A G E N D A
INFRASTRUCTURE COMMITTEE
November 10, 2022 at 10:00 AM

Call to Order

Approval of Minutes

1. Minutes: October 13, 2022

Old Business

2. City Hall Remodel Update

New Business

3. Public Works Project Updates
4. Marine Science Center Restrooms
5. Stormwater Master Plan

City Manager Comments

Comments from the Public

Adjournment

EXECUTIVE SUMMARY ONLY
FOR INFRASTRUCTURE
COMMITTEE AGENDA 10/13/22

COMPREHENSIVE STORMWATER MASTER PLAN

CITY OF TYBEE ISLAND | GEORGIA

JOB# 29160.0000

JULY 2022

THOMAS & HUTTON

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Executive Summary

On behalf of the City of Tybee Island, Thomas & Hutton has prepared a city-wide, comprehensive stormwater master plan. The master plan effort was predominantly funded by a Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation (PDM) Grant (2019). This master plan provides the City of Tybee Island a stormwater system inventory, hydrologic and hydraulic modeling, an assessment of existing stormwater system deficiencies, identification of proposed stormwater improvements and the preparation of conceptual budgetary costs to be used for future planning purposes.

Purpose

In the past, the City of Tybee Island has not assessed its stormwater system comprehensively to identify system improvements that provide cumulative flood reduction throughout the City. Except for 14th Street stormwater improvements, the City has provided reactive maintenance and spot repairs to the stormwater system to minimize localized flooding issues. To provide a wholistic system approach to stormwater management and to ensure repairs and upgrades provide a cumulative flood reduction benefit throughout the City, the City commissioned the preparation of this stormwater master plan. The master plan is completed in accordance with the scope of work submitted to obtain FEMA PDM grant funding and has been prepared to appropriate industry standard of care. This study focuses on grey infrastructure, with specific emphasis on conveying stormwater to the outfall through pipes, channels and pumps. Green infrastructure such as infiltration based best management practices (BMPs)are not considered in this study due to cost limitations. However, green BMPs can be added to study modeling as funding becomes available to evaluate the effectiveness and efficiency of green infrastructure BMPs.

Approach

To perform hydrologic and hydraulic modeling and understand existing stormwater system deficiencies, the components of the existing stormwater system were inventoried to obtain data required to create a meaningful model. Previously performed surveys were used as resources to obtain data for several areas throughout the City. Field reconnaissance and measurements were used to obtain data for the remaining primary stormwater system. Data gathered included elevations and locations of stormwater structures, pipes and channels, pipe sizes, and other required information. This data has been delivered to the City via a database presented through a webservice application that allows City staff easy access to review stormwater system information. The stormwater inventory information can be used for stormwater maintenance and repair purposes. Over 300 structures, 375 pipes, and 50 channels are included in the inventory database.

Hydrologic and hydraulic modeling was prepared using ICPRv4 by Streamline Technologies. ICPR4 is a dynamic model that can simulate the stormwater system performance using rainfall, terrain, tidal boundary conditions and existing stormwater system geometry. Stormwater components are input as 1-dimesional features that connect to 2-dimensaionl surface terrain, cumulatively allowing the model to calculate the magnitude of stormwater runoff, direction of flow, system head losses, resulting water surface elevations, and areas of flooding. Several precipitation events were modeled including the 1-year (4.19 inches), 10-year (7.49 inches), 25-year (9.38 inches), 50-year (11.00 inches) and a 100-year (12.70 inches) rainfall events over a 24-hour duration. The model also uses a dynamic boundary condition simulating tidal conditions of the marshes to which the existing stormwater system discharges. Precipitation events were modeled in conjunction with a mean higher high water (MHHW 3.45 NAVD88) tidal cycle curve, an annual high (5.49 NAVD88) tidal cycle, MHHW plus 1 foot of projected sea level rise, MHHW plus 2 feet of projected sea level rise, and MHHW plus 3' of projected sea level rise. Tidal values were extracted from NOAA Tides and Currents, Station 8670870, Fort Pulaski, GA. Although there are variations within peak tide elevations and timing at varying points throughout the island, tidal amplitude and timing were assumed to be constant and match Fort Pulaski readings. Peak tides coincide with peak of precipitation events to depict the worst-case scenario. Inundation depth maps are included in the study depicting areas where the existing stormwater system is deficient.

Using the completed existing conditions stormwater model, scenarios were simulated to determine the average flood reduction benefit over all structures within the model. The data was then graphed to determine a benefit curve. The analysis indicated that the peak benefit was realized between the 1-year, and 10-year, 24-hour design storm events. For this reason, proposed improvements were designed to a 10-year (7.49 inches), 24-hour design storm event.

Capital Improvement Projects

After analysis of the existing stormwater system to identify existing system deficiencies, proposed improvements to reduce flooding were identified for the 10-year (7.49 inches), 24-hour design storm event. The following conceptual projects were identified.

South End		
CIP Project	**Project Name**	**Opinion of Cost**
1	14th Street Parking Area/15th Street Outfall	$10.4M
2 – Alt 1	Alley 3 and Inlet Avenue Outfall Improvements	$6.5M
2 – Alt 2	Alley 3 and Fisherman's Walk Avenue Outfall Improvements	$7.3M
3	13th Street Outfall Improvements	$5.6M
4	Miller Avenue Outfall Improvements	$4.6M
5	Tybrisa Street Drainage Improvements	$4.0M
6	Strand Avenue Drainage Improvements	$7.1M
7	11th Street Drainage Improvements	$3.0M
8	10th Street Drainage Improvements	$3.7M
9	12th Street Drainage Improvements	$5.6M
	Total Estimated South End CIP Cost (Alt 1)	**$50.5M**
	Total Estimated South End CIP Cost (Alt 2)	**$51.3M**
Middle Island		
CIP Project	**Project Name**	**Opinion of Cost**
1	5th Street Drainage Improvements	$6.5M
2	2nd Street Drainage Improvements	$3.6M
3	4th Street Drainage Improvements	$1.9M
4	9th Street Drainage Improvements	$4.0M
	Total Estimated Middle Island CIP Cost	**$16.0M**

North End		
CIP Project	**Project Name**	**Opinion of Cost**
1	Van Horne Avenue Outfall Improvements	$5.5M
2	Bay Street Drainage Improvements	$4.3M
3	Bright Street Drainage Improvements	$4.5M
4	Fort Avenue Drainage Improvements	$1.1M
5	Solomon Avenue Drainage Improvements	$1.0M
	Total Estimated North End CIP Cost	**$16.4M**
	Total Estimated CIP Cost (Alt 1)	**$82.9M**
	Total Estimated CIP Cost (Alt 2)	**$83.7M**

Additional scenarios were modeled to determine proposed improvements that are required to accommodate the design storm with sea level rise projections added to MHHW boundary conditions. Due to budgetary limitations, these project costs will be determined later as funding becomes available to evaluate the improvements further. Identified improvements recommended for further evaluation are found below.

MHHW + 1 Foot SLR	
Study Area	**Opinion of Cost**
14th Street Pump Station	TBD
11th Street Pump Station	TBD
10th Street Pump Station	TBD
9th Street Pump Station	TBD
Bright Street Pump Station	TBD
Armor/Raise Venetian Drive to 7.5’	TBD
Armor/Raise 12th Street to 7.5’	TBD
Armor/Raise Miller Avenue to 7.5’	TBD
Armor/Raise Lewis Avenue to 7.5’	TBD
Armor/Raise Bright Street to 7.5’	TBD
MHHW + 2 Feet SLR/Annual High Tide	
Study Area	**Opinion of Cost**
Armor/Raise Jones Avenue to 7.5’	TBD
Armor/Raise 6th Street to 7.5’	TBD
Armor/Raise Miller Avenue to 7.5’	TBD
Bay Street Pump Station	TBD
Armor/Raise Bay Street to 7.5’	TBD
MHHW + 3 Feet SLR	
Study Area	**Opinion of Cost**
Armor/Raise Miller Avenue to 7.5’	TBD
Armor/Raise Chatham Avenue to 7.5’	TBD

<u>Recommendations</u>
As a result of the modeling and evaluation included in this master plan, the City should consider the following recommendations for implementation:

System Inventory

- Continue to gather system inventory data of secondary drainage system components to obtain a complete inventory of the stormwater system.
- Update system inventory by incorporating updated elevations and sizes of stormwater structures, pipes and components when constructed in the future.
- Reclaim City rights-of-way where residents/businesses may have encroached. Full use of City right-of-way will be critical to constructing proposed stormwater improvements.

Hydrologic and Hydraulic (H&H) Modeling

- As rain gauge and water level sensor data become available, the H&H model should be calibrated to a specific event. This allows for model calibration through parameter adjustments within the model to account for variation in precipitation intensity throughout the island.
- Continue to refine the H&H model with data obtained from post-construction surveys, rain gauges, water level sensors and sea level rise projection updates.
- Combine the NFWF Back River model with the stormwater master plan to provide a comprehensive model of all effort currently underway.
- Augment the model with green infrastructure BMPs to evaluate their impact to flood reduction and effectiveness.

Capital Improvement Projects

- Provide backflow prevention devices on all stormwater outfalls discharging to the marsh.
- Adopt the conceptual proposed capital improvement project list as a planning tool and guidance document for implementation of the stormwater improvements.
- Update conceptual costs annually to adjust for economic, labor and material fluctuations.
- Create a capital improvement project plan that evaluates stormwater improvement project funding mechanisms and schedules for completion based on selected mechanism funding.
- Continue to pursue grant opportunities to assist with the design, permit and construction of proposed projects.
- Proceed with the survey, design, permit and construction of the conceptual capital improvement projects resulting from the master plan.
- The City should continue to provide year-round maintenance activities on ditches, culverts, and stormwater pipes to assist with appropriate drainage system function.

Stormwater Program Funding

- Consider and evaluate a dedicated funding mechanism to fund stormwater projects. Consider the creation of stormwater utility rate fee structure to help fund stormwater management maintenance and capital improvement projects.
- Evaluate and assess other forms of funding for stormwater improvements such as grants, loans, etc.

The recommendations above are not listed in any particular order of priority. As funding and opportunities arise, the City of Tybee should strive to enhance and refine this stormwater master plan to include additional information as it becomes available and implement the identified improvement projects.

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