

Section 3.3.6. Storm Drainage Element

Pursuant to Section 163.3177(3), Florida Statutes.

Background Discussion

The purpose of this element is to provide for the management of stormwater drainage to control flooding of developed areas and to enhance the wetlands and natural drainage features of Sanibel.

The data and analyses for this element of the *Sanibel Plan*, pursuant to *Section 163.3177(6)(c) Florida Statutes* are provided in this subsection and in the Surface Water Management Plan, adopted in August 1989.

All of the City of Sanibel is located in the coastal floodplain. No other regulatory floodplains, such as for rainfall flooding, have been established within the City.

Stormwater runoff characteristics are a direct function of the amount of precipitation, condition and density of vegetation or other groundcover, and the structure and texture of the soil or other surface material and its saturation level. Topography also affects stormwater flow, percolation and overflow rates. Water infiltrates each soil type at a specific rate, characteristically rapid at first, then leveling off until it is no longer absorbed. If precipitation continues, depressions fill, water accumulates and overland flow occurs.

The infiltration rate on Sanibel's shell and sand substrate is exceedingly high and, as a result, overland flow is almost negligible under natural conditions. Rainwater quickly

replenishes the groundwater table and overland flow of water from one area to another would be virtually negligible. This condition, however, is not maintained in development areas unless stormwater is managed by having adequate areas of permeable soil and vegetation.

The City is one of 13 co-permittees that are included with Lee County's National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit. The NPDES stormwater program regulates non-point source discharges of stormwater into surface waters of the State from certain municipal, industrial and construction activities.

As the NPDES stormwater permitting authority, the Florida Department of Environmental Protection is responsible for promulgating rules and issuing permits, managing and reviewing permit applications, auditing annual reports submitted by permittees and performing compliance and enforcement activities.

A second phase of NPDES requires permits for construction activities that disturb one or more acres of land. For smaller projects, a program has been developed by the City to implement measures of the NPDES program for stormwater, erosion and sediment control. This program attempts to eliminate particulates in construction site runoff caused by dewatering activities and rainfall.

New development and redevelopment activities that are not exempt from permitting requirements of the South Florida Water Management District are required to provide stormwater drainage systems in compliance with the requirements of the District. Stormwater drainage systems that are required by the District are for a 25-year storm event of three-day duration. However, in accordance with the Future Land Use Element of

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this Plan, over 90 percent of the development permitted in the City of Sanibel has already occurred. Therefore, the stormwater management requirements, established in the original *Sanibel Plan*, are retained for infill development.

Stormwater drainage systems for infill development are required to design for the five-year storm event of one-hour duration.

Past environmental damage caused by inadequate human-devised storm drainage systems on Sanibel represented a real threat to several valuable ecological functions, including maintenance and recharge of the freshwater lens, maintenance of water quality and maintenance of natural vegetation and wildlife habitats. To preserve and restore these valuable ecological functions, the City of Sanibel requires that stormwater drainage systems reflect the natural drainage system in a manner that preserves natural processes and causes the least environmental disruption.

The method of dealing with stormwater drainage so as to minimize harmful impact of development on the environment is to preserve and use the inherent capabilities of the site to absorb water effectively with minor modifications to land configuration. By careful site planning and maximizing the areas that retain and absorb stormwater, costly piping, channels and culverts can be reduced. A natural drainage system that is sympathetic to natural processes causes the least environmental disruption and can be less costly to build and maintain. Most importantly, the problems and solutions are localized to the project site and not imposed on adjacent land.

In order to retain Sanibel's native vegetation and wildlife habitats, the existing groundwater system must not be disrupted. It is, therefore, a policy of the City in this Plan that, at a minimum, the stormwater produced by five-year storm

conditions will be collected, retained, and recharged on the site of any development.

The Natural Storm Drainage system can achieve the following:

- Maximize recharge of the shallow groundwater aquifer
- Minimize runoff
- Minimize erosion and siltation
- Minimize vegetation removal
- Minimize maintenance and drainage system costs
- Improve water quality
- Enhance flow in Sanibel River

An invaluable resource to the Island-wide natural drainage system is the interior wetlands. This 3,500-acre depression in the central area of the Island, roughly bordered by Periwinkle Way and Sanibel-Captiva Road on the north and Gulf Drive on the south, plays an important role in terms of stormwater storage during both high frequency as well as more intense storms. The main drainage way of the interior wetland is the Sanibel River.

Historically, the Sanibel River was a semi-continuous slough system that originated in the vicinity of the present Tradewinds subdivision and completed its course near the present Colonnades Condominiums and Colony Beach Estates.

During extreme high water conditions, the River would break over the beach and empty into the Gulf of Mexico at several locations along its path. In 1960, the River was channelized for mosquito control purposes. The primary objective was to

concentrate the surface water in one channel and to maintain as constant a water level as possible. Water level control structures at Tarpon Bay and Beach Road were constructed at this time and continue to be the only River outlets to saltwater under normal conditions.

County roads through the interior wetlands crossed the river over bridges early in the Island's development. However, these bridges were eventually replaced by culverts and fill. In many cases the culverts were woefully undersized and the inverts of the culverts were placed at elevations higher than the normal level of the water in the river. Most of these bottlenecks have since been corrected by the City or in association with private development.

More importantly in terms of storm drainage and the health, safety and welfare of the Island's residents, constrictions in the interior drainage system may cause flooding. During periods of heavy rainfall, moderate to severe flooding once occurred in some areas. At times, substantial portions of major roads were covered often to a depth of six to eight inches for extended periods of time. This was partly due to incorrectly sized and improperly placed culverts. The combination of improving intra-basin flow in the interior wetlands as well as raising the roads gives greater flood protection to emergency evacuation routes in the event of a hurricane. Constricting culverts can also reduce the velocity of the flow in the River and effectively prevent adequate flushing of saltwater from the interior of the Island because of the density relationship between freshwater and saltwater. Typically this results in the discharge from the Island of the overlying freshwater and the retention of the lower strata of saltwater, thus greatly reducing water quality in the interior wetlands. The Sanibel *Surface Water Management Plan* has addressed these concerns.

Surface Water Management Plan

Implementation of the Surface Water Management Plan (SWMP) has been achieved; however, there is preliminary consideration for elevating the seasonal water table in the conservation lands between the Sanibel Highlands subdivision and Tarpon Bay Road.

A long-apparent need for an Island-wide surface water management plan was primarily addressed by the Surface Water Management Plan's dual goals of flood protection and environmental enhancement.

The Goal and Objectives of the Surface Water Management Plan

Goal

To safeguard human health and welfare and to maintain and improve the wetland system of the Sanibel River and its tributaries in order to enhance and promote water quality as well as vegetative and wildlife habitat diversity.

Objectives

1. To reduce extreme flooding in developed areas and the length of time of flooding in order to keep roads, driveways, house pads and septic systems drained to the greatest extent possible.
2. To use surface water management as one of many tools in undeveloped areas in order to encourage and support the return to savannah and marsh vegetation as well as other native habitat types, including but not limited to ridge hammocks, buttonwood sloughs

and transition zones, and to discourage the continued invasion of exotic plants.

- To identify undeveloped areas for habitat preservation and restoration that are large enough to support representative plant and animal populations, economically and physically feasible to manage and compatible with the water management needs of developed areas
 - To increase rainfall detention in undeveloped areas to encourage the recharging of the water table aquifer and to return to conditions of environmental extremes in surface water and water table elevations natural characteristics in the past
3. To use natural drainage methods wherever possible with minimum change to the environment, using minimal amounts of human-made structures and arriving at a system requiring minimal maintenance.

The plan was designed in accordance with South Florida Water Management District criteria, which is a 25-year, three-day storm event, which drops approximately 8.5 inches of rainfall.

In order to implement the revised SWMP, City Council authorized improvements along the Sanibel River. Included in those improvements were the replacement of the old Tarpon Bay and Beach Road Weirs. The old weirs did not have outfall crests high enough to achieve the environmental restoration objectives of the Plan, nor did they have the drainage capacity to satisfy the flood control objectives of the Plan. The new weirs, which are both in place, have considerably longer weir crests set at the optimum water elevation levels of 3.2 feet NGVD (2.0 feet NAVD) at Tarpon Bay and at 2.7 feet NGVD (1.5

feet NAVD) at Beach Road to hold surface water at those desired levels. The new weirs also have greatly increased drainage (sluice) gates that will allow the rapid release of stormwater when the optimum water levels are exceeded.

The final phase of the SWMP was the restoration of the Sanibel River itself. This project called for the removal of vegetative and subsurface constrictions in the river, and the creation of a number of wildlife habitat restoration areas along the River's path. The Sanibel Gardens Restoration project restored a large segment of the historical course of the Sanibel River.

The *SWMP* is administered and managed by a City Council-approved Weir Control Policy. The current policy was adopted by City Council through Resolution No. 94-75 on April 19, 1994, and approved by both the Florida Department of Environmental Protection and South Florida Water Management District.

The principal drainageway of the City of Sanibel is the Sanibel River. The eastern reach of the Sanibel River system discharges stormwater runoff at the Beach Road weir into the Shell Harbor/Sanibel Estates canal system. This canal system, which drains the altered land area at the eastern end of the Island, discharges stormwater runoff into San Carlos Bay. The western reach of the Sanibel River system discharges stormwater runoff at the Tarpon Bay Weir into Tarpon Bay. The area north of Periwinkle Way/Sanibel-Captiva Road (the roadways are generally located along the mid-Island ridge) drains into the estuary. The bayous near Blind Pass drain the western end of the Island.

Permitting of surface water management systems is subject to the regulations of the South Florida Water Management District.

The City of Sanibel has operational responsibility for public drainage facilities of Sanibel. Private property owners have operational responsibility for private drainage facilities, including outfall structures to public drainage features.

The Sanibel Land Development Code requires that post development rates of discharge not exceed predevelopment rates. Retention rather than detention is required to promote recharge of the groundwater table aquifer. The volume of retention is based on requirements of the South Florida Water Management District; however, infill development on existing parcels is required to retain runoff from a five-year, one-hour duration storm. The rainfall intensity for this storm is 2.8 inches. For infill development, the occurrence of greater storm events may result in flooding as retention area capacity is exceeded. However, the impacts of storm drainage systems to handle greater retention outweigh additional benefit achieved. Furthermore, buildings constructed in infill development areas are protected by the base flood elevation requirements of the Federal Flood Insurance Rate Map.

The City of Sanibel is located in a coastal zone. Since 1979, all residential buildings are required to be elevated and commercial buildings or required to be elevated or flood-proofed above a base flood elevation established in the Land Development Code in accordance with elevations prescribed by the Federal Emergency Management Agency and depicted on the adopted Federal Flood Insurance Rate Map.

Regional Impacts on the Quality of Surface and Ground Waters

Pollutants have had a dramatic and unacceptable impact on the quality of surface waters surrounding the City. Sanibel is susceptible to overnutrification through runoff from

development. To improve the quality of surface water and groundwater in and around Sanibel, the City has put a significant effort and investment into its SWMP and its Master Plan for Wastewater Treatment.

The City continues to eliminate non-point source pollution. In 2007, City Council adopted a fertilizer ordinance (no. 07-003) to reduce stormwater nutrient loading from residential and commercial landscapes. The ordinance regulates the amount of nitrogen and phosphorus that may be applied to residential and commercial landscapes, and prohibits the application of fertilizers containing nitrogen and phosphorus during the rainy season. This ordinance, however, does not apply to golf courses. In 2008, City Council adopted a list of Nutrient Management Guidelines for the golf courses in the City. The Nutrient Management Guidelines follow the Florida Department of Environmental Protection's Best Management Practices for the Enhancement of Environmental Quality on Florida Golf Courses (2007). The recommendations are voluntary; however, the managers of the golf courses on Sanibel have embraced the recommendations and are making significant efforts to implement these Best Management Practices on their courses.

Unfortunately, efforts and investments to improve water quality have not been as extensive in other areas within the watershed of the Caloosahatchee River. Continued surface water runoff within the watershed of the Caloosahatchee River containing nonpoint source pollution contributes to the further degradation of the quality of the waters surrounding the City. This degradation of waters surrounding the City is exacerbated by the water releases from Lake Okeechobee.

There is a critical need to improve policies controlling water releases from Lake Okeechobee in order to maintain the water quality of coastal waters and the estuaries of Southwest Florida.

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It is vitally important that the United States Environmental Protection Agency and the State of Florida implement the Total Maximum Daily Loads (TMDLs) for pollutants provision of the Federal Clean Water Act. Cooperation from the U. S. Army Corps of Engineers, the Florida Department of Environmental Protection, and the South Florida Water Management District is essential to adequately address this regional challenge.

Provisions of the Plan for Storm Drainage

In the preparation of plans for surface water management, in conjunction with development, the following principles should be observed:

1. A storm drainage system should provide for the gradual and dispersed drainage of excess surface runoff so that runoff from within the boundaries of the proposed development will approximate natural rates, volumes, quality and direction of flow from that parcel.
 - A storm drainage system should not reduce the volume or quality or increase the rate of water flow from any parcel draining to the interior wetland or Freshwater Management Area
 - A storm drainage system should not result in any surface runoff across or onto the beach
2. Inventory existing drainage problems on an area-by-area basis and identify needed water management improvements.
3. Develop area-wide stormwater management plans on a priority basis and integrate these into the adopted SWMP. Require future development to be consistent with these plans. Bring existing development into conformance with these plans as opportunities arise, e.g., by attaching conditions to development permits.
4. Require acceptable long-term operation and maintenance programs for stormwater drainage systems.
5. Include drainage improvements on a priority basis in the City's Five-Year Capital Improvements Program and budget.
6. Minimize the placement of fill below elevation 1.8 feet NAVD (3.0 feet NGVD) in the Freshwater Management Area.
7. Encourage property owners to periodically remove debris, sand, topsoil and other material from the bottom of swales on their property to maintain proper depth and increase storage capacity.
8. At least annually, inspect and maintain the publicly owned portions of the surface water management system, which includes the Sanibel River, weirs, culverts, catch basins, road side swales and detention and retention ponds.
9. The Tarpon Bay and Beach Road weirs shall be maintained at an elevation that is consistent with the Weir Policy of the SWMP.
10. Manage the surface water management system in accordance with the City Council-approved weir control policy to maximize the water management

objectives of improved flood control and environmental enhancement.

- 11. Consider establishing, in the Land Development Code, a minimum elevation for the floors of building entryways, garages and storage areas located below the base flood elevation.

In general, after heavy rainfall events there may be periods of several days' duration with standing water in some locations. This standing water will result in inconveniences to residents and visitors, but is necessary to sustain native wildlife and its habitat, to recharge the groundwater aquifer, to impede salt-water intrusion and to nourish the native vegetation.

Goals, Objectives and Policies

Goal Statement

Provide adequate stormwater drainage facilities and systems for the residents and land uses in the City of Sanibel in a manner that provides protection from flooding while preserving natural drainage features, the recharge of the groundwater aquifer, native vegetation and wildlife habitat.

Objective 1

Require stormwater drainage facilities and systems to be designed to the established level of service standard in order to provide protection from flooding for life and property within the City of Sanibel.

Policy 1.1. Preserve, maintain and upgrade existing stormwater drainage facilities and systems by

scheduling the needed work as a part of the City annual work program.

Policy 1.2. Provide stormwater drainage systems that retain the rates, volumes and direction of flow of stormwater runoff consistent with predevelopment conditions. At a minimum, stormwater drainage facilities and systems will be provided in accordance with the following level of service standards:

Standard for Stormwater Drainage Systems

For developments that are not exempt from permitting requirements of the South Florida Water Management District, provide stormwater drainage systems in accordance with the requirements of the District, typically designed for:

the 25-year storm event of three-day duration

For infill developments that are exempt from permitting requirements of the South Florida Water Management District, provide stormwater drainage systems designed for:

the five-year storm event of one-hour duration.

The water quality of stormwater discharge from stormwater management systems shall meet or exceed water quality standards established by Federal and State law.

Policy 1.3. Improvements for replacement, expansion or increase in capacity of stormwater drainage facilities

and systems will be consistent with maintaining the level of service standard for stormwater drainage systems.

Policy 1.4. Stormwater management facilities will be coordinated with adjoining facilities when such coordination will help or enhance maintenance of the Island's natural drainage system.

Policy 1.5. The City will continue to monitor local water quality and take appropriate actions to meet State and Federal standards.

Objective 2

Require stormwater management facilities and systems to be designed to preserve the valuable ecological functions of the natural drainage system in order to protect natural drainage features and the natural recharge of the groundwater aquifer.

Policy 2.1. The regulations in the Land Development Code will be retained to ensure that:

- The Plan for Storm Drainage and these objectives and policies are incorporated in the requirements of the Land Development Code
- Developments that are not exempt from permitting requirements of the South Florida Water Management District are required to provide stormwater drainage systems in compliance with the requirements of the District
- Stormwater drainage systems for infill development that are exempt from South Florida

Water Management District permitting requirements, are required to provide stormwater drainage for the five-year storm event of one-hour duration

- New developments are required to manage runoff from the storm event so that post development runoff rates, volumes and pollutant loads do not exceed predevelopment conditions
- Contaminants contained in construction site runoff are targeted through Best Management Practices (BMP) to curtail sedimentation and erosion and to minimize the delivery of nutrients, metals and organic compounds to downstream waterways
- Through proper enforcement, developments employ stormwater BMP
- Prohibited illicit discharges into the stormwater system are identified and monitored through a system of proactive inspections and enforcement activities against those who discharge illicitly
- Periodic inspection and maintenance of on-site stormwater drainage systems and facilities is provided
- Compliance with upcoming changes to Total Maximum Daily Loads (TMDL) and Numeric Nutrient Criteria is achieved

Policy 2.2. When a development order (permit) is issued, require, at a minimum, retention of a five-year, one-hour duration storm to provide for the recharge of the groundwater aquifer.

Policy 2.3. Require surface water retention areas to be planted with types of native species that can survive in the wet/dry conditions of these areas.

Policy 2.4. The Public Works Department will ensure that the public stormwater management system is inspected and maintained on at least an annual basis.

Policy 2.5. When the South Florida Water Management District identifies prime groundwater recharge areas on Sanibel, the City will establish regulations for the protection of these resources.

Objective 3

Implement the *Surface Water Management Plan* for the Freshwater Management Area of the Sanibel River.

Policy 3.1. Implement the surface water management program and wetlands enhancement features recommended in this Plan.

Policy 3.2. The Tarpon Bay and Beach Roads weirs will be maintained so that the elevation of the weir crest of the Beach Road weir and the Tarpon Bay weir is consistent with the *SWMP*.

Policy 3.3. Stormwater drainage facility and system improvements warranted by the *SWMP* are to be included in the City's Capital Improvements Program.