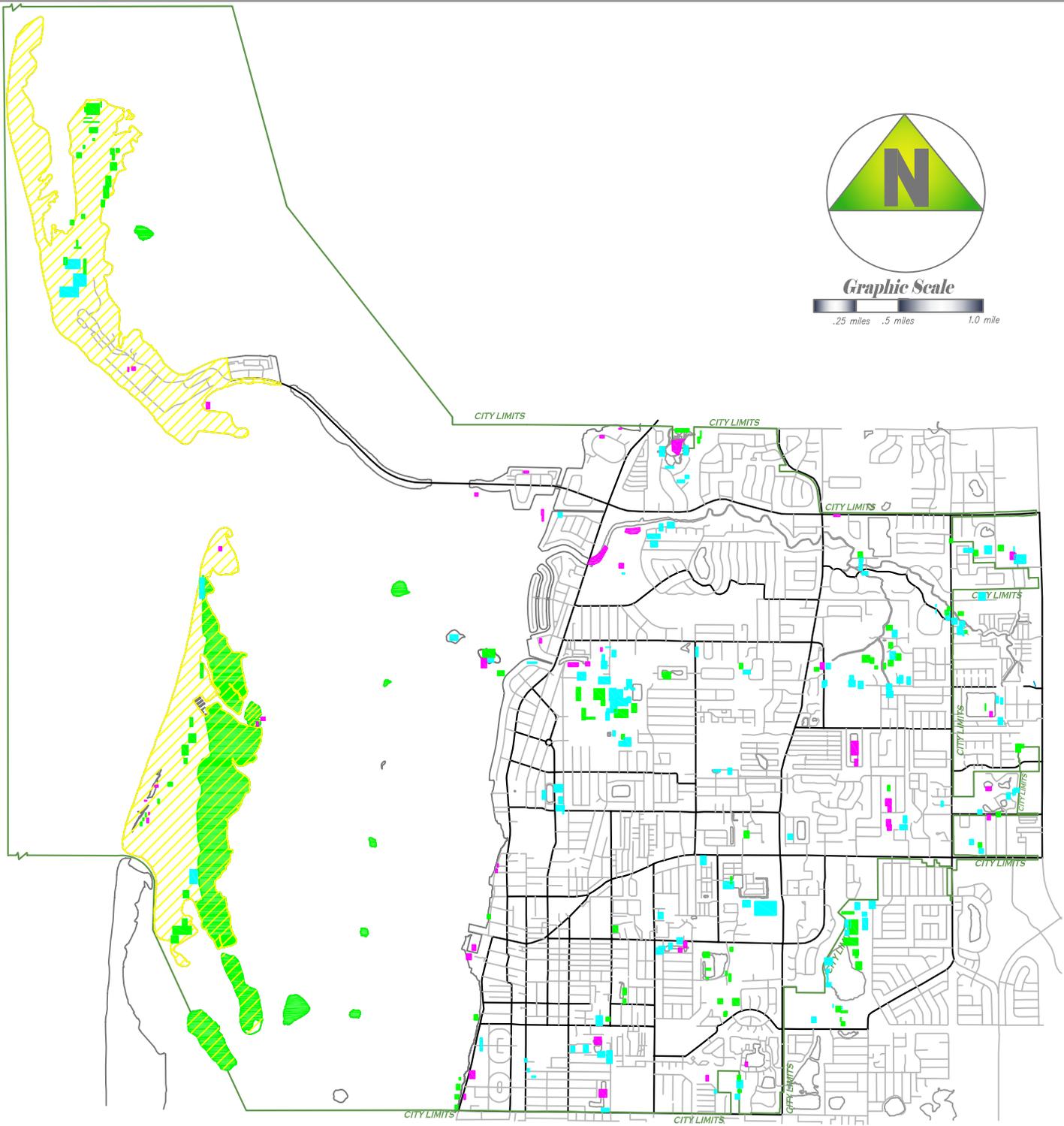
CONSERVATION AND COASTAL MANAGEMENT

FIGURE 18

STRATEGIC HABITAT CONSERVATION AREAS AND PRIORITY WETLANDS

LEGEND

-  EXISTING PUBLIC LANDS
-  1-3 SPECIES OVERLAP (UPLAND USE AREAS)
-  4-6 SPECIES OVERLAP (WETLAND USE AREAS)
-  7-9 SPECIES OVERLAP (WETLAND USE AREAS)



SOURCE: FLORIDA GAME & FRESH WATER FISH COMMISSION, 1994, 1995



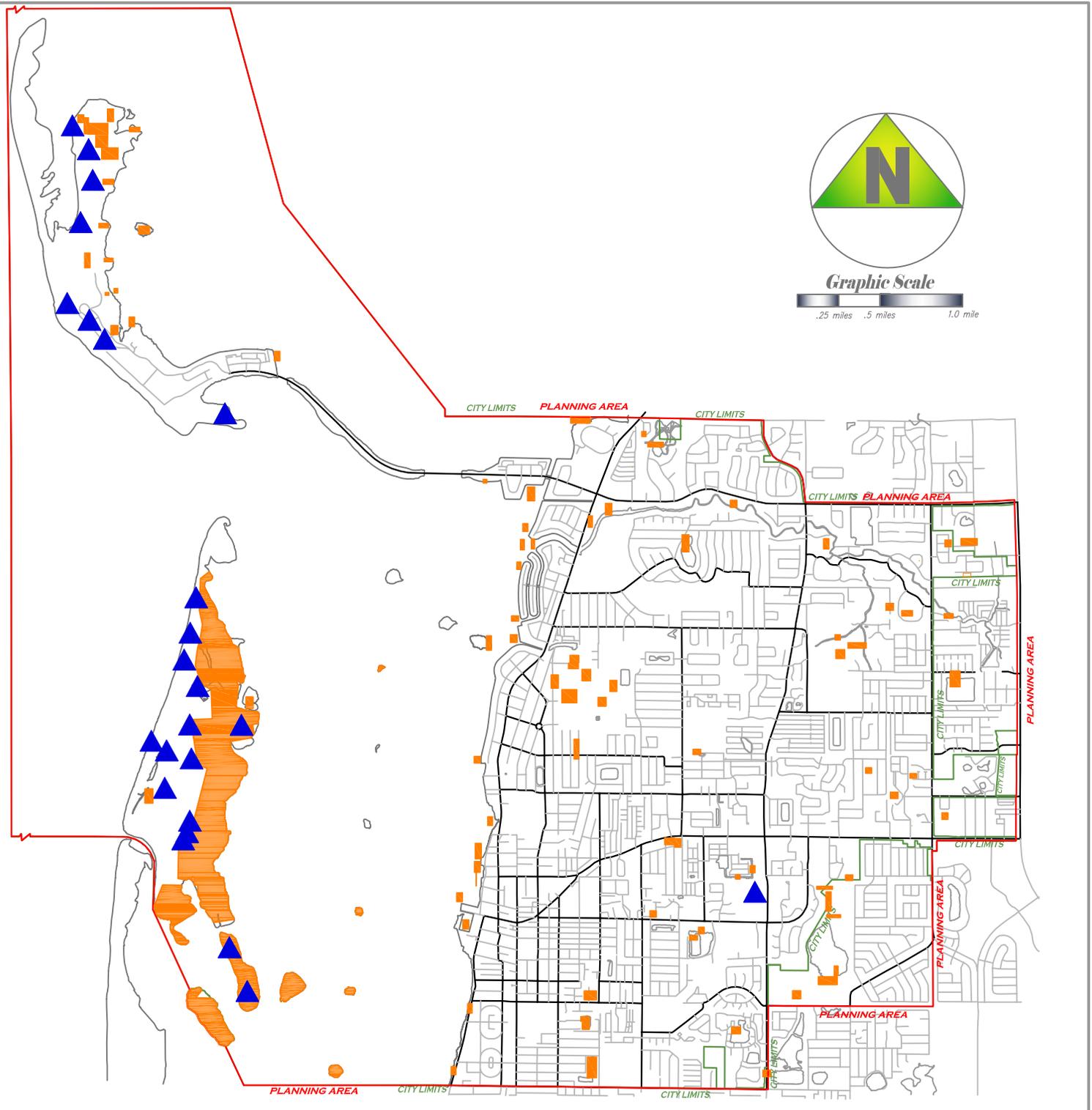
CONSERVATION AND COASTAL MANAGEMENT

FIGURE 19  
BIODIVERSITY HOTSPOTS

LEGEND

 7+ FOCAL SPECIES OVERLAP

 FLORIDA NATURAL AREAS INVENTORY OCCURRENCE



SOURCE: FLORIDA GAME & FRESH WATER FISH COMMISSION, OCTOBER 1994

**TABLE 6  
PRIORITY WETLAND AREAS**

GENERAL LOCATION	LAND USES/FEATURES
<b>Honeymoon Island</b>	Recreation/Open Space
<b>Caladesi Island</b>	Recreation/Open Space
<b>Curlew Creek</b>	Recreation/Open Space, Water, Easements
<b>Vanech Recreational Complex</b>	Recreation/Open Space, Residential Suburban, Residential Urban
<b>North of Curlew, East of Alternate US 19</b>	Preservation, Recreation/Open Space, Residential Suburban
<b>North of Curlew, East of CR 1</b>	County: Preservation, Recreation/Open Space, Residential Low, Institutional
<b>South of Curlew, East of Belcher</b>	County: Residential Low, Water
<b>Northwest of Belcher and SR 580</b>	Water, Residential Medium, Residential Low Medium
<b>Chesapeake Apartments</b>	Water, Residential Medium, Institutional
<b>Jerry Lake</b>	County: Water, Preservation, Residential Urban
<b>Spring Lake</b>	County: Water, Preservation, Residential Urban
<b>Tooke's Lake/Scotsdale Park</b>	City: Water, Recreation/Open Space, Institutional; County: Water, Recreation/Open Space, Preservation, Residential Suburban
<b>Howell Swamp</b>	County: Preservation, Residential Suburban
<b>Lake Paloma</b>	Lake Paloma: Water, Residential Urban surrounding
<b>Central Shoreline</b>	Recreation/Open Space, Residential Low, Residential High, Community Redevelopment District
<b>Lake Diane/Lake Logarto/Lake Earle</b>	Water, Residential Urban, Recreation/Open Space, Residential Medium
<b>Spoil Island</b>	Recreation/Open Space
<b>South Shoreline</b>	Recreation/Open Space
Source: Florida Game and Fresh Water Fish Commission; Dunedin Department of Community Services	



**TABLE 7  
BIODIVERSITY HOT SPOT AREAS**

GENERAL AREA	LAND USE/FEATURES
<b>Honeymoon Island*</b>	Recreation/Open Space
<b>Caladesi Island*</b>	Recreation/Open Space
<b>Ward Island</b>	Recreation/Open Space, Water, Commercial General (upland)
<b>Harbor View</b>	Water, Residential Urban (upland)
<b>Curlew Creek</b>	Recreation/Open Space, Easements
<b>Lake Sandra</b>	Water, Residential Urban surrounding
<b>North of Curlew, East of CR 1</b>	County: Preservation, Residential Suburban, Residential Low, Institutional
<b>Resort Lake</b>	County: Water, Residential Low Medium surrounding
<b>Hammock Park</b>	Recreation/Open Space
<b>Central Shoreline</b>	Recreation/Open Space, Residential Urban, Community Redevelopment District
<b>Southern Shoreline</b>	Recreation/Open Space
<b>Pinehurst at SR 580</b>	Water, Commercial General
<b>Howell Swamp*</b>	County: Preservation, Residential Suburban
<b>Jerry Lake</b>	County: Preservation, Water, Residential Urban
<b>Tooke's Lake</b>	County: Water, Preservation, Recreation/Open Space, Residential Suburban
<b>Northwest of Belcher and SR 580</b>	Water, Residential Low Medium, Residential Medium
<b>Spring Lake</b>	County: Water, Preservation, Residential Urban
<b>Lake Diane/Lake Logarto</b>	Water, Recreation/Open Space, Residential Medium
*Areas also have records processed by the Florida Natural Areas Inventory (FNAI) showing the location of other natural resources	
Source: Florida Game and Fresh Water Fish Commission; Dunedin Planning & Development	



In 2001, the City examined the feasibility and appropriateness of a habitat or ecosystem management ordinance. The study concluded the following:

Despite being over 95% built-out, and a highly urbanized community, Dunedin has a significant amount of recreation, open space and preservation acreage, comprising over 25% of the City's land area.

The ecological communities scattered throughout the City cannot be considered "intact" and capable of effectively supporting wildlife in all its forms.

The City has several regulations within its *Uniform Development Code* that address most of the requirements that would be contained in a habitat/ecosystem management ordinance. Although an ordinance specifically written to preserve habitats and ecosystems might be more efficacious, it does not appear necessary at this time to rewrite the existing code or to improve the language.

The inclusion of regulations for the subjects not addressed (buffering) or inadequately addressed (upland preservation) are not necessary because of other overriding concerns. The nearly built-out nature of the City would render such requirements questionable at best. Structure setbacks provide some, but perhaps not the best, protection.

The analysis and conclusions lead to the following recommendations:

The construction of a new ordinance addressing habitat/ecosystem management should not be pursued. Rather, insuring that the current regulations are appropriately adhered to will maintain the ecological communities now present in the urban environment.

In addition to the [existing] activities [such as Adopt-a-Park, Adopt-a-Street and Adopt-a-Tree]...the City should take other steps to ensure that the citizens of Dunedin are environmentally sensitive. This can include the publication of periodicals that promote environmentally-sound activities. The City can also encourage volunteer involvement in efforts such as Coastal Clean-up and Pinellas County's Hazardous Waste Amnesty Days.

To develop a significant wetlands inventory, City staff examined the wetlands maps (US Department of the Interior, SWFWMD), priority wetlands maps, biodiversity maps and the marine grassbeds maps, and used local knowledge. The map created is for the incorporated City only, and is shown in Figure 20. Table 8 tabulates this data, denoting whether the wetland is estuarine, marine or palustrine, describes what the wetland does, estimates the acreage, and provides a Relative Value as an indication of the relative importance. A "1" indicates it is part of the St. Joseph's Sound/Barrier Island system (i.e., waterward of the mainland) and very significant. A "2" indicates that it is either very unique, relatively large, important for habitat or drainage, or a combination of the three. A "3" indicates it is important for habitat and/or drainage considerations. It should be kept in mind that the actual condition of the wetlands (in terms of both water quality and how well the wetland functions biologically) is unknown.

Most wetlands are currently protected through several mechanisms, including land use, ownership, easements, or zoning. The Marine Park (MP) Zoning District's purpose, for example, is to "protect wetlands, environmentally sensitive coastline areas, coastal park lands, bodies of water and other submerged lands..." Also, Waters of the State (abbreviated WOS) have numerous regulatory requirements which must be met at the state and regional level before any impacts may occur. While not specifically a protection mechanism, some wetlands are completely or nearly completely developed around them, offering a buffer of sorts from any other future developments. Most wetlands are also protected through an absence of vacant contiguous land (based on the Vacant Developable Land Map). Most of what little vacant land there is currently has a residential land use. The City should ensure, though, that all wetlands contiguous to those few areas of undeveloped land should be protected and buffered or mitigation measures applied.

The City has not utilized spoil sites on a permanent basis. Dredged material is dried on-site



CONSERVATION AND COASTAL MANAGEMENT

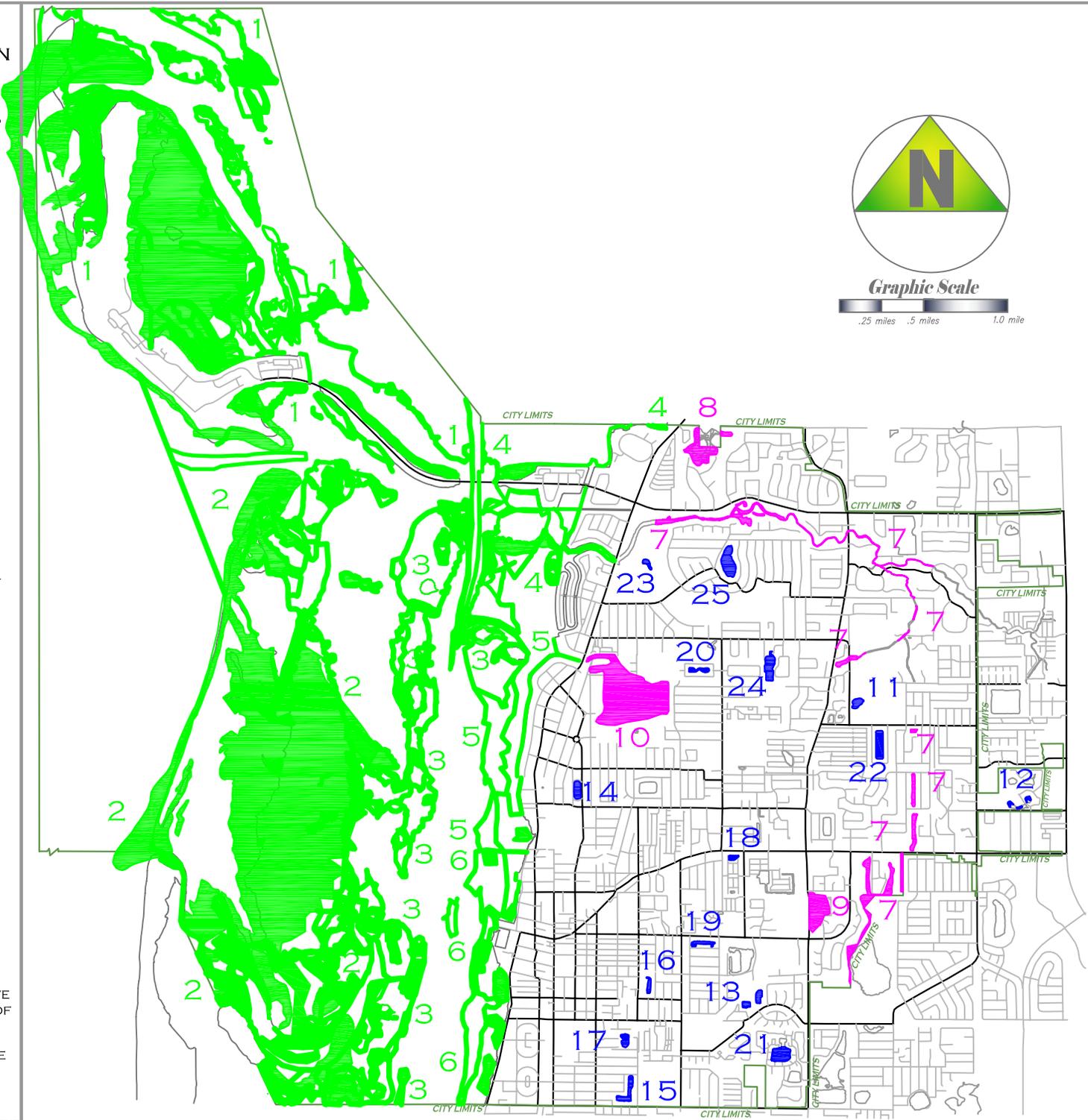
FIGURE 20  
SIGNIFICANT WETLANDS



- LEGEND**
- 1 HONEYMOON ISLAND/CAUSEWAY
  - 2 CALADESI ISLAND/MALONE ISLAND/ MOONSHINE ISLAND/CORE ISLAND
  - 3 SPOIL ISLANDS
  - 4 NORTH SHORELINE
  - 5 CENTRAL SHORELINE
  - 6 SOUTH SHORELINE
  - 7 CURLEW CREEK
  - 8 SALT MARSH
  - 9 HOWELL SWAMP
  - 10 HAMMOCK PARK/YOUTH GUILD PARK/ CEDAR CREEK
  - 11 VANECH RECREATIONAL COMPLEX
  - 12 CHESAPEAKE APARTMENTS
  - 13 SCOTSDALE PARK
  - 14 LAKE PALOMA
  - 15 LAKE DIANE
  - 16 LAKE EARLE
  - 17 LAKE LOGARTO
  - 18 LAKE HAVEN MHP
  - 19 DUNEDIN LAKEWOOD ESTATES
  - 20 LAKE RHONDA
  - 21 NORTH LAKE
  - 22 SCOTS LAKE
  - 23 DUNEDIN COUNTRY CLUB
  - 24 STIRLING HEIGHTS
  - 25 LAKE SAUNDRA

RELATIVE VALUE OF 1  
 RELATIVE VALUE OF 2  
 RELATIVE VALUE OF 3

EXTENT AND LOCATION BASED ON BEST AVAILABLE INFORMATION  
 PINELLAS COUNTY PLANNING DEPARTMENT,  
 SOURCE: SWFWMD, US DEPARTMENT OF THE INTERIOR,  
 FLORIDA MARINE RESEARCH INSTITUTE, DUNEDIN  
 PUBLIC WORKS, DUNEDIN PLANNING & DEVELOPMENT



**TABLE 8  
SIGNIFICANT WETLANDS**

GENERAL LOCATION	TYPE	FUNCTION	ESTIMATED SIZE (ACRES)	RELATIVE VALUE	CONDITION	PROTECTION MECHANISMS	CONTIGUOUS VACANT LAND USES
<b>Honeymoon Island/Causeway (including Marine Grass Beds)</b>	Estuarine, Marine	2, 5, 6	2,846	1	Unknown	ROS Land Use, State ownership, MP Zoning on water and land, WOS	None
<b>Caladesi Island/Malone Island/Moonshine Island/ Core Island (including Marine Grass Beds)</b>	Estuarine, Marine	2, 5, 6	2,302	1	Unknown	ROS Land Use, State ownership, MP Zoning on water and land, WOS	None
<b>Spoil Islands (including Marine Grass Beds)</b>	Estuarine	5	509	1	Unknown	ROS Land Use; MP Zoning on water and land, WOS	None
<b>North Shoreline (including Marine Grass Beds)</b>	Estuarine	5, 6	152	1	Unknown	MP Zoning on water, WOS	RM, RU
<b>Central Shoreline (including Marine Grassbeds)</b>	Estuarine	5, 6	78	1	Unknown	Recreation/Open Space, MP Zoning on water, WOS	RM
<b>South Shoreline (including Marine Grassbeds)</b>	Estuarine	5, 6	133	1	Unknown	MP Zoning on water, WOS	RM
<b>Curlew Creek</b>	Palustrine, Riverine	1, 5	32	2	Unknown	ROS Land Use, Easements; buffering, mitigation	RU, CG, CL; RS (County)
<b>Salt Marsh</b>	Palustrine	1, 5	14	2	Unknown	Preservation, ROS Land Use	RS
<b>Howell Swamp</b>	Palustrine	1, 5	8.5	2	Unknown	Preservation Land Use	None
<b>Hammock Park/Youth Guild Park/Cedar Creek</b>	Estuarine	1, 5, 6	90	2	Unknown	ROS Land Use, City ownership	RU
<b>Vanech Recreational Complex</b>	Palustrine	1, 5, 6	1	3	Unknown	ROS Land Use, City ownership	None
<b>Chesapeake Apartments</b>	Palustrine	1, 5	3	3	Unknown	Buffering, mitigation	None
<b>Scotsdale Park</b>	Palustrine	1, 5	4	3	Unknown	ROS Land Use	RE (County)
<b>Lake Paloma</b>	Palustrine	1, 5	2.5	3	Unknown	City ownership	None
<b>Lake Diane</b>	Palustrine	1, 5	3	3	Unknown	Drainage easement	None
<b>Lake Earle</b>	Palustrine	1, 5	1	3	Unknown	Drainage easement	None



**TABLE 8 (CONTINUEFD)**

GENERAL LOCATION	TYPE	FUNCTION	ESTIMATED SIZE (ACRES)	RELATIVE VALUE	CONDITION	PROTECTION MECHANISMS	CONTIGUOUS VACANT LAND USES
Lake Logarto	Palustrine	1, 5	2	3	Unknown	MFDUs to east and west, SFDUs to north	RM
Lake Haven MHP	Palustrine	1, 5	1	3	Unknown	CG parcel small, used for retention; buffering, mitigation	CG
Dunedin Lakewood Estates	Palustrine	1, 5	1.5	3	Unknown	Partial City ownership; otherwise surrounded by SFDUs	None
Idlewild Estates	Palustrine	1, 5	1.5	3	Unknown	Surrounded by SFDUs	None
North Lake	Palustrine	1, 5	4.5	3	Unknown	Buffering, mitigation	None
Scots Lake	Palustrine	1, 5	5	3	Unknown	Surrounded by SFDUs	None
Dunedin Country Club	Palustrine	1, 5	1	3	Unknown	ROS Land Use, City ownership	None
Stirling Heights	Palustrine	1, 5	1	3	Unknown	ROS Land Use	None
Lake Sandra	Palustrine	1, 5, 6	6.5	3	Unknown	Surrounded by SFDUs, except for park on western side	None

ROS: Recreation/Open Space MPL: Municipal Public Lands RU: Residential Urban RE: Residential Estate RS: Residential Suburban CG: Commercial General CL: Commercial Limited RM: Residential Medium MP: Marine Park RE : Residential Estate RS : Residential Suburban WOS: Waters of the State

Function: 1 = Flood water attenuation and conveyance 2 = Wave Energy Abatement 3 = Natural Sedimentation and Erosion Control 4 = Pollutant Removal 5 = Fish and Wildlife Habitat 6 = Recreational Opportunities 7 = Potable Water Storage 8 = Aquifer Recharge

Relative Value: 1 = Waterward of mainland; most significant 2 = Unique or large in size; very significant 3 = Mainland, mostly habitat and/or drainage; reasonably significant

Contiguous Vacant Land Uses refers to the regulatory land use of vacant developable parcels contiguous to the wetland (based on the Vacant Developable Land Map). If there is no vacant developable land contiguous to the wetlands, "None" is reported

Estimated Size refers to only those wetlands, or portions of wetlands, which are within the corporate limits of the City

Source: Florida Game and Freshwater Fish Commission; US Department of the Interior; Florida Marine Research Institute; Southwest Florida Water Management District; Dunedin Department of Public Works; Dunedin Department of Community Services



in a temporary upland spoil site. The material is then transported to the Pinellas County landfill for their use. Spoil material is utilized as a necessary component of landfill technology. These procedures will continue during what little future dredging that may occur. However, the Intracoastal Waterway Dredging, carried out under the auspices of US Army Corps of Engineers, utilizes spoil islands sprinkled throughout St. Joseph's Sound.

With regard to potable water supplies, Dunedin is unique in that it is one of the few Pinellas County municipalities operating an independent and distinct water system. Supplied by 29 active wells with varying yields between 150 and 850 gallons per minute (gpm), Dunedin supplies all its residents within the service area with drinking water. A state-of-the-art Reverse Osmosis (R/O) Water Treatment Plant is utilized to deliver over three million gallons per day. Staff samples 15 monitor wells for chloride concentrations, with readings taken each week. The average chloride concentration in raw water is 120 parts per million (ppm) but treated water has chloride concentration of 80 ppm. This is far below SWFWMD's 125 ppm and Pinellas County Health Department's 250 ppm maximum. Four storage tanks networked on a loop provide an eight million gallon reserve capacity and pressure consistency.

Dunedin is affected by several agencies, including Tampa Bay Water, and SWFWMD. Tampa Bay Water (TBW) was created to prevent costly competition among local governments for rights to water sources. TBW is concerned with maintenance and operation of wellfields, treatment plants, design and construction of additional facilities, and the development of a water supply plan. Dunedin is not a member government of Tampa Bay Water so it is only marginally affected by their policies. SWFWMD, on the other hand, greatly affects the City and its delivery of water. The water management district regulates water use and quality and prepares water shortage and conservation plans. It issues well construction permits and consumptive use permits. The City coordinates consumptive use permits, conservation efforts and educational undertakings with SWFWMD.

The City enforces one day per week irrigation restrictions and provides water saver kits. As well, Dunedin subscribes to the Florida Building Code limiting the amount of water that may be released from fixtures.

The water supply is adequate to meet demand. With the capabilities of the R/O plant, a brackish water well has been added.

SWFWMD's *Regional Water Supply Plan* (December 2006) reported the following:

- Treatment Capacity of 9.5 mgd;
- Five year average withdrawals 5.27 mgd;
- Source aquifer is Upper Floridan Aquifer;
- Water quality Total Dissolved Solids of 200 to 2200 mg/l
- Waste concentrate treated and dilutes and disposed of at wastewater treatment plant

The permitted rates changed in 2007 to an annual average of 6.617 mgd, and a peak month rate of 8.725 mgd.

As noted in Potable Water Sub-element, the year 2015 projections suggested (42,686 x 110 gallons per capita per day (gpcpd)) or 4,695,438 gallons per day. Practically all remaining development would be of the infill variety. These projections fall within the current SWFWMD permitted withdrawal rates cited immediately above. Further, year 2025 projections shows that (43,149 x 110 gpcpd) 4,746,357 gallons aligns well with these same permitted withdrawal rates.

The City has done a tremendous job of reducing the consumption of potable water. This has been accomplished by emphasizing water conservation through public education efforts and through distribution of free water saver kits. The implementation and expansion of a Reclaimed



Water System has resulted in approximately 2.7 mgd being delivered for irrigation purposes. Because of these conservation efforts, projected usage does not exceed the permitted withdrawal rates. In terms of protection, the City preserves its wetlands and recharge areas through the use of Recreation/Open Space and Preservation land use designations.

With respect to shoreline uses and economics, for analysis purposes, the City has divided the shoreline into six zones, along with their attendant issues. The first zone stretches from Union Street to President Street. Land use is primarily Residential Urban with high quality residences. Alternate US 19 carries in excess of 15,000 vehicles per day. The largest environmental issue is the question of the continued erosion of the shoreline west of Alternate US 19. The second zone runs from President Street to Tilden Street, and is comprised mainly of the Community Redevelopment District land use. There is a major redevelopment thrust in this area, with the City Marina having undergone improvements in the last few years. Main Street and affected portions of Alternate US 19 will be major redevelopment activity links.

The third zone is made up of land between Tilden Street and Dunedin Isles Unit No. 1. The Residential Medium land use here allows mixture of residential and tourist facility uses. Projects will be approved based on economic viability, infrastructure vulnerability and wetland/marine environmental impact. Zone four runs from the southern limit of Dunedin Isles Unit No. 1 to Dunedin Causeway Unit No. 1, and Residential Urban land use with single family residential predominate.

The entrance to Dunedin Causeway Boulevard is the next zone and is served by Alternate US 19 and SR 586. This area ties the mainland to Honeymoon and Caladesi Islands. Existing land uses encompass a major marina facility, restaurants, multi-family housing complexes and other commercial activities on the eastern end. Finally, the last zone is the barrier islands. Royal Stewart Arms is the only development that has or will occur, the remainder of Honeymoon Island under the management of DEP. Caladesi Island is only accessible by boat.

While not awash in them, the City does have a number of historic sites (Figure 21). The Community Redevelopment Agency (CRA) District has 24 historic homes, commercial sites and religious institutions; there are 34 others outside CRA District identified by City. The most recent find occurred in the summer of 1996, when FDOT maintenance personnel uncovered remains of Old Road Number 37/Bayshore Road. This road connected Dunedin with Ozone and was built in 1924. This is the only known segment of Bayshore Road that exists in its original condition in Pinellas County today. Pinellas County has restored, preserved and enhanced this historic site since its discovery.

The City boasts of two properties on the National Register of Historic Places. One is St. Andrews Memorial Chapel, which is owned and operated by the Dunedin Historical Society. The other is the Williamson (formerly Douglas/Kauffman) House, a residence which has been used as a bed and breakfast facility. The Department of State's Division of Historical Resources' Master Site File lists six historic locations, including Hog Island Mound (on Caladesi Island), Dunedin Mound: (north of downtown, near the coastline), an Osprey Breeding Site (on Honeymoon Island), Hammock Park, St. Andrews Memorial Chapel, and the Williamson (J.O. Douglas) House.

As with wetlands, habitat and water quality the "damage has already been done" to historic properties. Development and redevelopment has had numerous impacts on historic resources and sites. For example, many historic sites are just that, with the actual structures no longer in existence. These include the Library Hall Site, Pharmacy Hall Site, and Jones' First Home Site. Many are currently in use, most notably for retail establishments, including the Fenway Hotel (previously utilized as a university), the Dunedin Society Historical Museum, and the Dixie Theater. In many cases exterior restoration has occurred that may have obviated the historical architecture. Down-



CONSERVATION  
AND  
COASTAL  
MANAGEMENT

FIGURE 21  
HISTORIC AND  
ARCHAEOLOGICAL  
SITES

LEGEND

- |    |  |    |                                       |
|----|--|----|---------------------------------------|
| 1  | DIXIE THEATER                                    | 31 | BLATCHLEY HOUSE                       |
| 2  | J. MARTSON HOME SITE                             | 32 | ARCADIA HOUSE/YACHT CLUB SITE         |
| 3  | ANDREWS MEMORIAL CHAPEL SITE/PRESBYTERIAN CHURCH | 33 | ANDREWS MEMORIAL CHAPEL LOCATION      |
| 4  | MANGET HOUSE                                     | 34 | S.F. BOUTON HOME SITE                 |
| 5  | W.Y. DOUGLAS COTTAGE                             | 35 | ANDERSON COTTON GIN SITE              |
| 6  | BARNE'S PROPERTY SITE                            | 36 | L.B. SKINNER MACHINERY SHOP SITE      |
| 7  | BURN'S HOUSE                                     | 37 | DUNEDIN ICE COMPANY SITE              |
| 8  | FENWAY HOTEL                                     | 38 | GILCHRIST STORE, SECOND LOCATION SITE |
| 9  | ZIMMERMAN HOUSE                                  | 39 | ELEMENTARY SCHOOL SITE                |
| 10 | HISTORICAL SOCIETY MUSEUM                        | 40 | THARIN-MEASE HOME                     |
| 11 | POOSER'S STORE SITE                              | 41 | TOD HOUSE                             |
| 12 | WHITEHURST HOTEL SITE                            | 42 | D.K. MUSSEY HOUSE                     |
| 13 | BECKETT BOARDING HOUSE SITE                      | 43 | F.L. SKINNER HOUSE                    |
| 14 | EPISCOPAL CHURCH OF THE GOOD SHEPHERD            | 44 | B.C. SKINNER HOUSE                    |
| 15 | DUNEDIN HOTEL SITE                               | 45 | FRISCHKORN/KELLOGG HOUSE              |
| 16 | BANK OF DUNEDIN/CHAMBER OF COMMERCE              | 46 | DOUGLAS/SOMERVILLE STORE SITE         |
| 17 | LOUCK'S STORE SITE                               | 47 | FIRST UNITED METHODIST CHURCH SITE    |
| 18 | J.O. DOUGLAS/WILLIAMSON HOME                     | 48 | FIRST BAPTIST CHURCH SITE             |
| 19 | OCTAGON HOUSE                                    | 49 | SCHOOLHOUSE SITE                      |
| 20 | LIBRARY HALL SITE                                | 50 | POST OFFICE SITE                      |
| 21 | DR. JASON L. EDGAR PHARMACY SITE                 | 51 | EARLY MEASE HOSPITAL SITE             |
| 22 | JONES' FIRST HOME SITE                           | 52 | DUNEDIN GOLF COURSE                   |
| 23 | G.E. LOUCK'S PROPERTY SITE                       | 53 | OLD ROAD 37                           |
| 24 | JONES' SECOND HOME SITE                          | 54 | BOAT HOUSE                            |
| 25 | DR. BADEAU RESIDENCE                             | 55 | HAMMOCK SITE                          |
| 26 | H.P. & C.O. MALONE HOME                          | 56 | HOG ISLAND MOUND                      |
| 27 | L.H. MALONE HOME SITE                            | 57 | OSPREY BREEDING SITE                  |
| 28 | J.S. & E.T. MALONE HOME                          | 58 | DUNEDIN MOUND                         |
| 29 | N.S. & C.B. BOUTON HOME                          | 59 | DUNEDIN ELEMENTARY                    |
| 30 | LELAND HOME                                      |    |                                       |

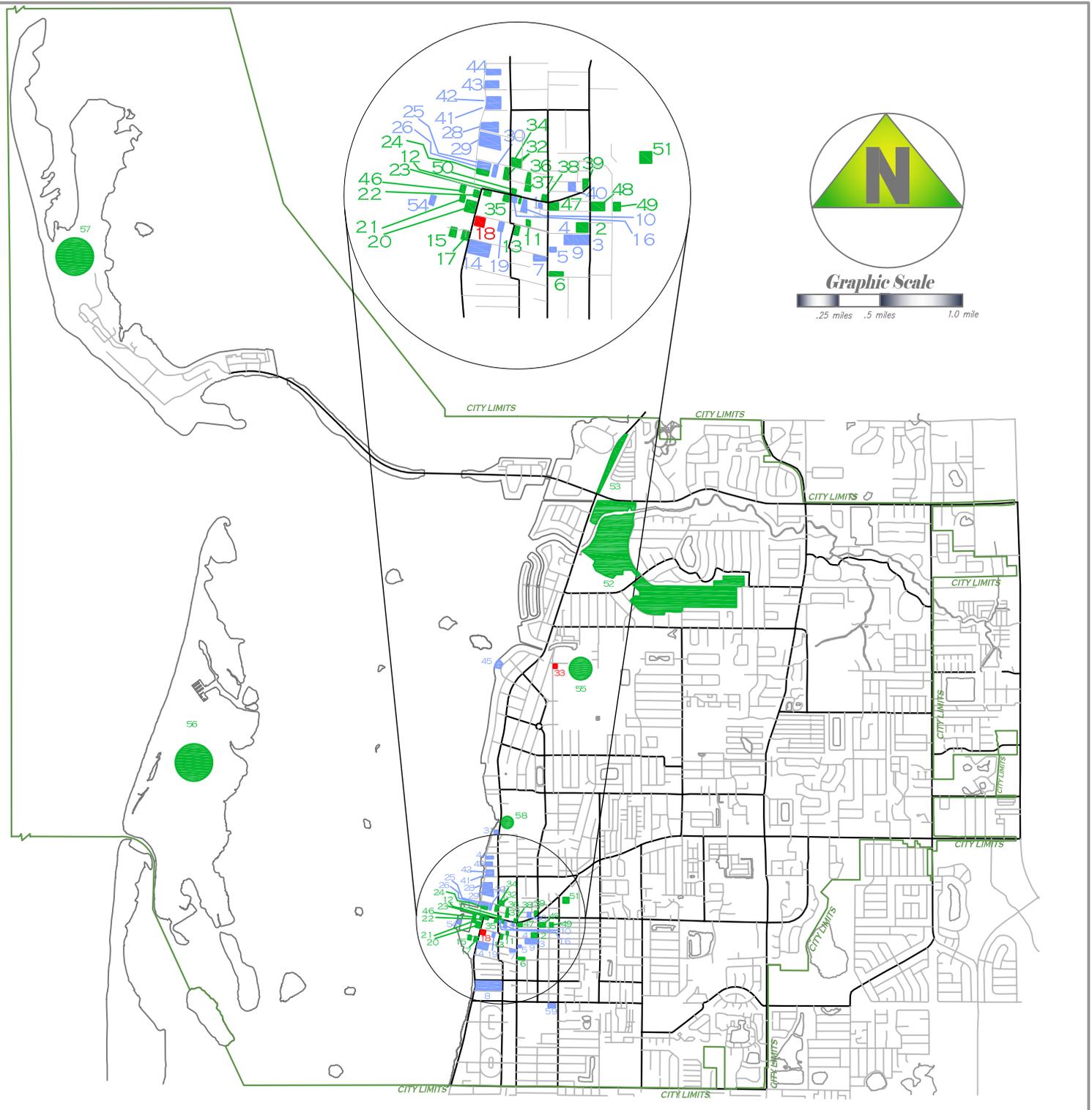
BLUE DENOTES STRUCTURES

GREEN DENOTES SITES

CIRCLES DENOTE ARCHAEOLOGICAL SITES (APPROXIMATE LOCATION ONLY)

RED DENOTES STRUCTURES ON THE NATIONAL HISTORIC REGISTER

SOURCE: DUNEDIN HISTORICAL SOCIETY, FLORIDA DEPARTMENT OF STATE, PINELLAS COUNTY PLANNING DEPARTMENT



town redevelopment pressures may contribute to the further demise of historical and architecturally significant properties. With structures on private property the City cannot preclude allowable development. The Historic Preservation Ordinance, while it does offer incentives to retention of notable structures (e.g., tax abatement), currently relies on voluntary participation. And as with parkland, the City does not have the funds to acquire and restore these historic sites and structures.

Sites on public lands, though, are much better protected from encroachment. These include Hog Island, the Osprey Breeding Site, Hammock Park and St. Andrews Chapel.

The subject of public access to waterfront sites has become increasingly important as the community approaches complete build out. As parcels along the water become developed, there become fewer opportunities to create new waterfront access. Fortunately, Dunedin has numerous areas where the public can make this access.

Although accessible only by private boat or 20 minute water taxi ride from Honeymoon Island, Caladesi Island State Park has an enormous shoreline. Under the control of the state of Florida, this mostly pristine island will continue to be accessible by the public. North of Caladesi is the Honeymoon Island State Recreation Area, which is accessible from the Dunedin Causeway. The Causeway itself is 1.5 miles long and has a beach on either side. The roadway joins the mainland just west of the Curlew Road and the Alternate US 19 intersection.

There are many other City-owned locations having water access. Mira Vista, San Jose and Kiwanis mini-parks are three parcels in the Dunedin Isles subdivision that front St. Joseph's Sound. Access is provided from Alternate US 19 onto smaller City-owned roads. Victoria Drive is an unimproved, .5 mile long one lane drive along St. Joseph's Sound shoreline. The majority of the actual shoreline is privately owned. Just to the south is Dunedin Marina and Edgewater Park, located between Victoria Drive and Edgewater Drive. Access is easily available from Alternate US 19. Finally, farther south is the Edgewater Drive shoreline. Approximately 4,100 linear feet long, it overlooks St. Joseph's Sound, with Alternate US 19 immediately to the east.

In addition to saltwater sites, there are many areas farther inland that afford the public views of the water. Curlew Creek Park is a three acre tract developed along banks of Curlew Creek with access from Curlew Road. Hammock Park is a staging area for Cedar Creek and its watershed and is just east of Alternate US 19. Other water features in publicly-owned lands include Lakewood Estates (with access from Virginia Street to Oakwood), Lake Paloma (access via Martin Luther King Jr. Avenue), Scotsdale Park (access from Scotsdale Street), Youth Guild Park (contiguous to Cedar Creek, with access from Alternate US 19 to Douglas or San Mateo), Wee Loch Ness (a lake in the northeast corner of Highlander Park, with access via Michigan Boulevard and Pinehurst Street), Vanech Recreation Complex (a lake resides in the western portion, a creek in the eastern portion, with access via Garrison Road and internal roads), and the Dunedin Golf Course (one lake in the center portion of course, with access via Palm Boulevard). All shorelines are primarily vegetated.

Located in the Planning Area, Jerry Lake is owned by SWFWMD but is not currently open to the public. If ever opened to the general public access roads would have to be provided.

Waterfront access sites are shown in Figure 22.

The above presented an inventory of beach and shoreline facilities. Just looking at Figure 22 shows that the City's own shoreline facilities are overshadowed by the Honeymoon and Caladesi Island facilities. Honeymoon Island has a total optimum capacity of 15,000 persons each day, or 7,000 persons at one time. Caladesi Island has a total optimum capacity of 3,200 persons each day, or 1,500 persons at one time. Based on the length of the shoreline, conservatively, Dunedin Causeway has a capacity of accommodating over 1,000 vehicles at any one time. Assuming an auto oc-



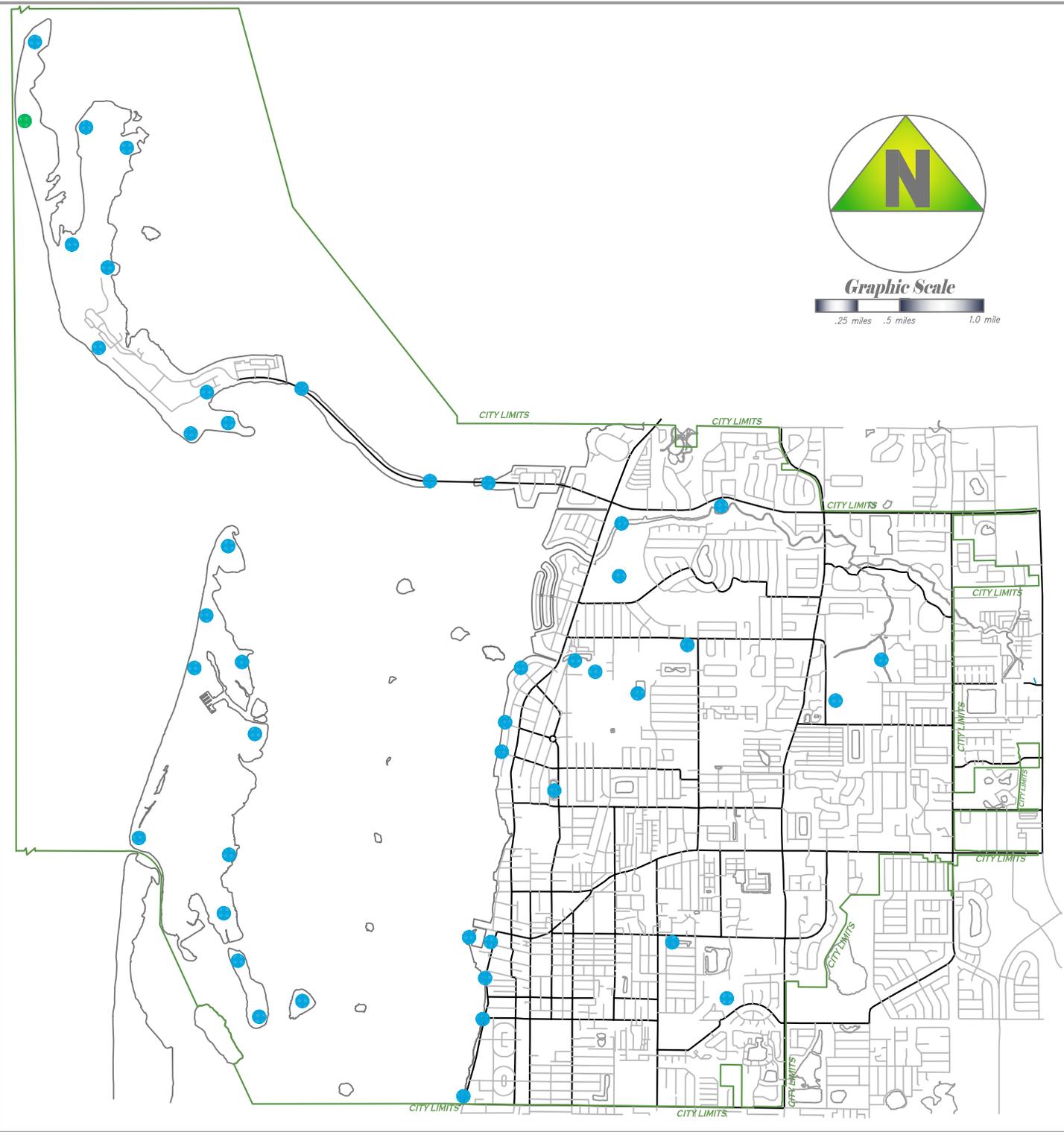


CONSERVATION AND COASTAL MANAGEMENT

# FIGURE 22 WATERFRONT AND WATERWAY ACCESS

## LEGEND

● LOCATION OF PUBLIC ACCESS TO WATERFRONT (BOTH FRESH AND SALTWATER)



cupancy of two persons per vehicle, the Causeway would boast a capacity of over 2,000 people at any one time. Maximum capacity is based more on multiple rows of parked cars. It would be difficult to expand the Causeway in order to create more capacity.

For the San Jose, Kiwanis, and Mira Vista mini-parks and Edgewater Drive, there is limited space for parking at all four. The parks are more for open space and scenic purposes rather than water activities, there being no real beach at any of them.

It would appear, then, that the beaches and shoreline have a capacity of over 11,000 people at any one time. This is a little less than one-third of Dunedin's current permanent population. Honeymoon and Caladesi, being regional parks, attract users from all over Pinellas County. The City has no adopted standard for regional parks, but standards suggest 20 acres per 1000 population. Separately, the two parks fall below this standard, but taken together they far exceed it. Dunedin Causeway is a community park, drawing persons from a two mile radius. While there is no adopted LOS standard for the City for community parks, 3.5 acres/1000 population suggested. Current population suggests a need for 150 acres of community parks. The 19 acres of Beach Causeway contributes to the existing 224 acres of Community Parks. Additionally, *Outdoor Recreation in Florida-1987*, suggests .5 acres of beach access per 1000 population. If this were the case, current population suggests a need for 21.4 acres, and the 19 acres of Beach Causeway would almost be sufficient based on this standard.

For the more active watergoers, Dunedin Marina is a 194 slip City-owned facility. It was improved within the last few years, with deteriorated pilings replaced and some of the shorter foot slips enlarged to 35-foot slips. Further expansion is very limited. There is one boat launching ramp at the marina; citywide, there is a need for additional boat launching facilities. Such launching sites elsewhere in the City have been examined, but there is limited land for ramps plus parking facilities along the shoreline. Honeymoon Island was considered as one possibility, but a study showed environmental concerns. The City is unable at this time to resolve the situation given a limited amount of undeveloped waterfront land. The most promising might be a joint arrangement with Honeymoon Island but environmental concerns may preclude this.

Regardless of any numerical need, the City received direction in 1990 from the defeat of a referendum calling for the purchase of a waterfront parcel. The electorate felt that the City has enough parks, particularly waterfront. Lack of funds otherwise prevents City from acquiring smaller such parcels. The City is currently considering the purchase of two parcels, one waterfront and a companion piece on the east side of Alternate US 19. Although grant funding was secured in 2007, a considerable amount of local funds may be required dependent on the final appraised value.

While not all wetlands are held in public ownership, a goodly amount is. The Barrier Islands and Spoil Islands are publicly owned by either the state or Pinellas County. Pinellas County owns several other wetland areas (e.g., Howell Swamp) and SWFWMD owns Jerry Lake. The City owns several wetland areas (e.g., Edgewater Drive, Lake Paloma, Hammock Park, Vanech, Wee Loch Ness) and maintains them as parklands. Many other wetlands are not only privately-held (sometimes by multiple owners) they are surrounded by development, mostly residential. As noted above, the City does not have extensive funds to purchase recreational lands and thus would not have funds to purchase, set aside and preserve wetland areas. Wetlands, though, have been protected through City policies, land uses and provisions of the *UDC*. The ameliorating effects of recent developments appear in Table 9.

Upland habitat areas area affected by the same situation, with the protection of endangered or threatened species protection coming into play. The City's best option is to continue protection through land use, execution of *UDC* requirements, and the enforcement of state and federal regula-

**TABLE 9  
DEVELOPMENTS NEAR WETLANDS**

LOCATION	DEVELOPMENT	AMELIORATING EFFECTS
<b>Marina Plaza</b>	Motel Expansion	Never Built
<b>Virginia East of Keene Road</b>	Potable Water/ Reclaimed Water Storage Tanks	Built Upland; Preservation designation on wetlands
<b>Keene Road South of SR 580</b>	Commercial	Built well upland; retention to south with Preservation designation; Preservation designation by County on wetlands
<b>South of Main East of Overcash</b>	Commercial	One Never Built; other to be built well upland
<b>Curlew Road</b>	Group Home	Never Built
<b>Lake Haven at SR 580</b>	Commercial	Alteration to existing structure
<b>SR 580 east of Virginia Extension</b>	Commercial	Addition to existing structure
<b>Pavilion</b>	Governmental	Elevated wood structure on shore of lake
<b>Palm Lake Village</b>	Residential	Southwest corner left undeveloped
<b>Weybridge Woods</b>	Residential	RS designation on upland buildable area; R/OS designation on Curlew Creek
<b>Golf View Drive</b>	Residential	R/OS designation on wetlands to west
<b>Stirling Heights</b>	Residential	RS designation on upland buildable area; R/OS and Drainage Easement on wetlands; Tupelos preserved with easement
<b>Indian Creek Court</b>	Residential	R/OS and Drainage ROW designation on Curlew Creek
<b>Weathersfield</b>	Residential	Drainage Easement on wetlands
<b>Harvard Avenue</b>	Residential	Built upland; R/OS designation on wetlands (Hammock Park)
<b>Glynwood Highlands</b>	Residential	Platted upland; retention on west side with preserved maples; seasonally flooded wetlands may have dried up in recent drought years
Source: Department of Community Services, 1995		



tions.

For the purposes of this Element, the entire City falls into the Coastal Planning Area. With Dunedin being as small and compact as it is, it does not make much sense to bifurcate the City into a coastal planning area and an upland planning area. Thus, analyzing the infrastructure within the Coastal Planning Area will take into account the entire incorporated City.

TABLE 10 PINELLAS TRAIL USAGE*					
	2001	2002	2003	2004	2005
<b>January</b>	73,040	57,050	46,440	51,810	54,400
<b>February</b>	82,510	59,580	50,930	50,560	47,920
<b>March</b>	64,416	100,485	68,563	61,974	59,323
<b>April</b>	87,048	93,696	80,316	53,328	59,328
<b>May</b>	78,299	86,879	118,196	70,785	75,868
<b>June</b>	50,218	90,104	59,906	59,995	62,608
<b>July</b>	59,080	88,410	80,374	63,840	65,170
<b>August</b>	66,514	80,850	54,334	56,574	54,866
<b>September</b>	66,417	80,795	59,124	47,320	63,687
<b>October</b>	72,392	61,092	43,332	55,536	50,352
<b>November</b>	77,580	58,590	40,970	44,840	47,050
<b>December</b>	62,920	49,300	47,620	38,780	36,270
<b>Total</b>	840,434	906,831	750,105	655,342	676,842
*Bicycle and Pedestrians per month and year. Source: 2006 State of the System					

With regard to roadways, the Transportation Element contains a listing of roadways within the City, along with demand upon, capacity of, area served by and future needs. Figure 23 shows the location of various bridges and one causeway; the demand upon and capacity of the bridges are based primarily on the roadway (which is contained within the Transportation Element). It should be noted that only span bridges are shown; most “bridges” are simply streets over pipes or culverts (e.g., Solon, Pinehurst, Cross Creek Way) and are not shown. The Dunedin Causeway capacity, as a recreationally-oriented facility, is covered above. The Pinellas Trail has three bridges: one over Cedar Creek, one over Curlew Creek and an overpass over Alternate US 19. Table 10 shows the countywide usage statistics for 2001 through 2005.

With regard to wastewater, potable water and man-made drainage facilities, the respective sub-elements describe

the different systems in the City, along with demand upon, capacity of, area served by, and future needs, and will not be repeated here. Neither is it necessary to discuss public shore protection structures as there are none. Honeymoon and Caladesi Islands are barrier islands and do act to protect the mainland’s shoreline from severe wave action.

The City has defined a Hurricane Vulnerability Area (HVA), and it is depicted in Figure 7. Pursuant to Rule 9J-5, HVA includes those areas requiring evacuation in the event of a Category 3 storm event. And pursuant to policy, the City will evaluate and limit the introduction of additional residents into the HVA.

At the City level, there appears to be no need for a Marina Siting Plan. Dunedin has one public marina with limited expansion possibilities. The coastline north of the marina is primarily privately-owned and developed; the coastline south of marina is primarily City-owned with recreation/open space designation, providing a scenic entrance to the municipality. The City, though, would like to review any siting plan developed by Pinellas County. Additional boat launching facilities are very desirable, but the opportunities for such are very limited.

Given the climatological changes that have occurred in recent years, natural disaster planning and mitigation has become a more significant subject. Obviously, the largest natural threat to



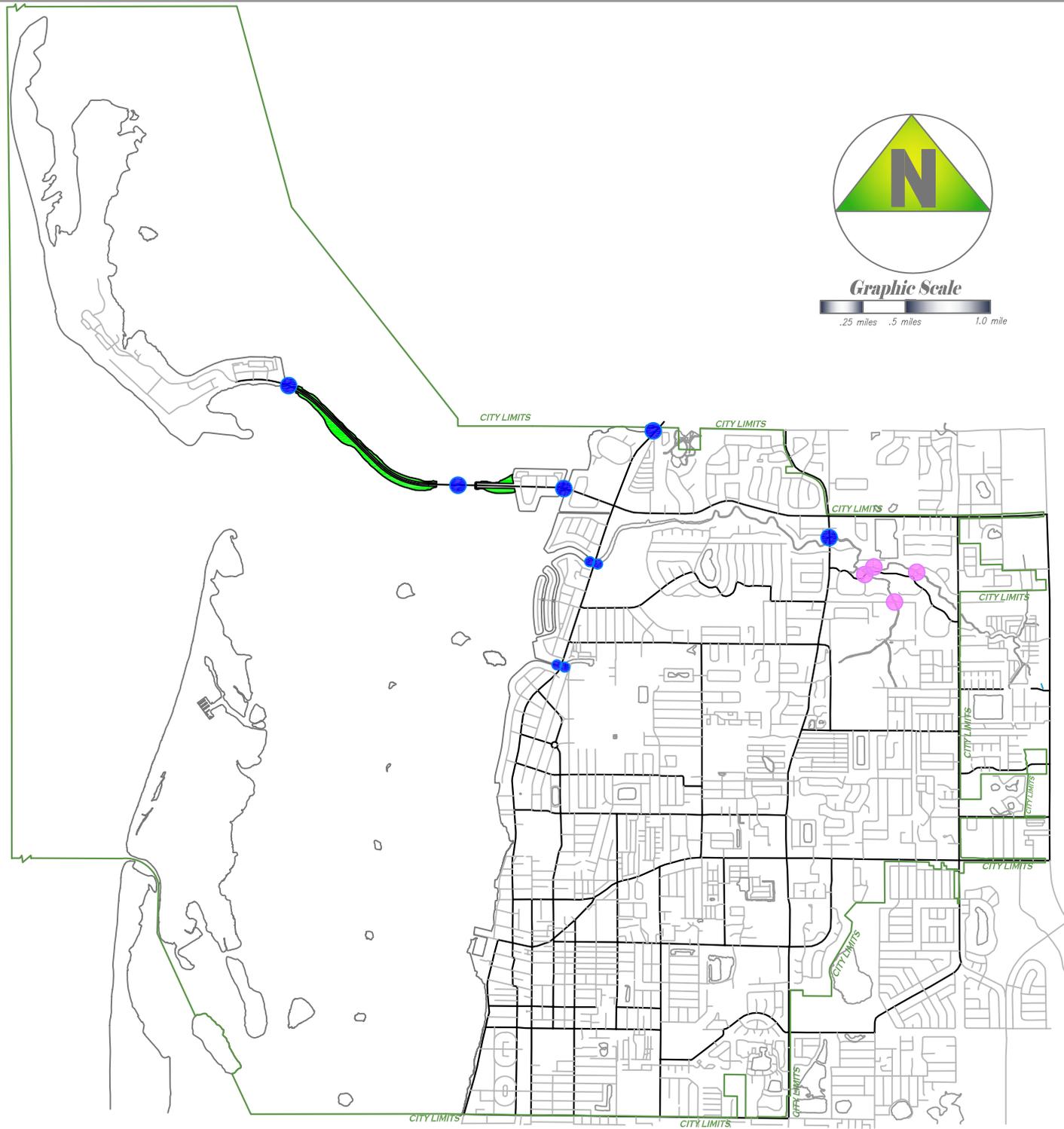


CONSERVATION AND COASTAL MANAGEMENT

FIGURE 23 BRIDGES AND CAUSEWAYS

LEGEND

-  COUNTY OR STATE-MAINTAINED BRIDGES
-  CITY-MAINTAINED BRIDGES
-  CAUSEWAY



any coastal community is storms. Various legislation, regulations, policies and agencies set the stage for disaster mitigation. These include the following:

ΓRule 9G-6, Florida Administrative Code (FAC) requires local emergency management agencies to develop comprehensive emergency management plan to include appendix on hazard mitigation.

ΓRule 9J-5.012, FAC requires local governments to restrict activities that would damage or destroy coastal resources and those that require recurring public expenditures.

ΓFDEP reviews application for coastal construction projects (e.g., dredge and fill, wharf, dock, intake or outfall pipe, ramps, signs).

ΓRule 62B-33, FAC requires DEP approval of any Gulf coastal construction/ reconstruction, or construction for shore protection purposes seaward of mean high water line.

ΓThe Coastal Building Zone requires that local governments with jurisdictions fronting the Gulf of Mexico establish such a zone. The control line shows the landward limit of the substantial damage to upland development from the effects of moving water from a 100-year coastal storm. This zone has been created and on the mainland is the land area from the seasonal high waterline to a line 1,500 feet landward of Coastal Construction Control Line (CCCL); on the barrier islands, it is 500 feet landward of CCCL. Major structures within this Coastal Building Zone must withstand 110 mile per hour winds, be elevated above storm surge and breaking wave height and have foundations to withstand wave, erosion and scourge forces associated with a 100-year storm event.

ΓNFIP Regulations require that insured structures can be repaired, reconstructed or improved at a cost of less than 50% of market value of structure without having to meet FEMA requirements. Not only does the City participate in the NFIP, it is also part of the Community Rating System (CRS). As noted above, credit points are awarded for activities the City performs. The City is a Class 7 community, with flood insurance premiums reduced by 15%.

ΓChapter 380.27, Florida Statutes (FS) requires that no state funds be used for purpose of constructing bridges or causeways to coastal barrier islands which were not accessible by such structures prior to October 1, 1985. These funds shall not be expended for the purpose of increasing capacity of costal area infrastructure unless consistent with approved coastal management element of comprehensive plan.

The problem countywide, though, is that many coastal structures were built prior to the enactment of more restrictive ordinances, rules, regulations and codes.

The City, and Pinellas County, have been fortunate that neither has suffered a direct hit from a hurricane. Both have come close, though. For example, Hurricane Elena in September of 1985 threatened the area but moved farther north before making landfall. Although the City was protected by barrier islands, it did receive \$56,000 in public assistance funds for debris removal, emergency protective services, road systems, public utilities and other services. The No Name Storm of March 13, 1993, which was not a hurricane, caused severe damage throughout Pinellas County. In Dunedin, there was an estimated \$250,000 in damages to private structures. The City itself received \$200,000 in assistance for damage to City buildings, the Marina and to fences. An *Interagency*

*Hazard Mitigation Team Report* was issued in response to the Disaster Declaration that was made for the State of Florida. Covering 37 counties, the report made 25 recommendations. Four recommendations were made with local governments listed as “Lead Agency.” These included the following, along with commentary on the local situation:

Γ Pursue the use of public acquisition within Post-Disaster Redevelopment Plans. There are several impediments to this concept. First, the coastal high-hazard area (CHHA) is already nearly built-out, primarily with residential development. Second, the City does not have funds to acquire all or a portion of this private property. Third, the effects on the tax-base of acquiring properties and removing them from tax rolls could be significant (many larger, expensive homes are along the waterfront).

Γ Incorporate economic issues into Post-Disaster Redevelopment Plans. Dunedin is primarily residential, with very limited commercial to begin with. Water-oriented commercial is even more limited, with commercial marinas, waterfront lodging, and boat-repair or boat-supplies being the prevalent uses. Only the last two uses could be easily relocated outside the CSA.

Γ Utilize the Building Officials Association of Florida (BOAF) plan when in need of additional building inspectors during reconstruction efforts. Dunedin assisted Pinellas Park during the March 1993 storm. If a severe storm were to hit Pinellas County, the BOAF would need to come from other areas in the state as most, if not all, local governments would have to deal with rebuilding crises simultaneously.

Γ Prepare and adopt an Urban Forestry Program. The City currently only removes trees which pose a hazard. For replantings, the City utilizes hearty hardwood trees which withstand wind and storm action. The City has taken steps to create an urban forestry program, but mapping the existing trees requires a great deal of time and manpower. Water, sewer and reclaimed water atlases have already been developed, allowing the tree survey to utilize this information. However, other utilities (power, telephone, gas, cable) may also have to be developed.

There were seven recommendations made with local governments or local emergency management departments listed as “Lead Agency.” These suggestions included the following:

Γ Prepare and provide information on emergency preparedness measures for small agri-businesses. This would not apply to Dunedin because the amount of crops and livestock within the corporate limits is negligible.

Γ Review the use of siren and voice transmission systems in populated areas. This is more appropriate at a county or regional level than at an individual city level due to areawide needs.

Γ Investigate individual residential warning equipment. This is also more appropriate at a county or regional level than at an individual city level due to areawide needs.

Γ Provide funding for National Oceanic and Atmospheric Administration (NOAA) radio transmitters. This may not apply to the City as Pinellas and Hillsborough Counties are covered by an NOAA transmitter.

Γ Install statewide tide monitoring gauges. Pinellas County operates a water level

monitoring system; such a City-owned system would be duplicative.

ΓRetrofit/replace water level monitoring system hardware and software. Again, any City-owned monitoring system would be duplicative of county programs.

ΓAdd mutual aid agreements to the Florida Peacetime Emergency Plan. Dunedin follows the Pinellas County Department of Emergency Management's lead during disasters. The City has several mutual aid agreements but none concerning emergency management. If appropriate language for such an emergency management mutual aid agreement could be developed, the City could enter into such.

These recommendations were considered as the post-disaster redevelopment plan was created, with the result that the plan considered numerous subject areas, including

- ΓPeriods of recovery
- ΓDamage Assessment
- ΓEmergency Management Support Facilities
- ΓLocal Resource Distribution
- ΓDisaster Declarations
- ΓRestoration of Services
- ΓRebuilding

Under the last item, the plan addresses procedures and criteria for issuing building permits, the redevelopment of infrastructure, build-back policies and acquisition of damaged land and property.

Disaster planning by the City itself reflects a coordinated effort by personnel from municipal, county and other disaster support agencies in preparation for, response to, and relief of injury and damages. The City bears the initial responsibility, but calls on the county when local resources are inadequate; the county calls on state or federal governments if the destruction is beyond their capability. The primary objective in any major storm is to minimize loss of life. Toward that end, there are several principal evacuation routes for leaving the region that can be utilized by Dunedin residents:

ΓSR 584 (Tampa Road), located outside the City limits, was improved to a six-lane divided arterial from Curlew Road to SR 580; and to an eight-lane facility from SR 580 eastward to the Hillsborough County Line.

ΓSR 586 (Curlew Road) is currently a two-lane divided arterial from Alternate US 19 to CR 1, and a four-lane divided facility from US 19A to US 19; it is a six-lane divided arterial from US 19 to SR 584. With the improvement between CR 1 and Fisher Road completed, no further construction (except an intersection improvement at US 19) is scheduled within the next five years. Pinellas County Emergency Management has identified the Curlew Road/Alternate US 19 intersection as a critical evacuation route point as this location has an elevation of six feet above mean sea level.

ΓDunedin Causeway Boulevard is the only evacuation route out for residents of Royal Stewart Arms. It is currently two-lane undivided west of the bridge, and four-lane divided from the bridge to Alternate US 19. There are no further improvements on the Long Range Plan. Again, Pinellas County Emergency Management has identified the Curlew Road/Dunedin Causeway Boulevard at US Alternate 19



intersection as a critical evacuation route point as this location has an elevation of six feet above mean sea level.

US 19 has also been identified is currently a six-lane arterial from SR 580 northward and a six-lane controlled access from SR 580 south to Enterprise Road. The Long Range Transportation Plan shows US 19 as a controlled access facility for the year 2025 from Gandy Boulevard northward to Tarpon Springs.

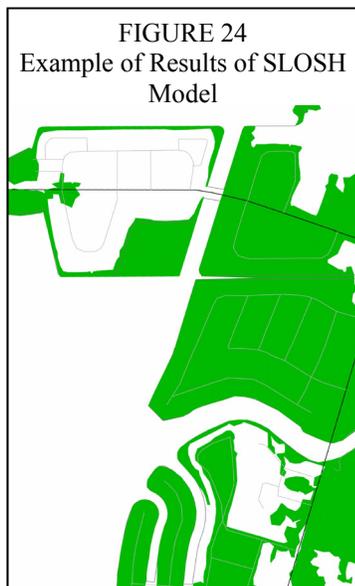
Alternate US 19. south of SR 580, it is a two-lane undivided arterial; north of SR 580 it is a two-lane divided arterial. The MPO's Long Range Transportation Plan shows a two-lane divided configuration north of SR 580 and the existing two-lane facility south of SR 580. No improvements are scheduled in the Transportation Improvement Program (TIP), although the segment south of Main Street was resurfaced recently.

SR 580 is a four-lane divided arterial from Alternate US 19 to Patricia it expands to a six-lane divided arterial from Patricia to US 19; the Long Range Transportation Plan shows this same configuration in the year 2025.

The Pinellas MPO, through the TIP, encourages the state to give priority to road improvements on regional evacuation routes.

Changes to Chapter 163, FS, modified how the coastal high-hazard area (CHHA) is defined. Having been altered previously, the most recent incarnation characterizes the CHHA as “the area below the elevation of the category 1 storm surge line as established by a Sea, Lake, and Overland Surges from Hurricanes (SLOSH) computerized storm surge model.” According to the Tampa Bay Regional Planning Council (TBRPC),

The SLOSH computerized model predicts the tidal surge heights that result from hypothetical hurricanes with selected various combinations of pressure, size, forward speed, track and winds. Originally developed for use by the National Hurricane Center (NHC) as a tool to give geographically-specific warnings of expected surge heights during the approach of hurricanes, the SLOSH model is utilized in regional studies for several key hazard and vulnerability analyses.



Making use of the SLOSH model, TBRPC developed a Storm Tide map for the Tampa Bay area showing the anticipated surge zones for each category of hurricane. Focusing on the surge zone for a category 1 storm allowed the development of the CHHA in Dunedin.

As can be seen in Figure 24, the results of the SLOSH model show areas that are expected to be inundated surrounding more upland areas. From a planning perspective, it would not be prudent to surround non-CHHA areas with areas that are subject to storm surge. Similar to Pinellas County's approach, the City has decided to apply a Coastal Storm Area (CSA) that partially consists of the CHHA. As defined in the Goals, Objectives and Policies document, the CSA is made up of the CHHA (which is defined by the SLOSH model), those isolated areas surrounded by the CHHA or by the CHHA and a body of water, and, the entire parcel if 20% or more of the parcel is located in the CHHA. When these adjustments are made, the resultant CSA (Figure 25) looks remarkably like the CHHA that was in place at the time the EAR of 2006 was adopted. In this way the CHHA becomes a subset of the



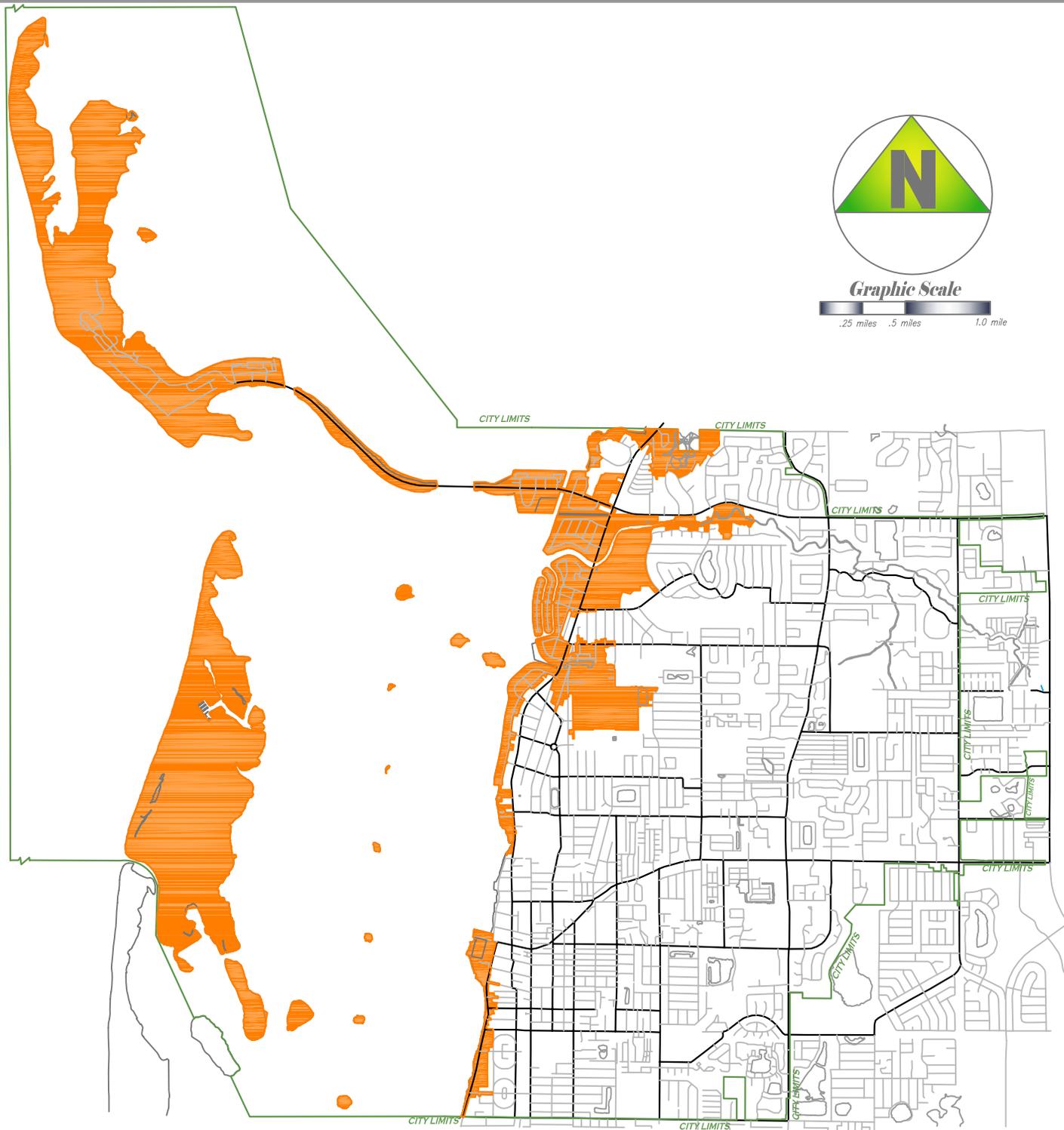
CONSERVATION AND COASTAL MANAGEMENT

FIGURE 25  
COASTAL STORM AREA

LEGEND

 COASTAL STORM AREA

COASTAL STORM AREA INCLUDES COASTAL HIGH HAZARD AREA.



SOURCE: PINELLAS COUNTY PLANNING DEPARTMENT; STORM TIDE ATLAS, DUNEDIN PLANNING & DEVELOPMENT, 2008

CSA, and policies previously applied only to the CHHA now apply to the entire CSA.

An important aspect of hurricane planning is the issue of evacuation. TBRPC’s *Regional Hurricane Evacuation Study (RHES)* estimates the at-risk population and evacuation population, based on the population affected by the evacuation levels determined by the SLOSH model. These evacuation levels are based on the category of the storm. Thus, a category 1 storm produces a level A evacuation, resulting in countywide at-risk population of 288,015, and an evacuation population during the summer months (when many residents reside in northern states) of 335,584. (The evacuation population can be larger than the at-risk population because there are persons outside the evacuation areas who will leave as well due to confusion or due to being extra cautious. This is known as shadow evacuation.)

Using a process similar to what was employed by the RHES, an estimate of the people at-risk and in need of evacuation at the City level was computed. The base for the information came from the RHES appendix showing the population in each sector; those sectors comprising Dunedin were utilized, and the estimates appear in Tables 11 and 12. The analysis suggest that roughly a little more than one-half of the City’s population is at risk.

TABLE 11 POPULATION-AT-RISK, DUNEDIN										
YEAR	CATEGORY A		CATEGORY B		CATEGORY C		CATEGORY D		CATEGORY E	
	Low	High								
2006	9,641	10,055	13,593	14,268	15,331	16,121	16,960	17,857	20,235	21,350
2011	9,781	10,197	13,796	14,478	15,564	16,363	17,218	18,127	20,546	21,674

Low and High refers to Seasonal Fluctuation.  
Source: *Tampa Bay Regional Hurricane Evacuation Study Update, 2006; Dunedin Planning & Development, 2008*

TABLE 12 EVACUATION POPULATION, DUNEDIN										
YEAR	CATEGORY A		CATEGORY B		CATEGORY C		CATEGORY D		CATEGORY E	
	Low	High								
2006	10,606	11,060	14,953	15,695	17,038	17,919	18,992	20,002	22,922	24,193
2011	10,759	11,217	15,176	15,926	17,297	18,188	19,282	20,304	23,275	24,562

Low and High refers to Seasonal Fluctuation.  
Source: *Tampa Bay Regional Hurricane Evacuation Study Update, 2006; Dunedin Planning & Development, 2008*

Many of these evacuees will seek shelter locally, some by going to friends’ or relative’s houses, and others by going to public shelters. Again, using the RHES approach estimates for Dunedin residents seeking shelter are shown in Table 13. There are eight shelters in proximity to the City these evacuees could be expected to use. These include the following:

- Palm Harbor University High School, with a 3,022 person capacity.
- Palm Harbor Middle School, with a 2,848 person capacity.
- Carwise Middle School, with a 4,043 person capacity.
- Kennedy Middle School, with a 3,512 person capacity.
- McMullen Booth Elementary School, with a 1,327 person capacity. .
- Dunedin Elementary School, with a 3,279 person capacity.
- Dunedin Middle School, with a 1,825 person capacity (Special Needs).
- Dunedin Community Center, with an 800 person capacity.



**TABLE 13  
PUBLIC SHELTER DEMAND, DUNEDIN**

YEAR	AVAILABLE CAPACITY	CATEGORY A		CATEGORY B		CATEGORY C		CATEGORY D		CATEGORY E	
		Low	High								
<b>2006</b>	20,656	1,566	1,612	2,219	2,307	2,531	2,641	2,824	2,953	3,414	3,582
<b>2011</b>	20,656	1,590	1,636	2,252	2,342	2,571	2,681	2,868	2,999	3,467	3,637

Based on 10% for Evacuation Level A residents, 15% for Evacuation Level B-E and shadow evacuees and 20% for mobile home residents; 20 square feet per person for capacity.  
Low and High refers to Seasonal Fluctuation.  
Source: *Tampa Bay Regional Hurricane Evacuation Study Update, 2006; Dunedin Planning & Development, 2008*

This yields a total of 20,656 spaces available close to Dunedin. While it may appear that there is plenty of space, persons from other zones outside of Dunedin will more than likely utilize that capacity as well. Figure 26 shows evacuation routes and evacuation shelters.

Table 14 shows the countywide estimates of those seeking shelter. As can be seen, on an aggregate basis, there will be a shortfall of spaces if a Category B evacuation is called for.

**TABLE 14  
PUBLIC SHELTER DEMAND, PINELLAS COUNTY**

YEAR	AVAILABLE CAPACITY	CATEGORY A		CATEGORY B		CATEGORY C		CATEGORY D		CATEGORY E	
		Low	High								
<b>2006</b>	35,221	29,682	30,396	57,496	58,221	71,754	72,464	87,318	88,032	93,751	94,464
<b>2011</b>	40,000	30,188	30,910	58,553	59,279	73,179	73,904	89,029	89,747	95,573	96,291

Based on 10% for Evacuation Level A residents, 15% for Evacuation Level B-E and shadow evacuees and 20% for mobile home residents  
20 square feet per person  
Low and High refers to Seasonal Fluctuation  
Source: *Tampa Bay Region Hurricane Evacuation Study Update, 2006*

Both Dunedin Fire Services and County Sheriff’s Department have procedures to locate evacuees requiring transportation and provide assistance. There are approximately 10,660 persons over the age of 65 (according to the 2000 Census) in the entire City. There is one group home in the CSA, but it was in the previously defined CHHA as well. While Mease Hospital has 173 beds, it is not in an evacuation zone.

Neither limited population increases nor future land uses are expected to have a significant impact on the City’s disaster preparedness. With a projected growth of less than 4,000 persons Citywide between 2005 and 2025, the City is nearing physical build-out. Most of the growth will be through infill development and through annexation. Most vacant developable land is outside of the CSA, but some parcels (most notably along or near Alternate US 19 or along or near Dunedin Causeway) are within the CSA limits.

Clearance times for an evacuation are based on TBRPC’s 2006 hurricane evacuation study. The model assumes certain behaviors for different situations, and does not include evacuation time *before* an official evacuation order given. These estimates take in the entire county, not just Dune-



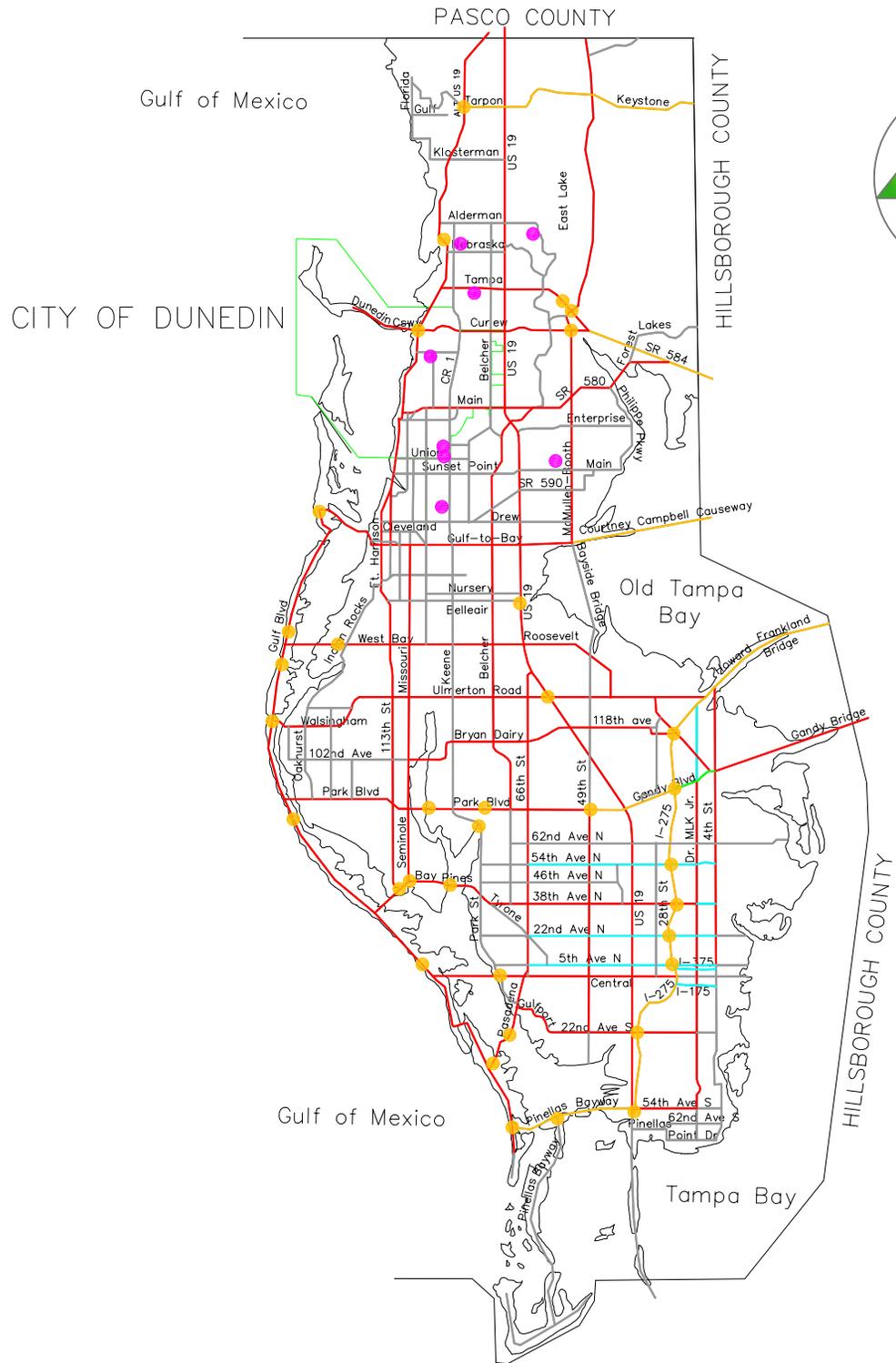


CONSERVATION AND COASTAL MANAGEMENT

# FIGURE 26 EVACUATION ROUTES AND SHELTERS

## LEGEND

-  PINELLAS COUNTY-IDENTIFIED EVACUATION ROUTES
-  TBRPC-IDENTIFIED EVACUATION ROUTES
-  CRITICAL EVACUATION ROUTE LINKS
-  POTENTIAL CRUCIAL BOTTLENECKS
-  CRITICAL EVACUATION ROUTE POINTS
-  EVACUATION SHELTERS IN OR NEAR DUNEDIN



din as the City itself cannot be broken out separately. Thus, evacuation is a regional issue, not just citywide. Table 15 shows the time required to clearance the county in various scenarios. Because of the population involved, the maximum time is nearly 55 hours in the event that an evacuation level E is ordered.

TABLE 15 CLEARANCE TIMES, PINELLAS COUNTY, 2006										
YEAR	EVACUATION LEVEL A		EVACUATION LEVEL B		EVACUATION LEVEL C		EVACUATION LEVEL D		EVACUATION LEVEL E	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
<b>No Reverse Lanes</b>	16.5	23	18.5	26	28.25	36.25	42.5	50.5	46.5	54.5
<b>With Reverse Lanes on I-275 and I-275 Northbound</b>					18.25	23.5	27.5	32.75	30	35.25
Out-of-County/Intra-State Movements, in hours FDOT is currently only considering this segment for contra-flow operations. No formal plans have yet been finalized or approved for implementation. Low and High refers to Seasonal Fluctuation Source: <i>Tampa Bay Region Hurricane Evacuation Study Update, 2006</i>										

The City has adopted policies that could maintain or reduce hurricane evacuation times. These include providing for and maintaining the clear posting of evacuation routes within the City’s jurisdiction; allowing earlier evacuation notice and encouraging residents to leave the City; educating the general public on hurricane evacuation procedures; and prohibiting new construction of certain developments (e.g., hospitals, nursing homes, expansions of mobile home parks) within the CHHA

The RHES shows Alternate US 19 through Dunedin and Causeway Boulevard as “Potential Flood Roads,” meaning that they could be inundated prior to stormfall depending on the weather. Also, City staff has called attention to the critical nature of the Curlew Road/Alternate US 19 intersection. This is the only way out for Royal Stewart Arms and Dunedin Causeway residents and also provides residents to the south access to Curlew Road as an evacuation route. At an elevation of around six feet it is subject to flooding; if the intersection is impassable during emergency, results could be disastrous. The latest (2007) response from FDOT was that

This intersection’s elevation is consistent with the average 4 to 6-foot elevations found along the entire Alternate US 19 corridor and other coastal areas of the District. A design raising the intersection’s elevation would not resolve the elevation differences along the remainder of Alter US 19. Additionally, increasing the roadway elevation would escalate the cost for right of way and construction. Our typical design for reconstruction/widening projects like the one mentioned would not include the intersection elevation any more than necessary to provide base clearance to the seasonal high-water levels in the area.

The City has promoted the use of the “Host Home” concept by sending out information packets to churches and large employers. The packets describe the program and delineate how to go about implementing it. Finally, the City continues to support of MPO’s position to place priority



on FDOT improving evacuation routes.

A Post-Disaster Redevelopment Plan addresses existing and proposed land use in CHHA. As is the rest of Dunedin, the CHHA is a mixture of mostly residential with some commercial and industrial. The residential is spread throughout, commercial primarily along US 19A or Causeway Boulevard, industrial at San Christopher Drive and Martin Luther King Jr. Avenue. There is only limited vacant developable acreage in the CHHA, a combination of single lots with infill potential and limited larger (one acre or more) areas. Most of the larger vacant parcels in the CHHA have a commercial designation.

Dunedin became a repetitive loss community subsequent to the March 13, 1993 storm. (A structure is termed a repetitive loss if it sustains more than one flood claim in excess of \$1000 during a ten year period. A city is considered a repetitive loss community if it has ten or more repetitive loss properties.) In 1993, 60 properties were repetitive loss; that number had grown to 85 by 2007. Figure 27 shows location of identified repetitive loss areas.

Currently the barrier islands of Caladesi and Honeymoon provide some protection against storm surges from the Gulf of Mexico. Coastal or shore protection structures would probably be of limited use due to extent of the peninsula facing the Gulf. The Interagency Hazard Mitigation Report did not cite any coastal or shore protection structures in their recommendations.

It is unfortunate that the older part of City is within the CSA, meaning that much of the infrastructure is subject to surge from a category 1 hurricane. For example, there are older sewer lines in this area, some in need of replacement. While inflow/infiltration (I/I) has been exceeded, it is not excessive. The FY 2008 through 2013 Capital Improvement Program (CIP) shows \$360,000 for sewer line repair but this is Citywide. Additionally there are 14 lift stations located in the CSA. The condition of these lift stations is average and some are being rehabilitated. The FY 2008 through 2013 CIP shows \$270,000 for lift station repairs but again this is Citywide. However, the City is anticipating spending \$1.2 million on Lift Station 15, located near the intersection of Curlew Road and Alternate, and its attendant piping. The Wastewater Treatment Plant is not in the CSA.

Undersized and deficient potable waterlines have been replaced throughout the City, and as other deficient pipes are discovered, they are replaced. The Water Treatment Plant is outside the evacuation limits, and no existing or proposed production wells are in the CSA. There is, though, one monitoring well in the CSA.

There are a limited number of drainage facilities in the CSA, most notably outfall pipes to St. Joseph's Sound. Four channels that have LOS standards associated with them are at least partially located within this subject area. Most of the Master Drainage projects are located outside of the CSA, but those that are within this area are related to stormwater quality. The FY 2008 through 2013 CIP contains several drainage projects within the CSA, including the following: Hammock Park Rehydration (\$1,815,000) Baywood Shores Tide Valves (\$40,000); and Dunedin Isles (\$1,846,000), although the latter would involve areas outside the Coastal Storm Area.

While the Solid Waste fleet is based outside CSA, and the City's single mulch station is within this vulnerable area.

For transportation, Alternate US 19 is the only deficient roadway in the CSA. It is constrained as the Long Range Plan shows it as not having an improvement.

Residing in the Coastal Storm Area are four mini-parks, four neighborhood parks, three community parks, two quasi-public parks, two regional parks, and portions of the Pinellas Trail. Regional parks are maintained by the state, and nine of these parks provide waterfront access. The Causeway was renourished in 2000. The Marina has been reconstructed recently. There are no recreation-related structures in the CSA.



CONSERVATION AND COASTAL MANAGEMENT

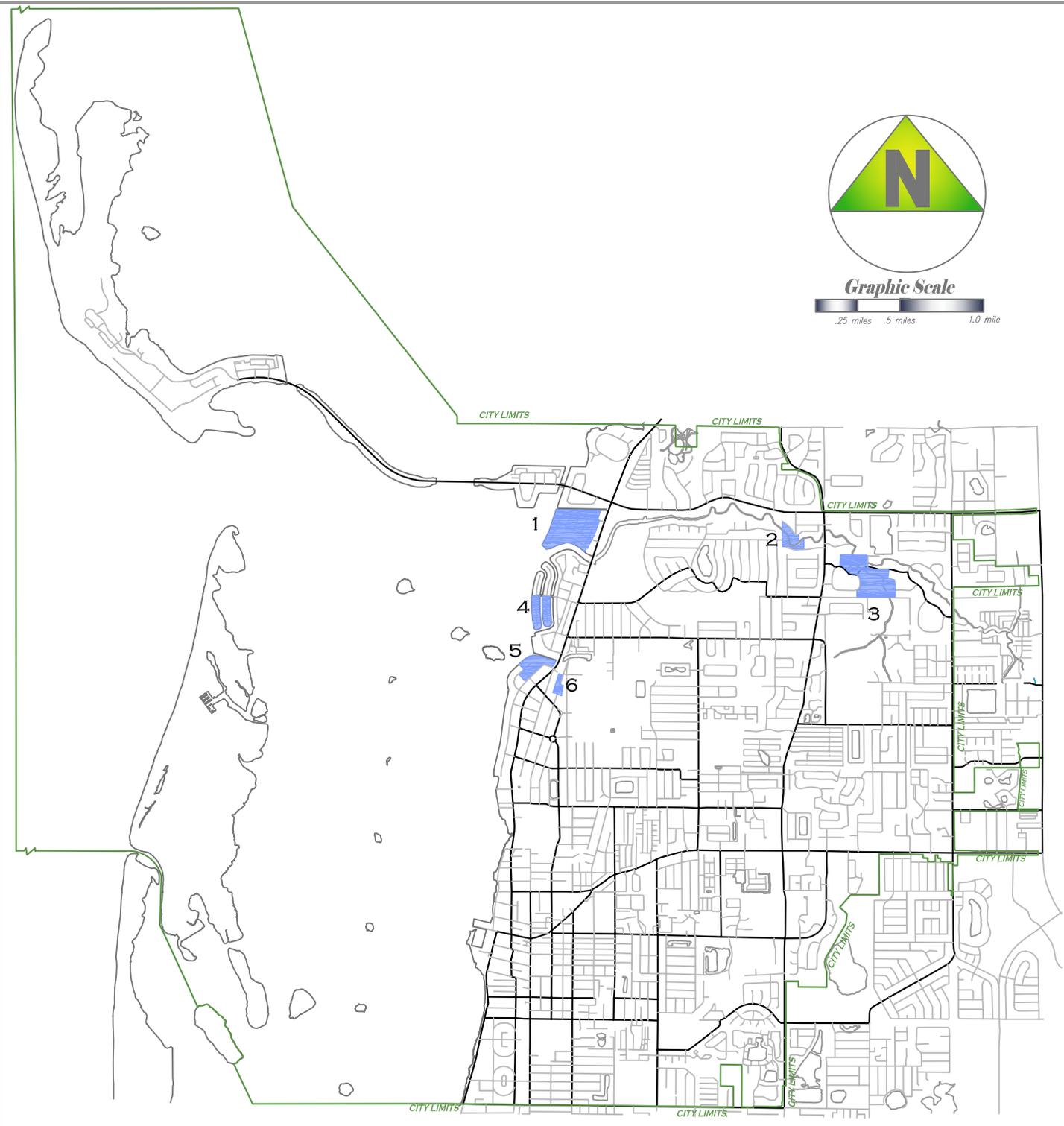
FIGURE 27

REPETITIVE LOSS AREAS

LEGEND



- 1 BAYWOOD SHORES
- 2 DUNEDIN RIDGE
- 3 SPANISH TRAILS
- 4 HARBORVIEW
- 5 BUENA VISTA
- 6 NORTH DOUGLAS



Overall, the infrastructure in the Coastal Storm Area is sufficient. Sewer line replacement, lift station rehabilitation and specific drainage improvements are the only outstanding issues. It cannot be emphasized enough that these are basic services which must be maintained in order to provide adequate levels of service. Table 16 summarizes those facilities in the CSA.

TABLE 16 FACILITIES IN CSA				
ELEMENT	ITEMS IN CSA	ITEMS RELATED TO LOS	PROJECTS IN CIP?	COMMENTS
<b>Wastewater</b>	Pipes, 14 Lift Station	Yes	Yes	
<b>Potable Water</b>	Pipes, 1 monitor well	Yes	Yes	
<b>Stormwater</b>	3 Channels 2 lakes	Yes	Yes	Most MDP projects in CSA related to stormwater quality
<b>Solid Waste</b>	Mulch Station	No	No	
<b>Transportation</b>	Alternate US 19	Yes	No	Roadway is constrained
<b>Parks</b>	4 mini 4 neighborhood 3 community 2 quasi-public 2 regional Pinellas Trail	Yes	No	Many parks provide water access
Source: Dunedin Planning & Development				

Beaches and dunes falling under the jurisdiction of the City and in the CHHA are minimal. Dunedin Causeway is of Made Land. There are no dunes on the Causeway. While dunes are present on Honeymoon and Caladesi Islands, both are under the jurisdiction of the state.

There are several measures that can be taken to reduce exposure to hazards. The first is relocation. Most of the developable land in the CSA is already built on, and the relocation of residents and businesses out of the CSA would be monumental and prohibitively expensive. Second is structural modification. The City enforces FEMA’s 50% Rule such that substantial improvement requires raising of the affected structure to the base flood elevation. As part of the City’s participation in the Community Rating System, floodproofing information is sent annually to repetitive loss areas. It should be noted that these modifications can be very expensive, especially when the requirements of the Florida Building Code are factored in as well. Even though modifications are expensive they could be less expensive than replacement later. Toward that end, FEMA has been providing grant monies in the form of Flood Mitigation Assistance Program (FMAP) funds to homeowners to retrofit their houses by elevating them or by constructing a second story. The FMAP program will pay 75% of the eligible costs to perform this work. Since the late 1990s, seven houses have been elevated using these funds.

Public acquisition is another method of mitigating against storm hazards. But again, most of the developable land in the CSA is already built on, and relocating residents and businesses would be very expensive. Additionally, acquisition of parcels in the CHHA by public entities



would have far-reaching consequences on City's taxable valuations. This could tremendously reduce the City's general fund, especially since relocation would have to be to areas outside the City since the remainder of the City is close to build-out as well.

The potential for relocating threatened infrastructure is very minimal. Water, sewer, reclaimed water lines, roadways and parks supply needed services and facilities to residents and businesses in the CSA. Relocating this infrastructure out of the hazard area would mean that infrastructure could no longer serve the CSA residents. A lack of infrastructure would force residents to move, resulting in the same scenario just mentioned above. It would be far better for infrastructure to be designed and built to withstand storm and wave action than to remove it. An Urban Forestry Program, on the other hand, would make much more sense. This would inventory trees in relation to infrastructure (pipes, utilities). City staff would provide assiduous pruning in order for the trees to better withstand storms.

Dunedin subscribes to post-storm damage assessment procedures specified at the county, state and federal levels. The City has received FEMA Disaster Relief reimbursement for the 1993 No Name Storm. The Pinellas County Comprehensive Emergency Management Plan (CEMP) specifies procedures, policies and measures for disaster recovery. Beginning in 1998 the City began participating in a countywide Local Mitigation Strategy (LMS). The purpose of the LMS is to determine guiding principles for hazard mitigation, identify programs and projects for funding (which are, in turn, based on a hazard identification and vulnerability assessment) and improve post-disaster decision-making process. The result was a single unified local mitigation strategy for Pinellas County. Originally adopted in 1999, this LMS was updated in 2004 and serves as a guide to strategies for all municipalities in Pinellas County. In fact, the adoption of this LMS allowed for Dunedin and other local governments to apply for and receive federal Hazard Mitigation Grant Program (HMGP) funds. These dollars were used to retrofit windows in two City-owned buildings against wind damage.

As far as air quality goes, the City is not a generator of heavy pollutants. The Coca-Cola North America plant is not a major concern, and neither is the City's Wastewater Treatment Plant's methane gas burnoff, although odors in immediate area do exist. The prevailing breezes recycle interim stagnant air envelopes.

Dunedin is part of the Tampa Bay Region and "airshed" is not an isolated thing. Pollutants come from businesses, residences, automobiles and buses throughout the region. Mass transit, though, is one primary method of reducing traffic congestion and its adverse effects.

In 1978, Pinellas County was designated as marginal non-attainment area for ozone under the National Ambient Air Quality Standards (NAAQS). The Clean Air Act required Florida to develop a State Implementation Plan in order to attain and maintain air quality standards. In 1994, Pinellas County submitted documentation to US EPA requesting that the marginal non-attainment designation be removed and demonstrating that Pinellas County was now an Attainment Area. The proof was monitoring information indicating that NAAQS standards had been achieved. A maintenance plan ensures that the standards will continue to be realized. On December 7, 1995, the US EPA issued a rule that approved Pinellas County's request. Effective the following February, the Tampa-St. Petersburg area became an attainment area for ozone. Even though air quality has been improved considerably since 1978, there are a number of pollution controls or programs that must remain in place, including the National Ambient Monitoring Stations, the Federal Motor Vehicle Control Program, the seasonal regulation of gasoline vapor pressure, a transportation conformity analysis, emission limiting standards for major point sources, periodic emission inventories (1994, 1997 and 2000; total emissions cannot exceed 1990 levels), State and Local Ambient Monitoring



Stations, operating permits for major point sources. Dunedin's air, as part of Pinellas County's airshed, has improved considerably since 1989.

The commercial and industrial activities in Dunedin produce little hazardous waste material. Mease Hospital and Coca-Cola North America have their wastes disposed of privately. While Dunedin does not have any hazardous waste facilities, Pinellas County has a collection site near the Resource Recovery Plant. Hazardous wastes are transported out of state to approved disposal sites. The City encourages use of the Waste-to-Energy facility and prohibits dumping of wastes such as oils and greases into the stormwater sewer system. Additionally, the City hosts collection days where items such as batteries and electronics are taken in from residents.

## LEVEL OF SERVICE

As noted above, since Dunedin is a coastal community, the City does not apply different level of service standards to different areas. The standards from other elements are applied City-wide, not just to the Coastal Planning Area or to the Coastal Storm Area.

## PLANNING AREA ANALYSIS

Except for the waterfront, the Planning Area is very similar to Dunedin proper. Topography rises to just over 70 feet above sea level, especially in eastern reaches of Planning Area. Single and multi-family residential predominates, with commercial along the primary arterials and some collectors. Commercial is especially prevalent along US 19 and on north side of SR 580.

As with the incorporated City, isolated remnants exist of older ecological communities, including Sand Pine Scrub, Longleaf Pine-Turkey Oak Hills, South Florida Flatwoods and Cabbage Palm Flatwoods. As shown in Figure 2, these four communities combined dominate the Planning Area. Many of these communities may not be "intact" but they are spread throughout the Planning Area. These ecological communities are discussed in much more detail above.

The highlands are drained almost entirely by Curlew Creek. The Jerry Lake tract, just east of the City limits, is a Freshwater Marsh and 31-acre lake. With a total size of 81-acres, it is designated as a stormwater management preserve. It is owned by the Southwest Florida Water Management District (SWFWMD) but no projects are planned until the previous owner is deceased. Land on the parcel is Preservation, with surrounding land use categories (within and without the City) being Recreation/Open Space, Institutional, Residential Suburban, Residential Low, Residential Urban, Residential Medium and Commercial Limited. Because the Residential Medium and Commercial Limited lands contiguous to the preserve are so small, excellent land use buffering currently exists.

Located in the Northern Planning Area, just east of Alternate US 19, is a salt marsh. It is one of very few located south of Tarpon Springs.

Watershed basins in the Planning Area include the Curlew Creek-Jerry Branch system. This was discussed above, the areas within and without the City not being differentiated. Pinellas County has adopted special construction setbacks and receiving drainage configurations. Twenty-three outfall pipes discharge into the primary basin channel, and Creek and tributary channels are designated as Flood Zone A

The vegetative cover map and ecological communities information was consulted in order to map such communities and provide an overview of niches and habitats within the City. These are shown in Figure 5, and ecological communities are shown in Figure 2. Sand Pine Scrub, Longleaf Pine-Turkey Oak Hills, South Florida Flatwoods and Cabbage Palm Flatwoods communities

were combined as Pinelands/Hardwood Forest vegetative cover categories. These communities predominate in the Planning Area, as they do in the incorporated City. Salt Marsh, Freshwater Marsh and Swamp Hardwoods communities are also found in the Planning Area. All of these ecological communities are discussed in much more detail above.

In terms of the floodplain, Zone AE penetrates along Curlew Creek as far south as south of Jerry Lake and as far east as US 19. Zone X predominates. The HVA extends just past CR 1. Only the northern Planning Area “square” of unincorporated county and a portion of the enclave north of Curlew Road are within either of these zones.

While palustrine wetlands predominate overall in the Planning Area, lacustrine wetlands are found in the Jerry Lake area. SWFWMD identified wetlands include Wetland Forested Mixed at Jerry Lake and north of Curlew Road, and Vegetated Non-Forested Wetland sprinkled throughout the Planning Area.

There are three permitted source dischargers in Planning Area. The Utilities, Inc. Wastewater Treatment Plant is a Domestic Point Source Surface Water Discharger, whose effluent flows directly into Curlew Creek and indirectly into St. Joseph’s Sound and the Gulf of Mexico.

The water quality assessment provided above suggests that Curlew Creek is an impaired water. However, it will not be subject to TMDLs until 2011.

As with the City, habitats are strewn throughout the Planning Area. The largest and most viable are the Jerry Lake, Curlew Creek enclave area, and Howell Swamp. Figure 17 suggests a good deal of wetlands connectivity in the Planning Area, but there are isolated wetlands. There are several large lakes in the Planning Area, of which Jerry Lake is the largest. The Howell Swamp and Tooke’s Lake are both in enclaves, and Resort Lake is in the Planning Area. Spring Lake, near Union Street and CR 1, is actually outside of Planning Area, but it is part of Curlew Creek Basin drainage system.

The demand for additional potable water from the residents in the Planning Area would be significant. If the entire Planning Area were annexed and the City provided service, a total functional population of 51,323 would exist. This would result in a total of (51,323 x 110 gpcpd), or 5,635,520 gallons per day. The average permitted withdrawal rates would not be exceeded based on currently approved Consumptive Use Permit. But according to the Dunedin Public Works Department, the cost to bring infrastructure up to standards in the area east of Belcher Road would greatly exceed the tax and other utility revenues. Thus, while the enclaves could be annexed and served adequately, the annexation of the entire Planning Area could present problems for the City in delivering water services. These areas, though, are indeed outside the City’s water service area and Pinellas County should continue providing water to these areas, even if they are eventually annexed.

While there are historic sites in this vicinity, they are all north of Curlew Road and thus outside of the Planning Area.

If the Planning Area were annexed, the City would assume responsibility for disaster planning, but, as noted above, Dunedin coordinates closely with county and other agencies. Residents in the enclaves and the Planning Area would rely on the same evacuation routes as detailed above. These include SR 584, SR 586, US 19, and SR 580. Please refer to the discussion above for further details. As also noted above, neither the CSA nor the HVA penetrate into the Planning Area beyond the enclaves and the unincorporated area in the northern portion of City. Only those structures along or near Curlew Creek in the AE zone would be affected by FEMA’s 50% rule for substantial improvement.

Except for extensive commercial along US 19 and SR 580, most of the enclaves and Planning Area consist of residential, institutional or recreational uses. Other than through the use of

automobiles, these would not be considered great generators of air pollutants. It should be noted that US 19 is served by transit routes.

Extensive commercial along US 19 and SR 580 consists primarily of retail, restaurant and office, and also includes automobile repair, car sales, motel, storage, gas stations, medical offices. These would not be considered tremendous generators of hazardous waste.

## SUMMARY

The Conservation and Coastal Management Element addresses a wide range subjects, ranging from ecological habitats to hurricanes. The information presented suggests the following conclusions:

¶In terms of effects on the natural world, the City does quite well. The use of reclaimed water not only reduces the discharge of wastewater to St. Joseph's Sound, it also reduces the demands on groundwater. While stormwater pollution is extant simply due to the urban environment, the City's Master Drainage Plan envisions numerous water quality improvements. Future stormwater studies hope to include aspects of comprehensive watershed management planning, including flood protection, stormwater quality, erosion and sedimentation.

¶The at-risk population for hurricane evacuation ranges from 9,640 for Level A to 21,350 for Level E. This is a sizeable group, and even though nearby shelters appear to have sufficient spaces, other evacuees will be using them. For a Category E evacuation, countywide, there is an estimated maximum deficit of over 59,000 shelter spaces.

¶Dunedin is one of the few cities in Pinellas County whose barrier islands are not extensively developed. Because of this, Honeymoon and Caladesi Islands enjoy a rich set of ecological habitats. The marine grassbeds in St. Joseph's Sound have become more extensive over the years.

¶Significant wetlands are spread through the City. For the most part, lower density residential and a minimum of commercial land uses allow for the continued health of these wetlands. Pollution, though, still impacts these areas.

While Dunedin has a wealth of natural habitat, the human population has to be aware of its continued impacts on these ecological niches. And man must also be mindful of the impacts of nature on his own actions, most notably in the form of tropical storms and hurricanes.