
GREEN INFRASTRUCTURE BEST MANAGEMENT PRACTICE FOR FLOODING AND WATER QUALITY—STORMWATER MASTERPLANNING

**Town of Lake Park Public Works Department and
Water Resources Management Associates**

June 15, 2023

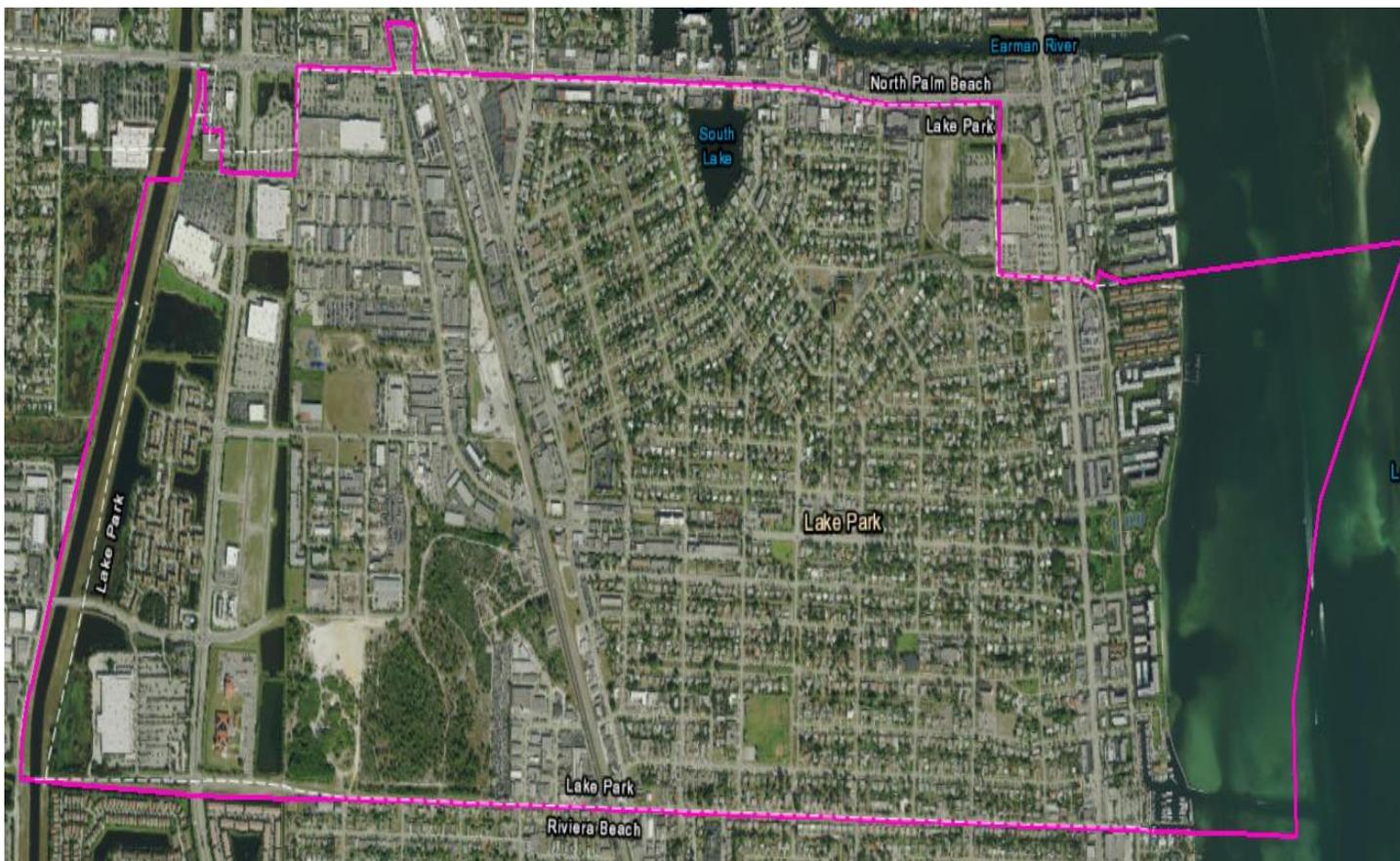


PROJECT TEAM



- **John D'Agostino** – Town Manager
- **Roberto Travieso** – Public Works Director
- **Raul Mercado** – Principal Engineer, WRMA
- **Michael Mercado** – Lead Design Engineer, WRMA
- **Don Hearing** – Principal/Landscape Architect, Cotleur & Hearing
- **John Wille** – Capital Projects Manager
- **John Wylie** – Stormwater Infrastructure Foreman

TOWN OF LAKE PARK, FLORIDA



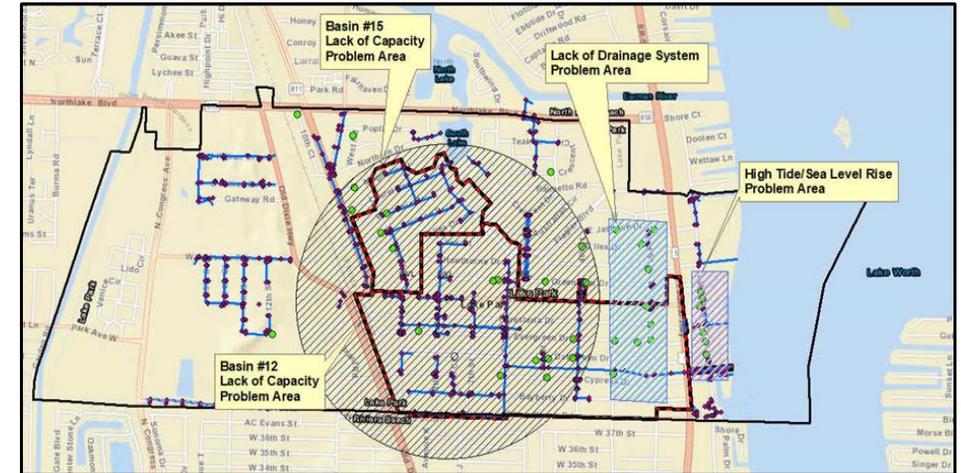
- Located in Palm Beach County, Florida
15 miles north of West Palm Beach
- The first zoned municipality in Florida
(1923)
- 2.1 square miles in size
- Approximately 9,000 residents
- Fully developed by 1980's
- Older residential and commercial
neighborhoods
- 0.8 Miles on Intracoastal Waterway (Lake
Worth Lagoon)

2020 STORMWATER MASTER PLAN NEEDS ASSESSMENT

Water Quantity



- 10.6 miles of older (50+ years) storm sewers in need of rehabilitation.
- Stormsewer system capacity surcharge flooding along Southern Outfall.
- Many areas without stormsewers with frequent flooding.
- “Sunny Day” Sea Level Rise Flooding along Lake Worth Lagoon waterfront.



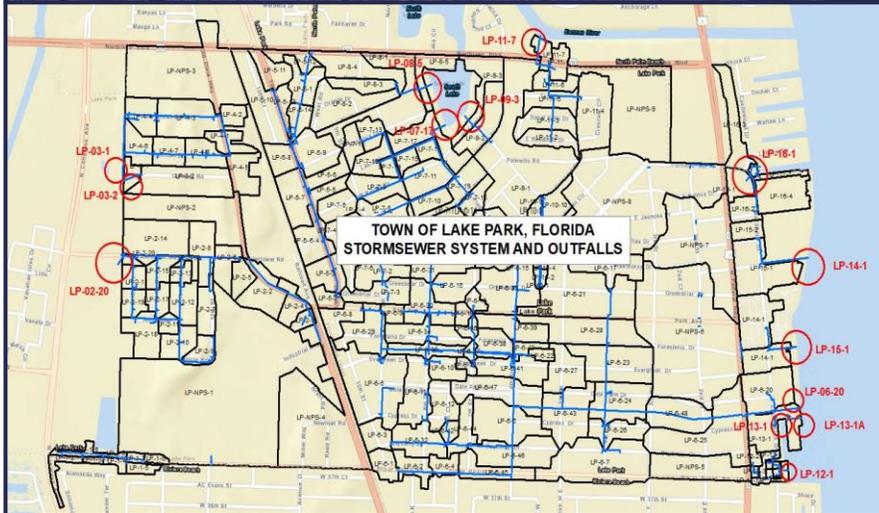
2020 STORMWATER MANAGEMENT NEEDS ASSESSMENT

Water Quality



- ❖ THE TOWN STOMSEWER SYSTEM DISCHARGES UNTREATED RUNOFF TO THE IMPAIRED LAKE WORTH LAGOON NORTH WATERWAY.

- LWLN is impaired by exceedances for Chl-a and Cooper
- Suspended sediments from coastal runoff is main culprit



- ❖ THE TOWN IS A PARTICIPANT IN THE PALM BEACH COUNTY NPDES GROUP PERMIT

- Requires monitoring of runoff discharges from 14 outfalls
- Requires Annual Plan Update of pollutant load reductions

SWMP UPDATE CHALLENGES

Climate Change Impacts

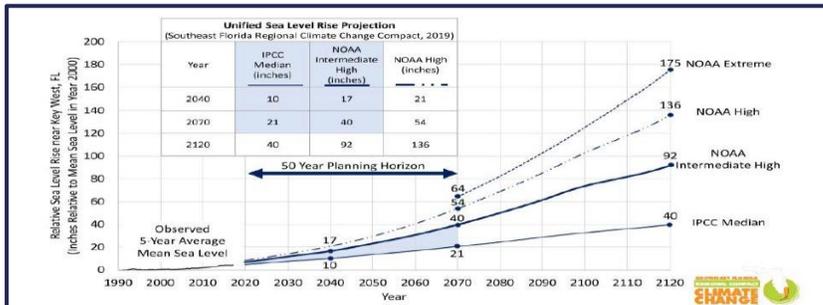


Figure 1 – Unified Sea Level Rise Projection

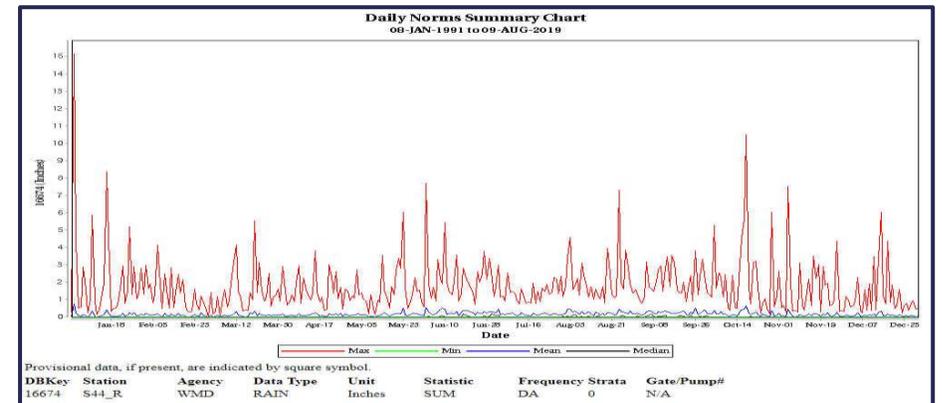
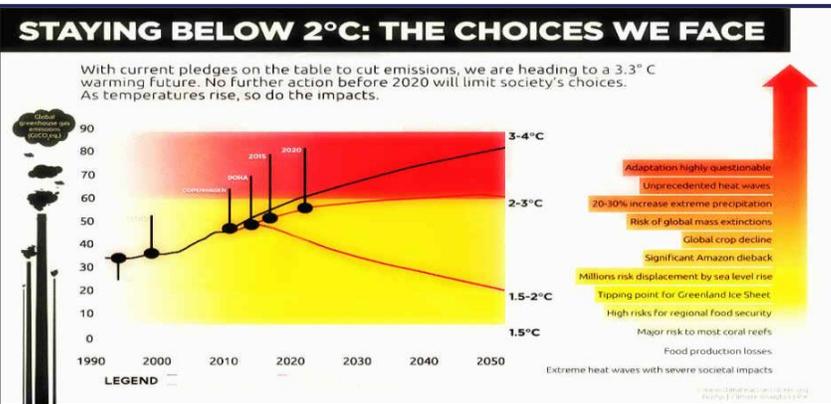
The Unified Sea Level Rise Projection, seen in Figure 1, consists of three planning horizons:

- short term:** by 2040, sea level is projected to rise 10 to 17 inches above 2000 mean sea level.
- medium term:** by 2070, sea level is projected to rise 21 to 54 inches above 2000 mean sea level.
- long term:** by 2120, sea level is projected to rise 40 to 136 inches above 2000 mean sea level.

SEA LEVEL RISE
42" Predicted
By 2070



WARMING
20-30% increase
in precipitation by
2035



SWMP UPDATE CHALLENGES

Funding Issues



- **Small population (~9000) Limits Stormwater Utility Fee Budget Expansion for Stormwater Management**
- **Bonding not an option for Capital Improvement Plan Implementation**
- **General Budget is primarily dedicated for roadway, utilities, police, waste management and administration services**

SWMP UPDATE FRAMEWORK

Green Infrastructure for Climate Change Abatement



- **Performing Vulnerability, Risk and Adaptability assessment for use in stormwater master planning**
- **Implementing Green Infrastructure, Low Impact Development (GI/LID) Best Management Practices (BMPs) for stormwater management Town-wide**
- **Recommending the use of Stormwater Utility fees for mostly O&M (sewer rehabilitation) costs**
- **Recommending the use of state and federal grant funding for major project capital improvements**

SWMP TECHNICAL APPROACH

GI/LID BMP's To Meet Climate Change Sustainability Goals



SMALL SCALE PRACTICES CLOSE TO THE RUNOFF SOURCE

Public ROW's

- Bioretention
- Bioswales
- Pervious Pavement
- Tree Pits



Private property

- RainScapes
- Rain Barrels
- Rain Gardens
- Urban Trees



Buildings

- Vegetated Roof Systems
- Bioplanter



SWMP SUSTAINABILITY APPROACH

5% Roadside Bioswales 20-year Program



Receiving Waterbody	Table 4 Pollutant Loading Reductions (Lbs/year) for 5% Roadside Bioswales BMPs					
	BOD ₅	TSS	TP	CU	ZN	N
LWL (Current BMPs)	22,418	98,253	883	53.7	261.5	10,630
LWL (Proposed Bioswales)	20,081	76,444	796	50.8	238.6	10,366
Reduction %	10.4	22.2	9.8	5.4	8.8	2.5

Suspended Sediments Runoff Discharge Is Reduced By 22% With TLP 5% Roadside Bioswales 20-year Program

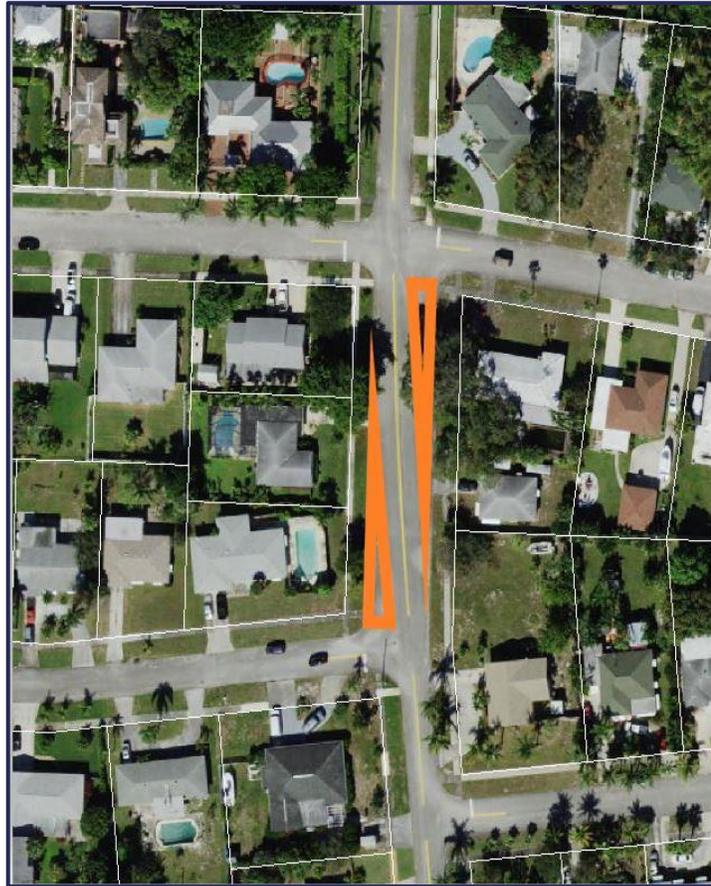
5% ROADSIDE BIOSWALES 20-YEAR PROGRAM

First Project - Bioswales Along 2nd Street Row



WHY 2ND STREET

- Extra pavement was added to the ROW in the past without grading
- Additional impervious area runoff creates ponding and flooding at intersections
- Opportunity for design of Bioswales to address recurring flooding and water quality NPDES requirements



FORESTERIA DRIVE



EVERGREEN DRIVE

SECOND STREET BIOSWALES PROJECT

Project Funding Framework (Planning & Design)



Florida Coastal Management Program, Coastal Partnership Initiative Grant (CPI)

- ❑ Funds available on a competitive basis to Florida's 35 coastal counties
 - ❑ Municipalities are required to include a coastal element in their comprehensive plans
 - ❑ Grant recipients are required to provide 100% (1 to 1) matching funds, which may be cash or in-kind.
 - ❑ CPI grant applications period closes in October
 - ❑ The funding year typically begins July 1 and ends Dec. 31
-
- ✓ Town applied in October 2020 and was awarded a NOAA \$30,000 grant in January 2021
 - ✓ Town matched \$50,000 to carry project to 100% design
 - ✓ 100% Design completed in August 2022

SECOND STREET BIOSWALES PROJECT

Project Funding Framework (Construction)



Resilient Florida – Infrastructure Grants

❑ Grant Type (Construction)

- ❖ Statewide **Flooding and Sea Level Rise** Resilience Plan (includes state and federal funded design, permitting and construction projects)

❑ Project Type (Statewide Flooding and Sea Level Rise Resilience Plan Project Type)

- ❖ Project identified through a local **vulnerability assessment**
- ❖ Project that mitigates the risks of **flooding and sea level rise**

❑ Requirements

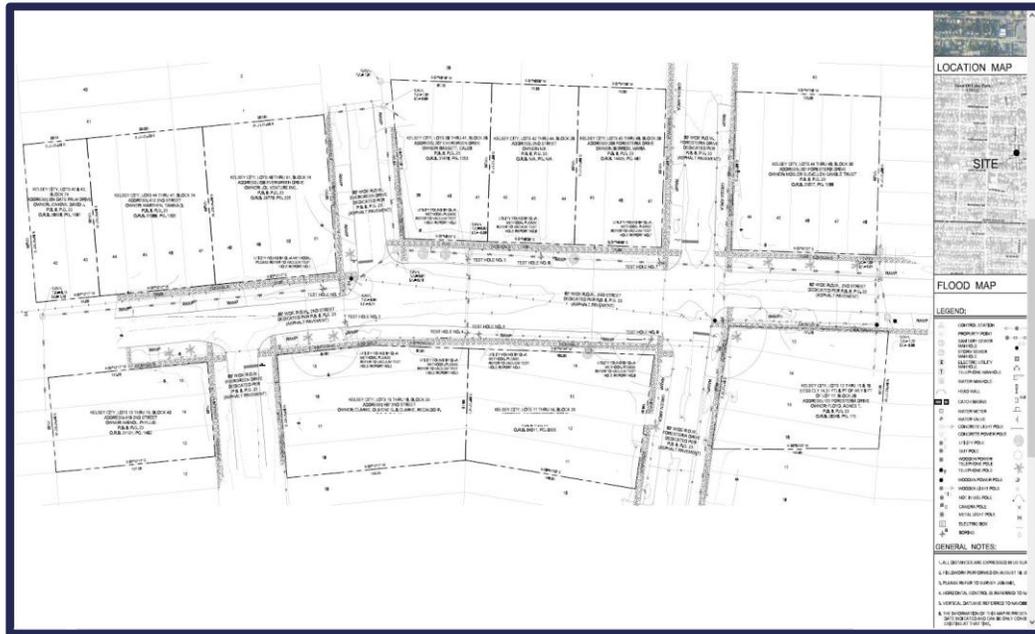
- ❖ No matching funds
- ❖ Project **Design must be near completion or completed by award date**
- ❖ Grant applications period between July and September

✓ **Town applied in August 2021 for \$553,758 (EOPC for Construction)**

✓ **Town was awarded \$553,758 in November 2022**

SECOND STREET BIOSWALES PROJECT

Project Formulation - Data



Surveying

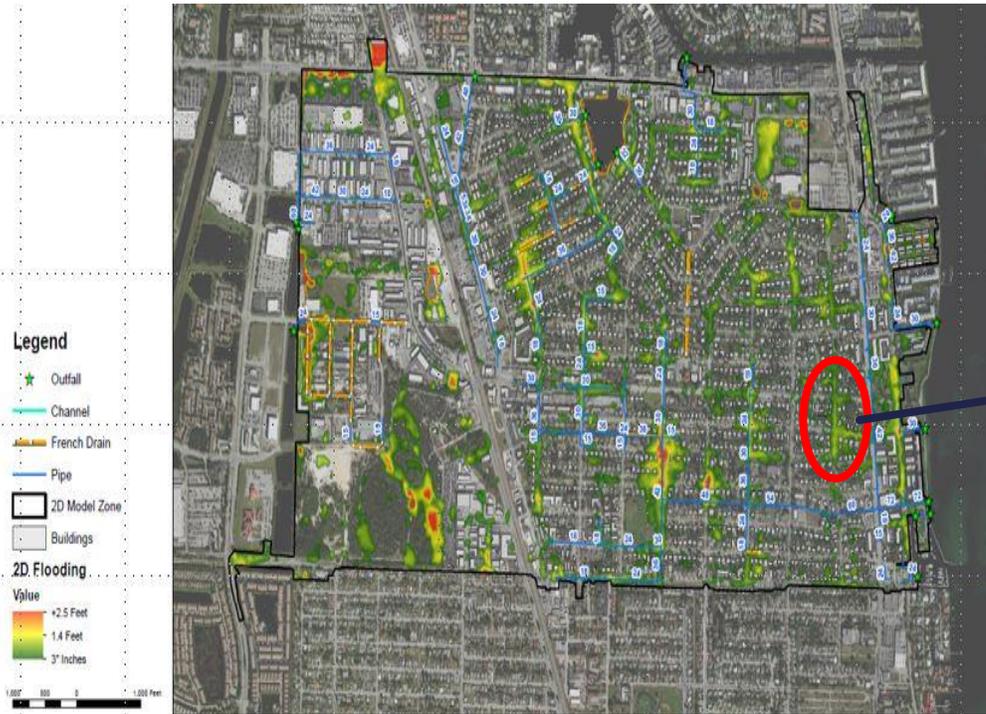
inframap Complete Utility Infrastructure Surveying and Mapping Since 1987
 PN: PF21141 VACUUM TEST HOLE REPORT NO.: 1

PROJECT NAME: 2ND STREET, LAKE PARK - TEST HOLES	CLIENT JOB# N/A	WORK ORDER # N/A
LOCATE REQUESTED BY: JAVIER E. BIDOT ASSOCIATES	PROJECT LOCATION: LAKE PARK - FL	
UTILITY REQUESTED: SANITARY	SHEET #: 1 OF 1	PROPOSED: UTILITY WORK
UTILITY FOUND: SANITARY	FORM BY: DL	ASSISTED BY: MP
MATERIAL AS FOUND: PLASTIC(GREEN)	# OF HOLES: 1	
SIZE AS FOUND: 8"	PAVING CONDITION: N/A	DATE DUG: 10-15-21
	SOIL CONDITIONS: SOFT MOIST SAND	
	UTILITY CONDITION: GOOD	
ELEV SURVEY PIN N/A	INSTALLED: HUB & TACK AT: TOP OF UTILITY MARKING TAPE: GREEN	
COVER (TOP) 5.50	SURVEY PIN LOCATED BY: OTHERS	
COVER (BOTTOM) N/A	SURVEY INFO.: ALL MEASUREMENTS ON THIS FORM ARE IN ENGLISH / METRIC UNITS (FEET / METERS).	
	NO SURVEY REQUIRED.	
	NOTES:	

Subsurface Utility Engineering

SECOND STREET BIOSWALES PROJECT

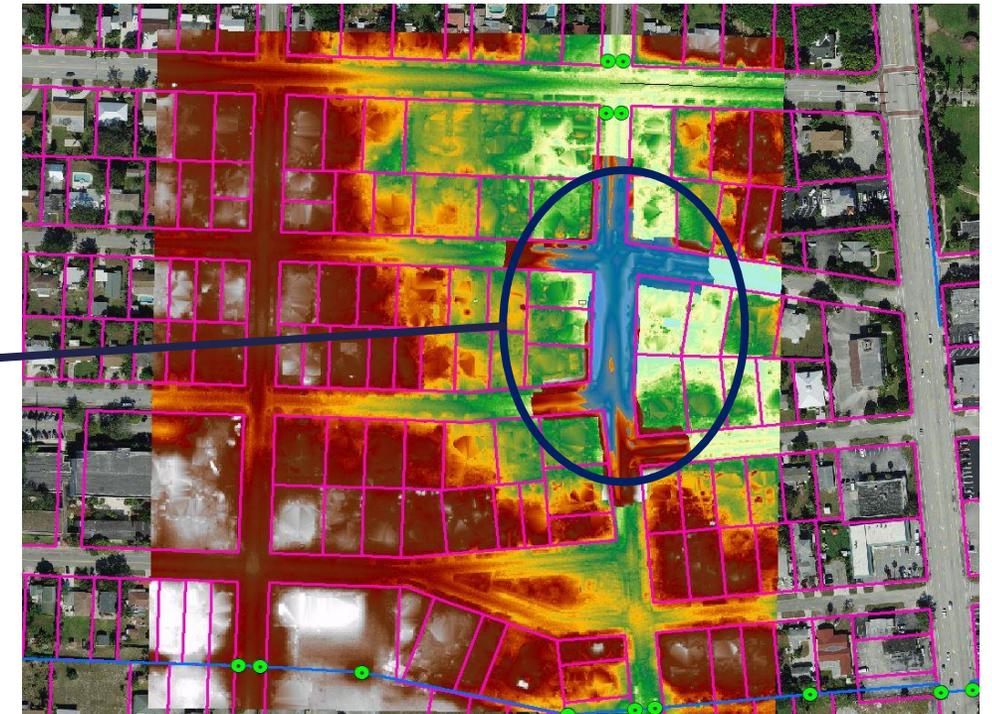
Project Formulation - Modeling



- Legend**
- ★ Outfall
 - Channel
 - French Drain
 - Pipe
 - 2D Model Zone
 - Buildings
 - 2D Flooding**
 - Value
 - +2.5 Feet
 - 1.4 Feet
 - 3" Inches
- 0 500 1000 Feet

ICPR4

**2nd
Street
Corridor**



High Resolution DEM

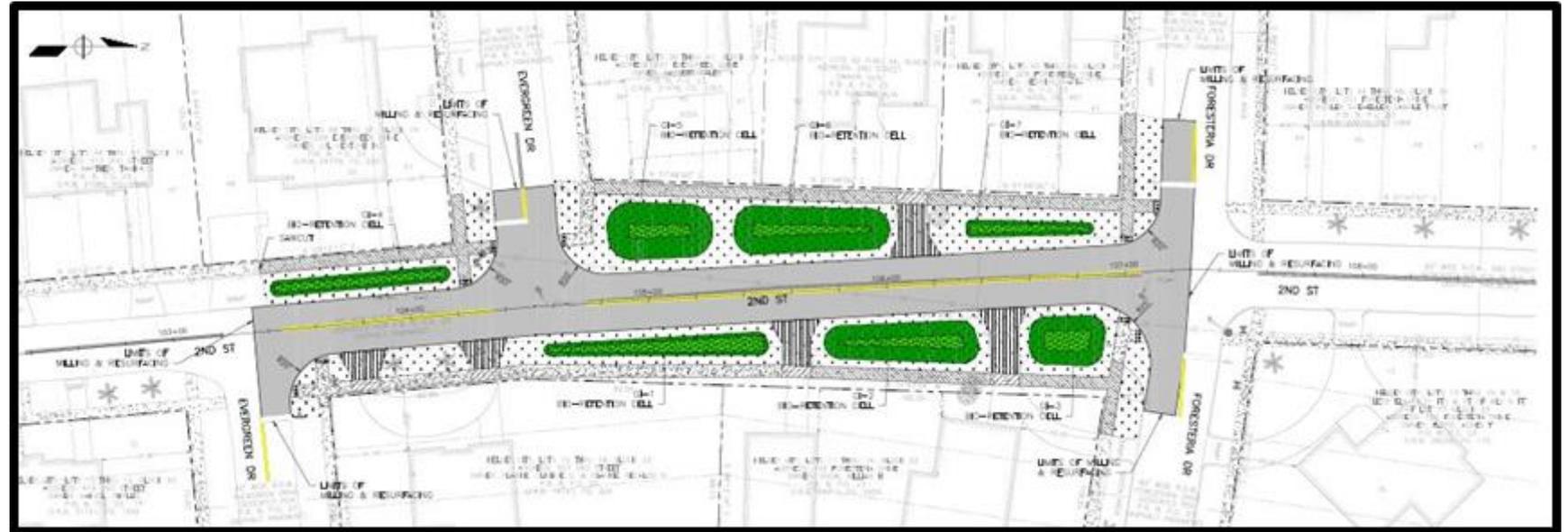
Hydrologic/Hydraulic Modeling Using Latest 2-D Methodology and LiDAR Topographic Data

SECOND STREET BIOSWALES PROJECT

Project Formulation – Concept Design



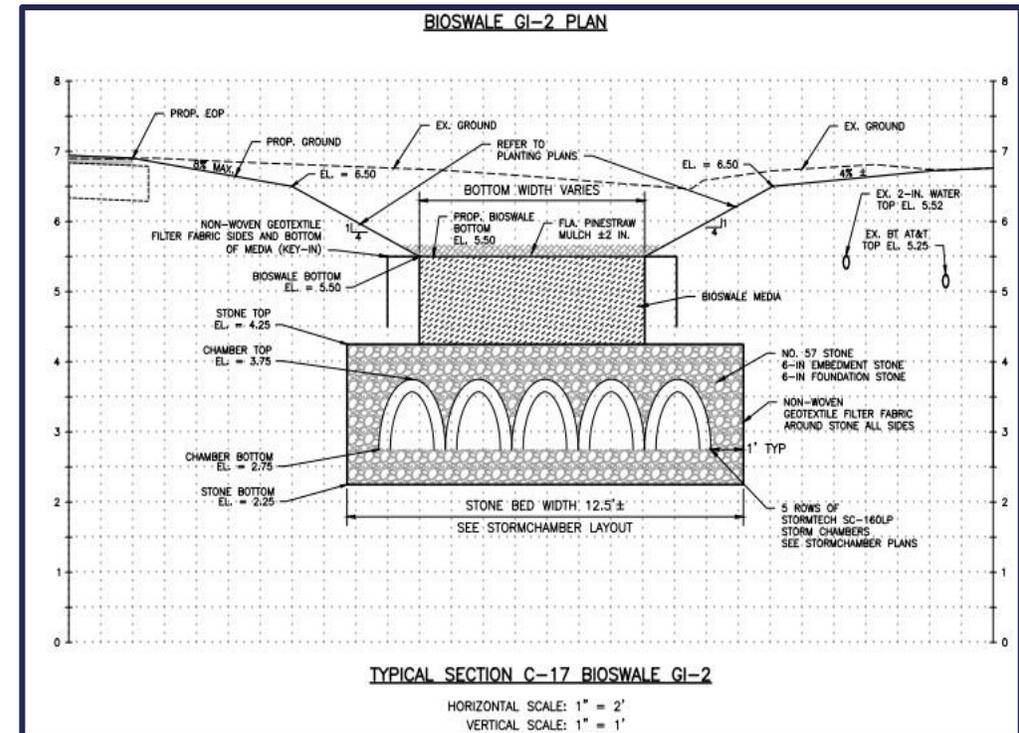
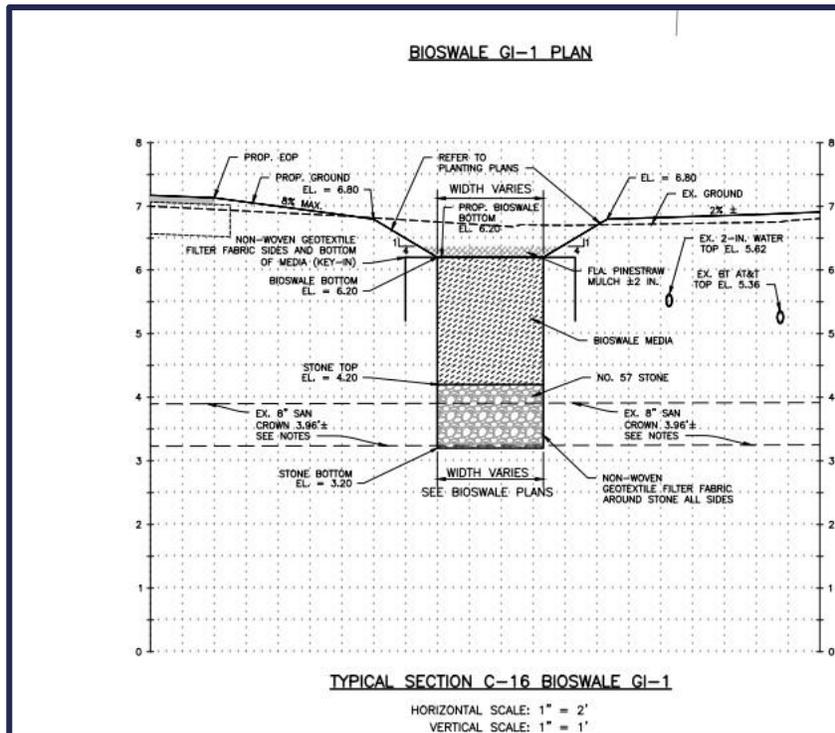
- ❑ **Surface (planted) bioswales captures first flush of runoff for infiltration and evapotranspiration**



- ❑ **Bioswales green-planted areas beautify the right-of-way**
- ❑ **Bioswales soils layers provide mulch & media for additional water quality treatment of runoff**

SECOND STREET BIOSWALES PROJECT

Project Formulation – GI/LID BMP Design



Bioswale with Bioactivated Absorption Media (BAM)

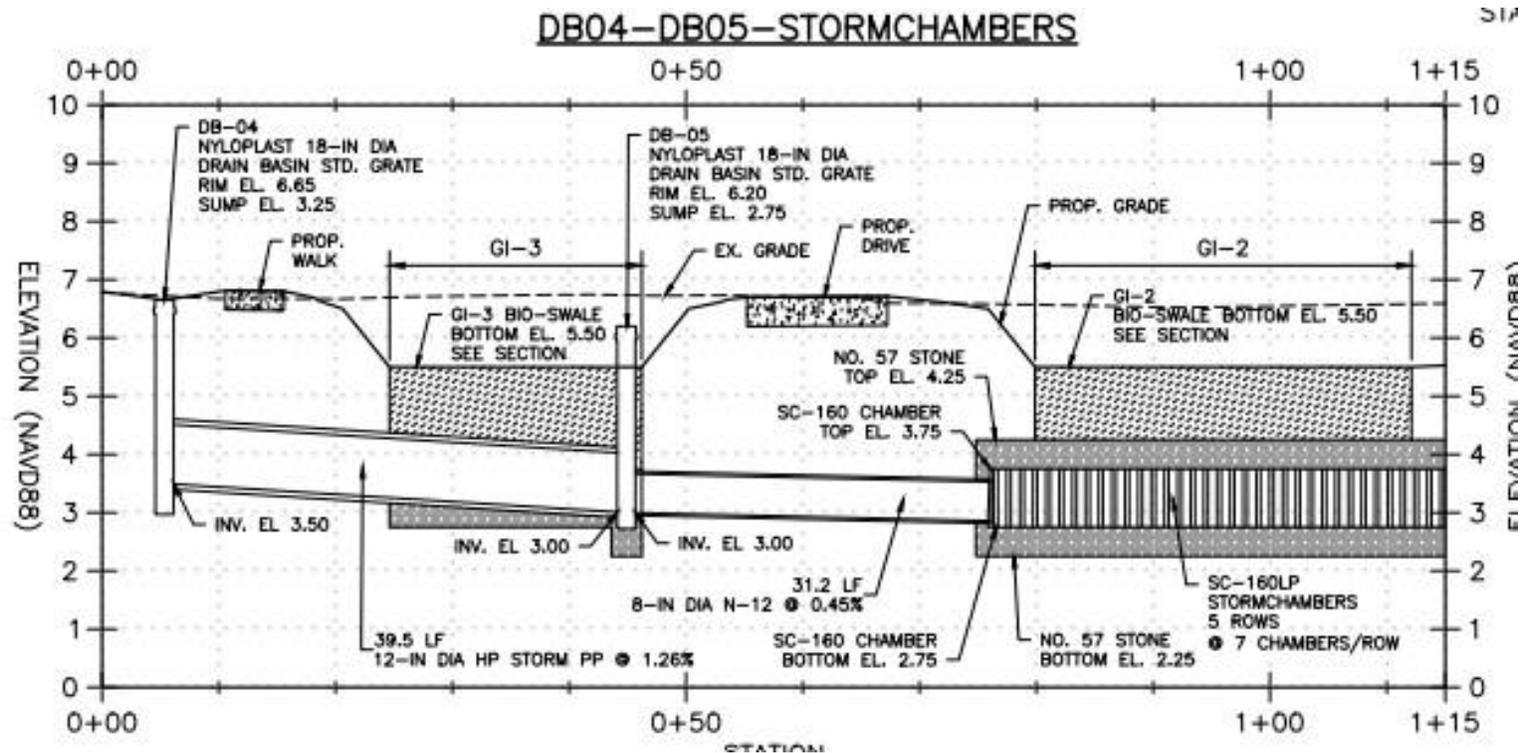
Underground Storage Filtration Chambers

SECOND STREET BIOSWALES PROJECT

Project Formulation – GI/LID BMP Design



- ❑ **Underground Storage Filtration Chambers provide additional runoff volume treatment capacity**



- ❑ **Interconnected chambers for maximum utilization of underground space**
- ❑ **Chambers can be accessed for maintenance to clear debris**

PROJECT DESIGN RENDERINGS



2ND STREET
Lake Park, Florida



DEPARTMENT
OF PUBLIC WORKS



BIOSWALE / RAIN GARDEN

2ND STREET
Lake Park, Florida



DEPARTMENT
OF PUBLIC WORKS



BIOSWALE / RAIN GARDEN

SECOND STREET BIOSWALES

Project Timeframe



- **Design & Bidding (Design partially funded by FDEP Coastal Partnership Initiative Grant)**
 - ❖ 100% Design Plans & Specifications: November 2022
 - ❖ Final Regulatory Permits: December 2022
 - ❖ Bidding Advertisement: May 2023
 - ❖ Contractor Selection: June- August 2023 (Currently underway)
 - ❖ Contract Negotiations: September – October 2023
- **Construction (Funded by \$0.5 Million Resilient Florida Grant)**
 - ❖ Mobilization/Start Up: October 2023
 - ❖ Completion/Close Out: June 2024

CONCLUSIONS

Green Infrastructure BMP's For Stormwater Masterplaning in the Town of Lake Park Has Been A Resounding Success



The Town Has Received Since 2020 Over \$18.2 Million In Funding For Stormwater CIP Project Design And Implementation

- Coastal Partnership Initiative Grant (CPI): \$105,000 (Sea Level Rise Vulnerability Study & Bioswale Design)
- Resilient Florida Grant: \$553,758 (Bioswale Construction)
- Rebuild Florida Mitigation General Infrastructure Program: One Project with 3 phases (\$11.1 million)
 - ❖ Phase 1 - Southern Outfall Priority Rehabilitation SWMP Project 100% plans (\$3.1Million)
 - ❖ Phase 2 - Bostrom Park Underground Storage Chambers – 60, 90, 100% plans (\$2.6 Million)
 - ❖ Phase 3 - 10th Street GI/LID Water Quality Drainage Pilot Project 60, 90, 100% plans (\$5.4 Million)
- FEMA/HMGP: \$6.5 Million (Two Sea level Rise Pumps along Lake Shore Drive)

Allows the Town of Lake Park to Meet Long-term Climate Change Sustainability Goals



Questions