
STORMWATER MANAGEMENT STATEMENT

For

Sunrise Mixed Use PD

9850 Midway Road

Fort Pierce, FL 32968

St. Lucie County

June 2, 2023

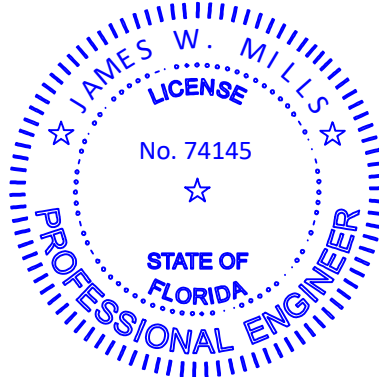
Mills, Short & Associates

700 22nd Place, Suite 2C & 2D

Vero Beach, FL 32960

772.226.7282

Certificate of Authorization No.: 30698



J. Wesley Mills, P.E. FL # 74145

Objective:

This report aims to provide a drainage summary for the Sunrise Mixed Use PD project to the City of Fort Pierce. The objective is to provide an overall summary of the intended design and conditions of the stormwater facility for the referenced project. A more detailed description and stormwater report will be presented at a subsequent submittal milestone for the City's review and approval.

Project Overview:

The project, spreading over an area of 516 acres, envisions the conversion of the existing agricultural/pastureland into a versatile lifestyle center. The stormwater management facilities for this project are designed as interconnected "wet detention" ponds, which will ultimately discharge into the Tenmile Creek through the existing NSLWCD canals (93, 96, and 102).

Watershed Limits and Location:

Situated to the west of Interstate 95 and north of West Midway Road (SR 712) in St. Lucie County, FL, the project is located within specific sections of Townships 35 and 36 South, Range 39 East. It resides within the Upper East Coast Water Supply Planning Unit under the SFWMD boundaries and the drainage area from South Midway Road (SR 712). The topography is predominantly flat, typical of the Florida Atlantic coastal region. No significant drainage issues are expected in the basin, as per current assessments and modeling.

Soil Analysis:

KSM Engineering conducted a geotechnical survey on the site, revealing a predominant hydrologic soil type 'D' in the project area. Based on these findings, the stormwater management facilities are planned as wet detention ponds.

Existing Conditions:

The existing conditions directs stormwater runoff through the North St. Lucie River Water Control District canal system, with varying directional flows for the west and east halves of the project. There are no tidal effects on the positive outfalls in the coastal regions near the Sunrise PD. The east half of the project flows east into the C-102 canal or north to the C-96 canal. All three canals ultimately discharge to Tenmile Creek.



Flood Zone Classification:

The Flood Insurance Rate Map (FIRM) indicates that a small portion of the project falls within Zone X, a 500-year flood plain. The remaining area lies outside the 500-year flood plain.

Regulatory Floodways:

No regulatory floodways exist within the project area.

Proposed Improvements:

The stormwater management facilities will be designed to ensure no adverse impacts on off-site contributing areas. The proposed surface water management system comprises of interconnected wet detention ponds and a 92-acre wetland tract for necessary treatment and attenuation. The linking of the ponds and lakes also presents a potential recreational feature. Plans are underway to abandon a portion of the C-93 canal that runs through the property as the canal only receives flow from the site itself. In the proposed condition, runoff will be directed to the ponds for treatment before discharging into the canal further north.

Operation and Maintenance:

A robust operation and maintenance plan is crucial to the success of this watershed management plan. This involves routine inspections of all storm sewers and storm drainage systems. Maintenance of detention areas will include removal of any accumulated trash or debris and regular mowing of grassed areas within the detention area boundary. A skimmer will be installed at the overflow discharge inlet and bleed down orifice to remove pollutants and debris and prevent clogging. These areas will be inspected post-storm to ensure unhindered flow from the site as designed.

Design Considerations:

The stormwater management facilities proposed for this project will be designed according to the latest regulations which include:

1. South Florida Water Management District (SFWMD)
 - a. Basis of Review for ERP; Regulations of Stormwater Management Systems, Chapters 17-302, F.A.C.
2. North St. Lucie River Water Control District (NSLRWCD):
 - a. Permit Information and Criteria Manual for Use or Connection to Works of the District.

Water Quantity (Detention Volume Criteria)

1. Storage of the post development runoff volume equivalent to the 25 year, 72 hour storm event (9 inches) is required.
2. The post development flowrate offsite shall not exceed the pre-development flowrate.
3. The allowable release rate for wet detention will be the first two inches of runoff from the area served from any 24-hour period for the 10 year, 72 hour rainfall, according to the North St. Lucie River Water Control District Criteria.

Water Quality Volume Criteria

Water quality volume will be provided for the project pursuant to Chapter 17-302, F.A.C.

Type of Treatment System	Class II Receiving Water
	On-line Treatment
Wet Detention	1.0 inch of runoff or 2.5 inches times impervious area, whichever is greater. 14-day residence time (with littoral zone). 21-day residence time (without littoral zone).
Outstanding Florida Water (OFW) Standard	Additional 50% above the criteria for wet detention.

Water Quantity Modeling (Model Used):

The ICPR model, a sophisticated two-dimensional unsteady-state dynamic stormwater model, was employed for both the existing and proposed stormwater systems. It features comprehensive hydrology and hydraulics elements, considering flow reversals, tailwater effects, and dynamic storage allocation within its solution algorithms. The model adopts a link-node approach, representing physical components of the drainage system as nodes where mass conservation is maintained, and links that facilitate water conveyance.

Hydrological Modeling:

Modeling of both pre- and post-development runoff hydrographs was achieved through ICPR. ICPR applies the Soil Conservation Service (SCS) Unit Hydrograph Method to compute runoff hydrographs for small watersheds. The model computes rainfall excess using the SCS curve number and infiltration formulae, then applies it to a unit hydrograph based on basin properties and shape factor to estimate runoff throughout the storm duration. A sub-basin - an individual drainage area with similar properties - is used to calculate runoff volume and stormwater discharge hydrograph, the latter being modelled through routing the volume of rainfall through each sub-basin to its discharge point.

Hydrologic Unit Areas:

Sub-basin limits were initially deduced from USGS topographical data. Given that man-made improvements often alter natural drainage patterns, these drainage boundaries were verified in the field to confirm actual flow paths. After establishing these boundaries, they were digitized into Autocad Civil 3D to calculate the area of each basin. Pre-development and post-development basin maps will be included in the subsequent submittals.

Curve Number and Overland Flow Parameters:

Topographical data, SCS hydrologic soil groups, and land use were employed to calculate stormwater infiltration and rainfall excess for each drainage sub-basin as model input. The overland flow parameters were evaluated by determining the hydraulic length and slope. The hydraulic length was ascertained by using USGS quadrangle map to establish the flow direction and lengths to the receiving junction, while the slope was determined by calculating the average topographic change over the defined hydraulic length.

Hydraulic Modelling (ICPR):

Advanced Interconnected Channel and Pond Routing Model (ICPR), also developed by Streamline Technologies, Inc., was used to model pre- and post-development flood routing. ICPR was chosen for its capability to ascertain the impacts of tail water on outflow for various control structures. The program facilitated modelling of the 10, 25, and 100-year 72-hour storm events for flood analysis, weir sizing, and structure base elevation determination. The ability of proposed facilities and structures to handle required flows was assessed by examining peak stages.

Pond sites modeled were sized based on retaining runoff from a 25-year/72-hour storm event with storage depths considering a wet-bottom pond. A 20-foot wide maintenance berm with 4:1 (H:V) side slopes and 5-foot outside slopes was the basis for the required pond area. Additional pond details will be provided in a subsequent submittal.

Stage-Storage Relationships:

Water storage data for each drainage basin within the project watershed were developed using USGS topographic information. This data informed stage-storage relationships for each junction in the ICPR model, describing available floodwater storage within the sub-basin.

Tailwater Conditions:

The stormwater runoff from the proposed development is planned to be directed to an already existing canal system. This system is strategically positioned along the northern and western boundaries of the property, ultimately leading its discharge to Tenmile Creek.

The design of these outfall systems adheres to the North St. Lucie River Water Control District's permissible discharge specifications. The tailwater conditions, concerning the 10, 25, and 100-year scenarios, have been examined for both outfalls using rating curves. These rating curves were derived using data from the Flood Insurance Study (FIS) for Tenmile Creek.

The conveyance design of this system may utilize either a piped system with strategically placed inlets or an open ditch system, both aimed at effectively managing the stormwater runoff generated along Midway Road.

Wetlands for Stormwater:

Certain areas within the project boundaries, notably those classified as 'wetlands', will be leveraged for the purpose of stormwater attenuation. The strategy entails directing drainage from the project site towards the designed stormwater management facilities and their associated network of channels. This arrangement is intended to ensure compliance with prescribed water quality standards.

Subsequent to initial treatment in these facilities, some of the stormwater management facilities (SMFs) will be linked with the wetlands using either bubble-up structures or overflow weirs. These mechanisms will allow the pretreated stormwater to rehydrate the wetlands, thereby contributing to the maintenance of their ecological functionality.