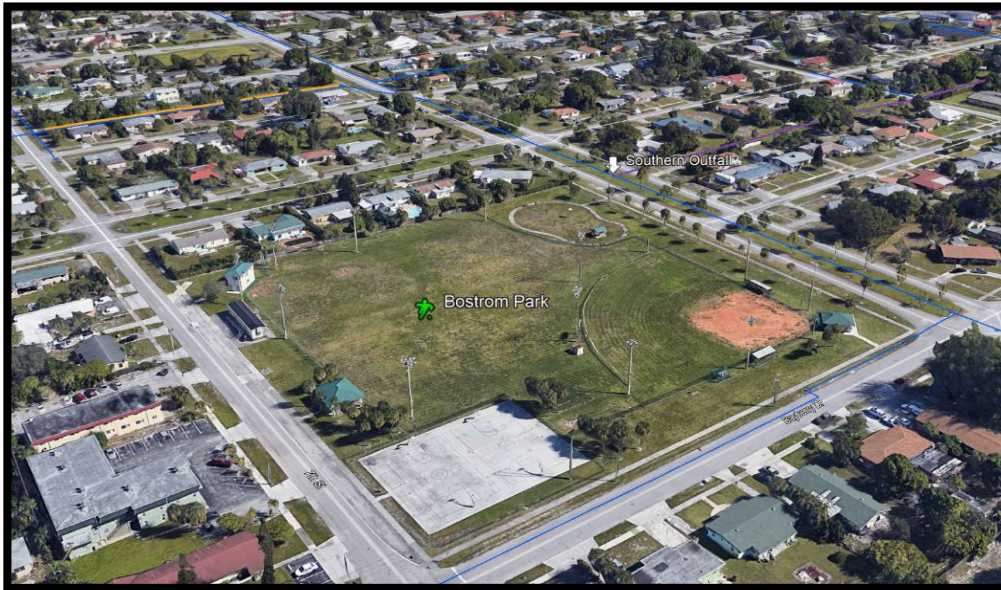


FLORIDA STORMWATER ASSOCIATION 2026 ANNUAL CONFERENCE



**Green Stormwater Infrastructure Underground Storage Filtration Chambers
For Flooding, Water Quality And Climate Change Resilience In Lake Park, Fl.**

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

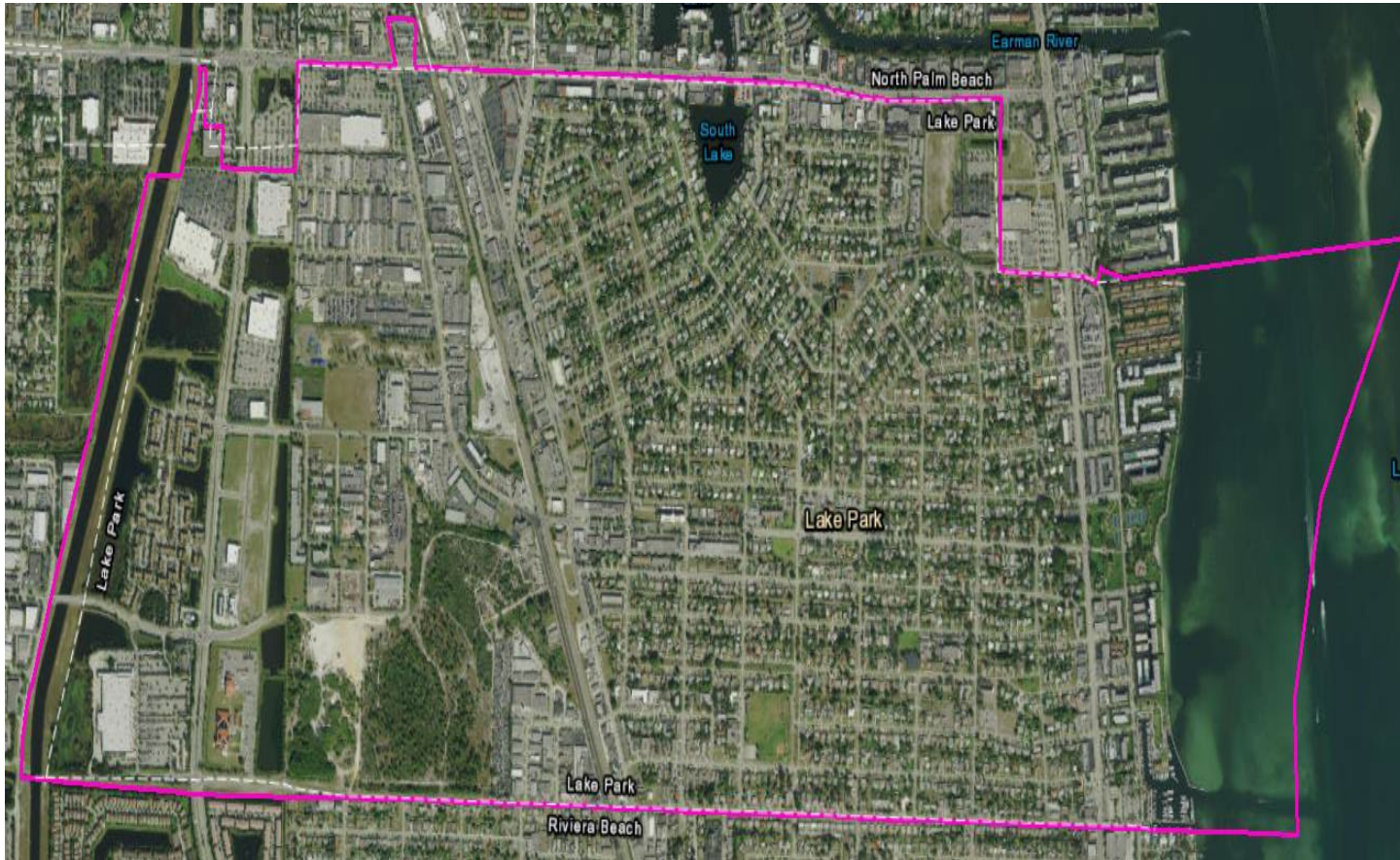
June 18, 2026

Project Team



- **Richard Reade** - Town of Lake Park Manager
- **Jaime Morales** – Town of Lake Park Public Works Director
- **John Wille** - Town of Lake Park Capital Projects Manager
- **John Wylie** – Town of Lake Park Stormwater Infrastructure Foreman
- **Raul Mercado, PE** – WRMA Principal Engineer
- **Michael Mercado, PE** – WRMA Lead Design Engineer

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 (LWL)

2020 Stormwater Masterplan Update

Stormwater Mgt. Needs Assessment - **Water Quantity**



- Showed that of the 10.62 miles of storm sewers 30% needed to be immediately rehabilitated (Repaired/Replaced) and the rest within 20 years.
- Identified key major capacity surcharge flooding problems along Southern Outfall (446 acre watershed)
- Identified many areas without stormsewers with nuisance flooding
- Identified long term climate change (Sea Level Rise) challenges along 0.8 miles of LVWL waterfront

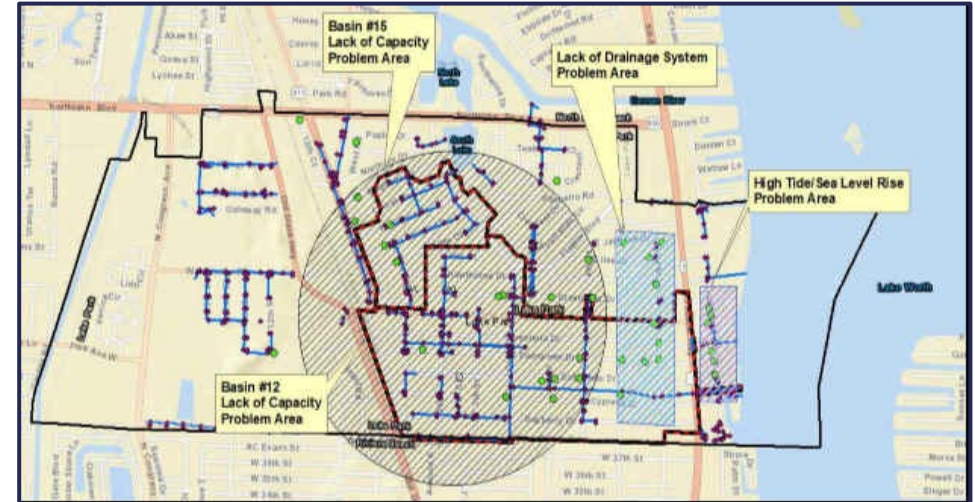


Figure 2-9 Nuisance Flooding Locations by Type



Lack of Drainage
2nd Street Corridor)



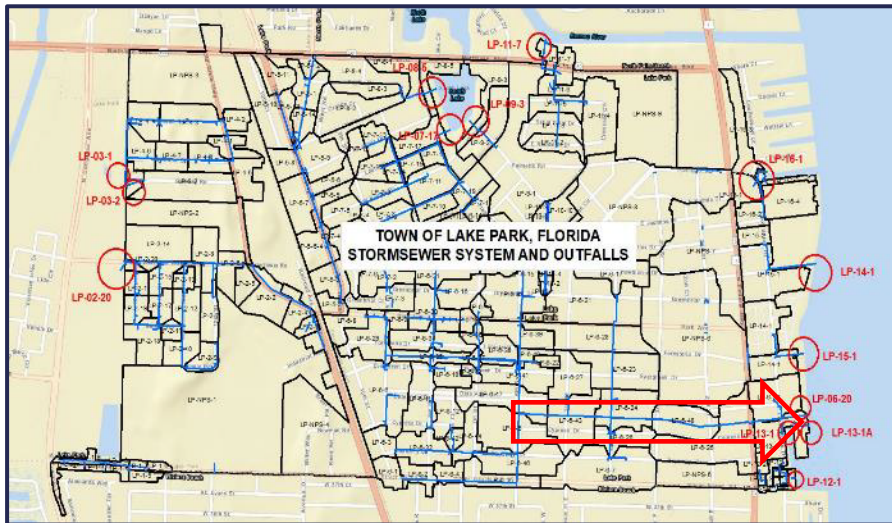
Sea Level Rise Sunny Day Flooding
Lake Shore Drive Corridor)

2020 Stormwater Masterplan Update

Stormwater Mgt. Needs Assessment - Water Quality



2/3 of the TLP area Discharges untreated runoff to the impaired Lake Worth Lagoon (LWL)



FDEP/NPDES/MS4 Permit requires the TLP to monitor runoff discharges from 15 outfalls Including the Southern Outfall



- 83% of the total seagrass acreage is in the northern lagoon, along the Town Of Lake Park waterfront
- Lake Worth lagoon seagrass beds are fast disappearing due to sediments from urban runoff

Southern Outfall is a Major Contributor of Sediments to the LWL

2020 SWMP Update Challenges

Climate Change Impacts

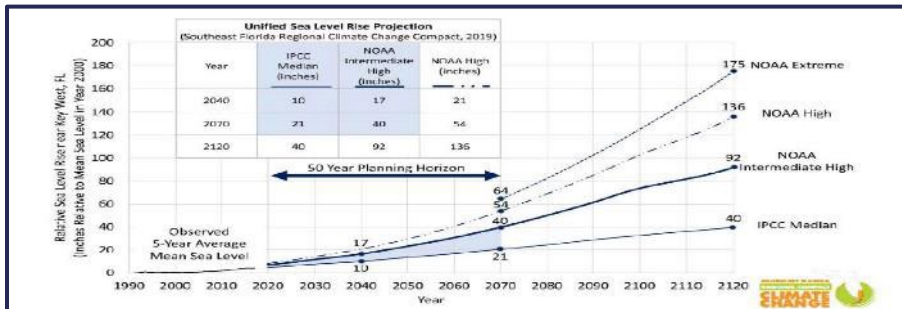


Figure 1 – Unified Sea Level Rise Projection

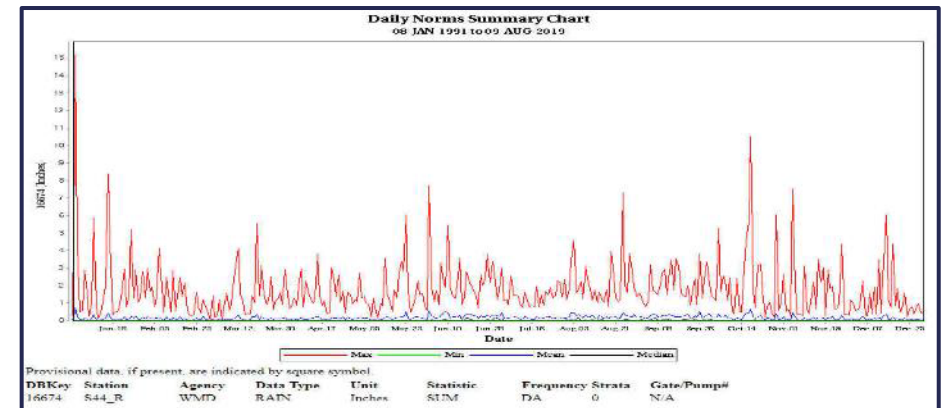
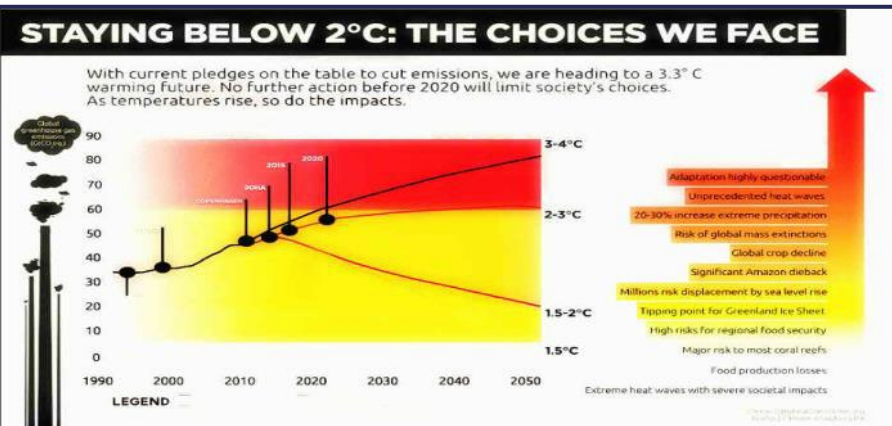
The Unified Sea Level Rise Projection, seen in Figure 1, consists of three planning horizons:

1. **short term:** by 2040, sea level is projected to rise 10 to 17 inches above 2000 mean sea level.
2. **medium term:** by 2070, sea level is projected to rise 21 to 54 inches above 2000 mean sea level.
3. **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



Climate Change Warming Higher More Intense Precipitation



Town of Lake Park MS4 Drainage Level of Service - 3-yr/24 hr storm event

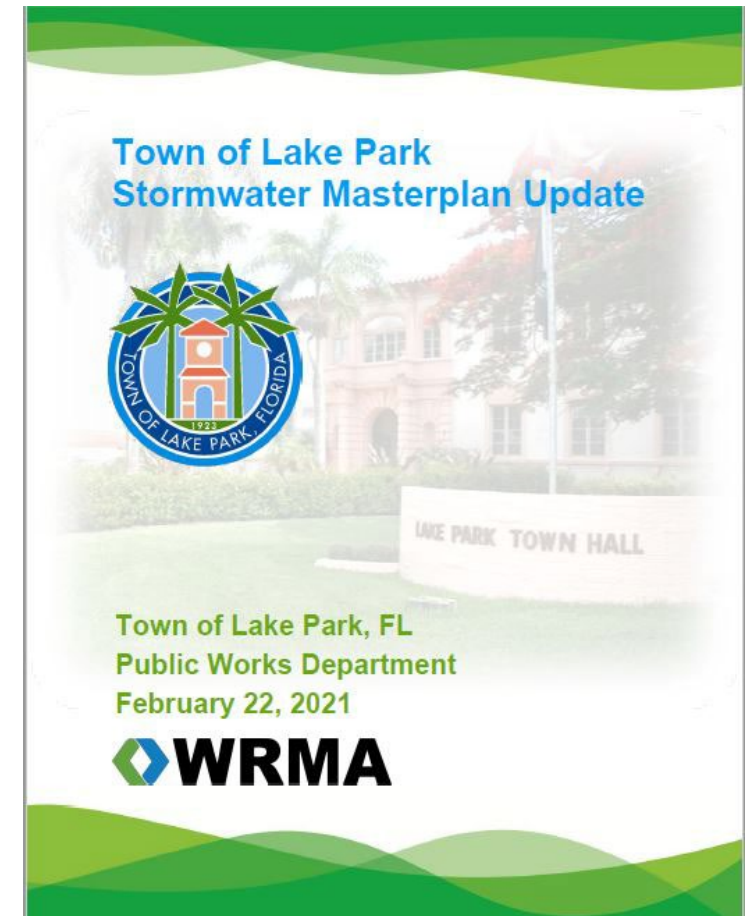
- A 3-year, 24-hour storm event of **6.24 inches** occurs in the Town of Lake Park (NOAA 14 Atlas)
- Assuming that precipitation intensity will increase by 7% per year in 2035 (9 years from now)
6.24 inches becomes $[6.24 + (0.07 \times 9)] = \mathbf{6.87 \text{ inches}}$
or approximately a 5 yr, 24hr storm event
- ❖ **Conduits & stormwater mgt. facilities would have to be upsized frequently**
- ❖ **Storm sewer system design becomes unaffordable & unsustainable**

Stormwater Master Plan (SWMP)

(Updated in 2020, Adopted in 2021)



- Completely based on Green Stormwater Infrastructure (GSI) Concepts (Hybrid bioswales, bioretention, pervious pavement, green roofs, etc.)
- Recommends the use of Stormwater fees exclusively to cover O&M costs (no more unsustainable stormsewer upsizing replacement capital improvements)
- Provided the incremental conversion of 5% roadside swales to hybrid bioswales (Swales and underground chambers) and the placement of Bioretention Facilities
- Recommends the use of state and federal grants for Stormwater Capital Improvement Projects



SWMP TECHNICAL APPROACH

GSI 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



2020 Stormwater Masterplan Update

Flooding Vulnerability & Risk Assessment



Drainage Level of Service (LOS) H&H Modeling Analysis

- Flooding to be assessed at the local level

Nuisance Flooding – 95 Percentile Storm Events

- Flooding to be assessed at the basin level

Regulatory LOS - 10yr/roads, 25yr/new dev., 100yr FFE's

- Flooding to be assessed as a function of climate change/sustainability (State-mandated Vulnerability Analysis)

Coastal /Sea Level Rise, compounded for increasing upstream storm event intensities & duration

2020 Stormwater Masterplan Update

Nuisance Flooding & Exposure

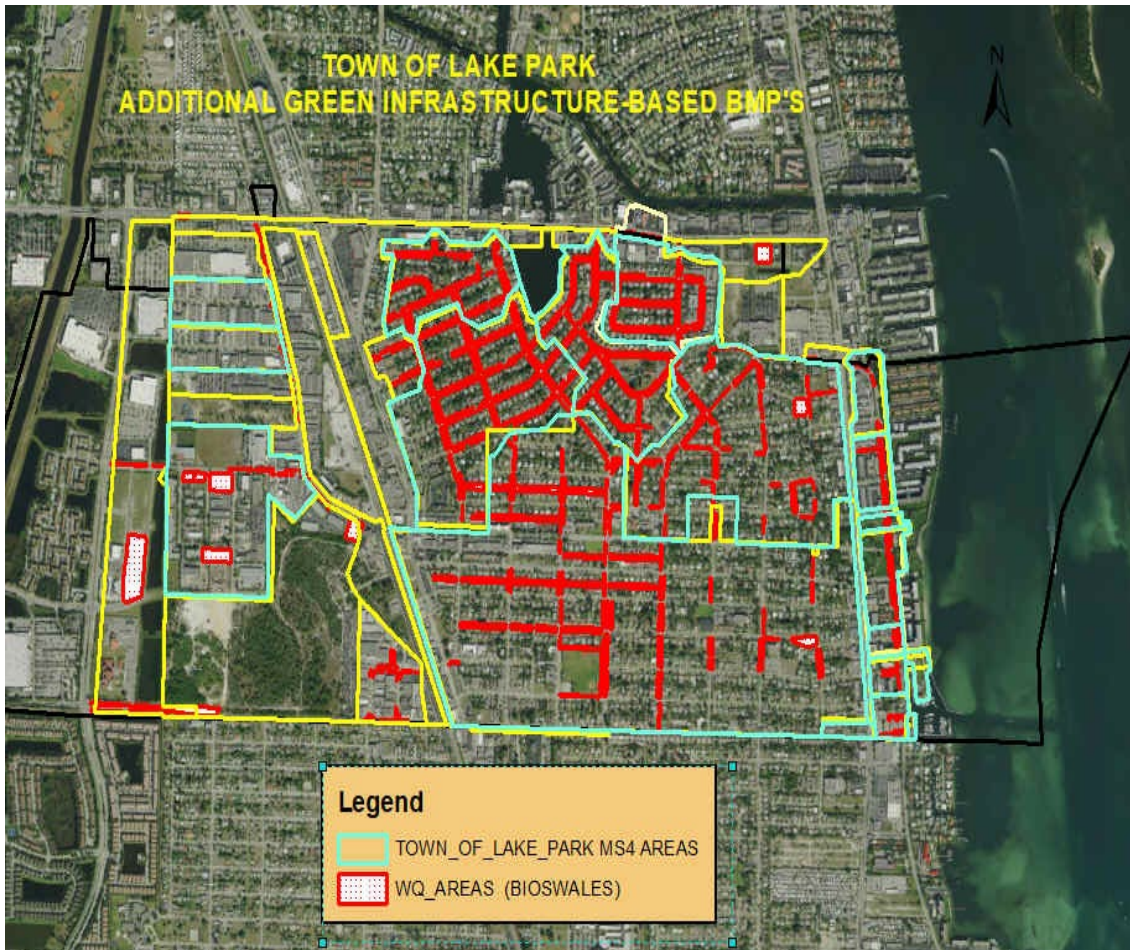


Risk of Nuisance Flooding at the Town of Lake Park - Annual Exceedance Probability (AEP)

- ❖ **Approximately 95% of the time for storm events of less than 1 inches**
- ❖ **Approximately 50% of the time for storm events of less than 2 inches**
- ❖ **Very infrequently for storm events of less than 4 inches.**

SWMP Sustainable Water Quantity/Quality Approach

5% Roadside Bioswales 20-year Program

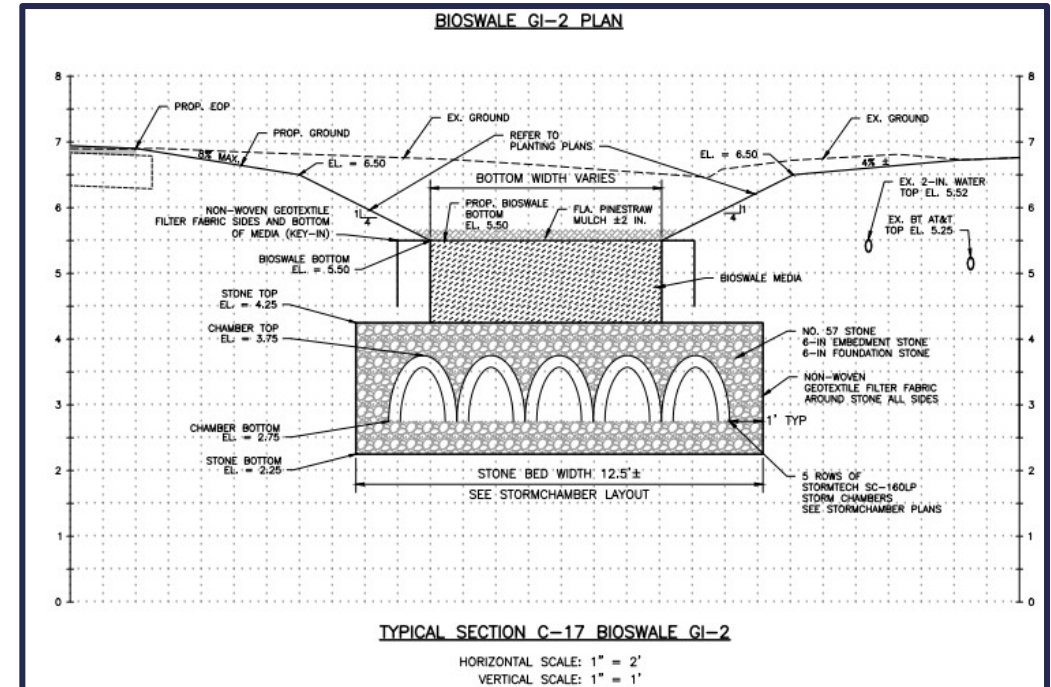
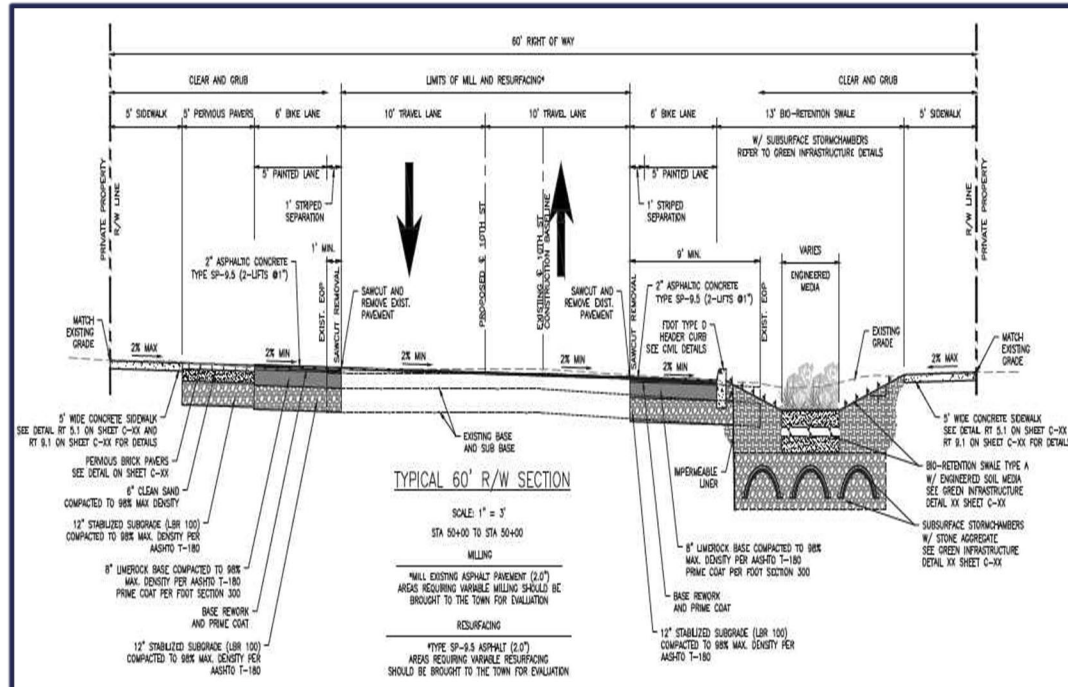


Receiving Waterbody	Table 4 Pollutant Loading Reductions (Lbs/year) for 5% Roadside Bioswales BMPs					
	BOD ₅	TSS	TP	CU	ZN	N
LWL (Current BMPs)	22,418	98,253	883	53.7	261.5	10,630
LWL (Proposed Bioswales)	20,081	76,444	796	50.8	238.6	10,366
Reduction %	10.4	22.2	9.8	5.4	8.8	2.5

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

Enhanced Hybrid Bioswale

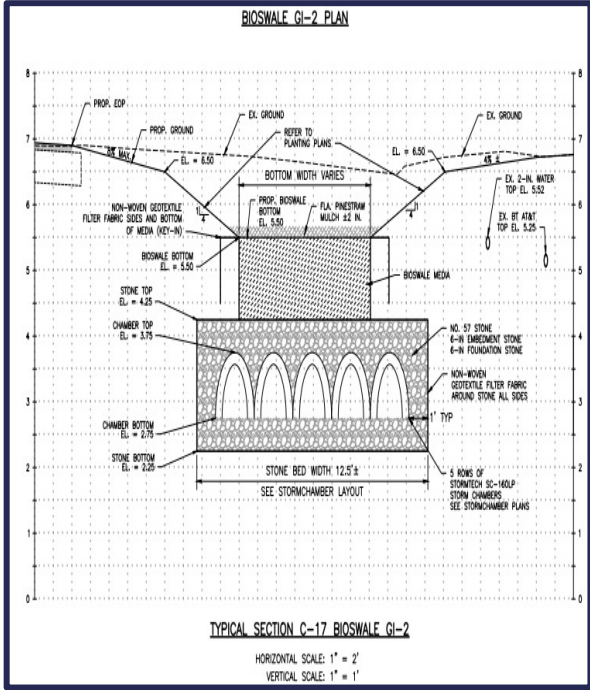
Green Stormwater Infrastructure BMP Design



Bioswale with Underground Storage Filtration Chambers and (Optional) Biosorption Activated Media (BAM)

Second Street Hybrid Bioswale Project

Green Stormwater Infrastructure Design



SWMP Sustainability Approach

Flooding As A Function Of Climate Change/Sea Level Rise



Bioretention & Bioswales



- ✓ Consolidation of outfalls to Lake Worth Lagoon and Valve Placement
- ✓ Installation of Sea Level Rise Pump Stations to offset high tides

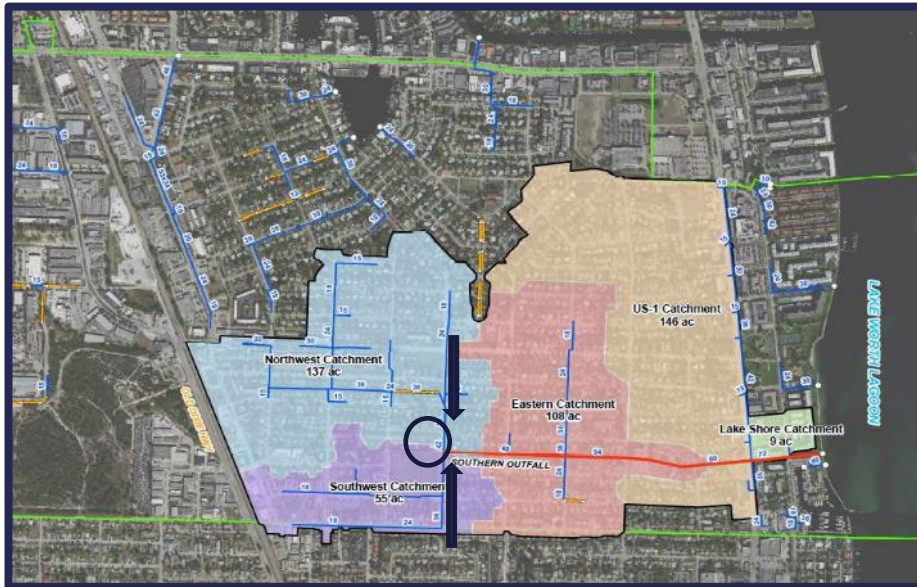


2020 Stormwater Masterplan Update

Flooding At The Watershed/Basin Level



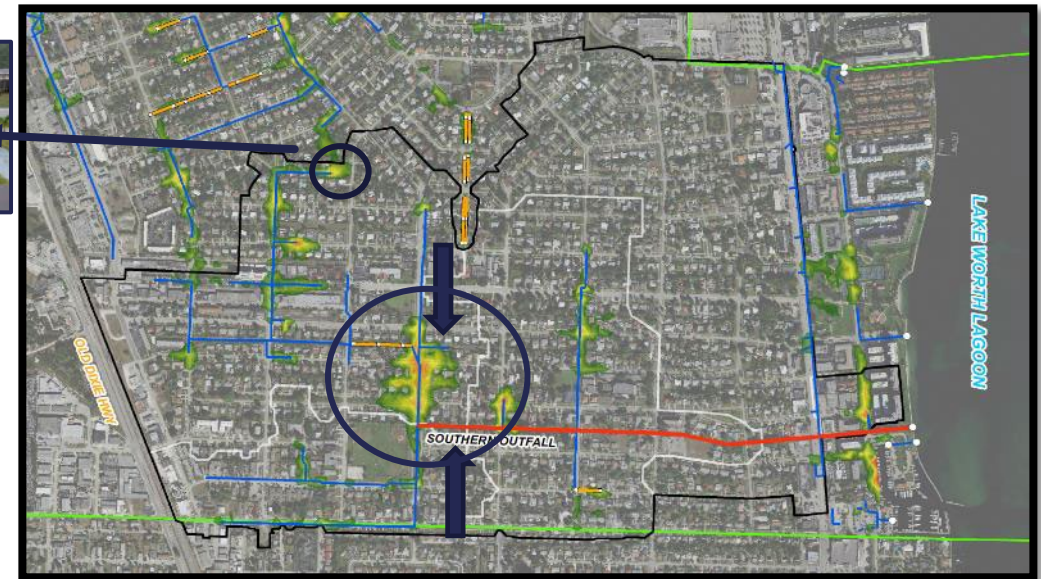
Southern Outfall Watershed Tributaries



Southern Outfall Watershed 3-Year, 1 Day Storm Event Flooding



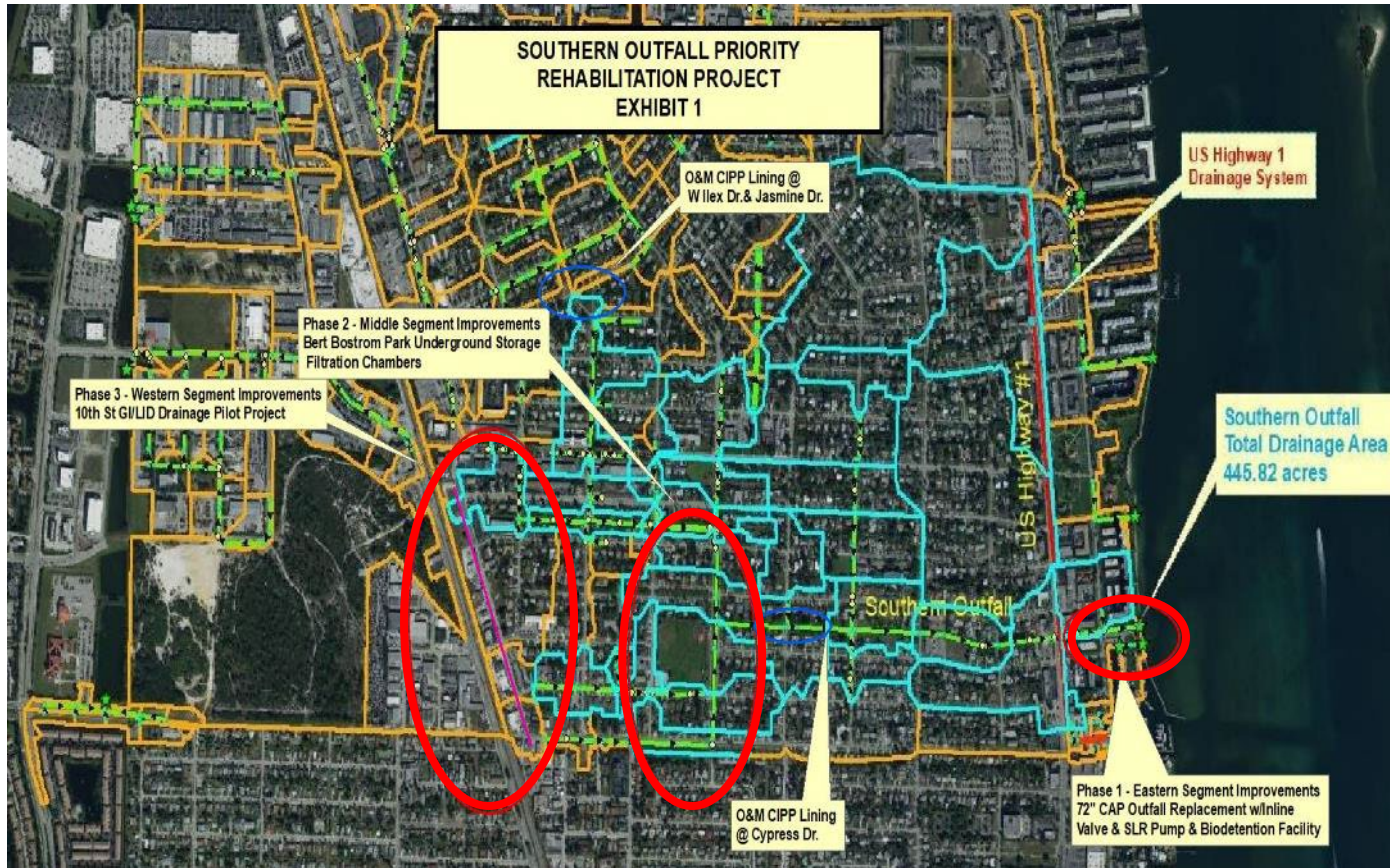
Ilex Court
Inlet Surcharge



- Peak flows from the Northern and Southern Tributaries can not reach the Southern Outfall Main Trunk at the east boundary of Bostrom Park (6th Street Between Date Palm Drive and Cypress Street) due to undersized stormsewers
- Major flooding occurs along 6th Street just north of Bostrom Park
- Backups propagate and induce inlet surcharges further upstream including at Ilex Court

SWMP Sustainable Water Quantity/Quality Approach

The Southern Outfall Priority CIP Project



- **PHASE 1 - 72-Inch CAP Outfall Replacement at the Town's Marina (Completed)**



- **PHASE 2 - Bostrom Park Underground Storage Filtration Chambers Water Quality Project (Completed)**



- **PHASE 3 - 10th Street Right-of-Way GSI Water Quality Pilot Project**
- **(To be completed 2027)**



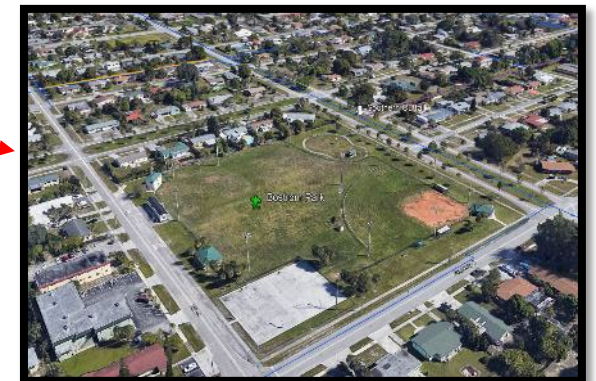
THE TOWN-WIDE PROJECT ADDRESSES CRITICAL STORMSEWER SYSTEM CAPACITY AND WATER QUALITY ISSUES THROUGH SUSTAINABLE GSI BEST MANAGEMENT PRACTICES

SOUTHERN OUTFALL PHASE 2

BERT BOSTROM PARK UNDERGROUND STORAGE FILTRATION CHAMBERS



- **Upstream Peak Discharge Diversion & Attenuation**
- **Water Quality Treatment Using GSI-based Underground Chamber Filtration**
- **Surface Playing Fields Remain Intact**



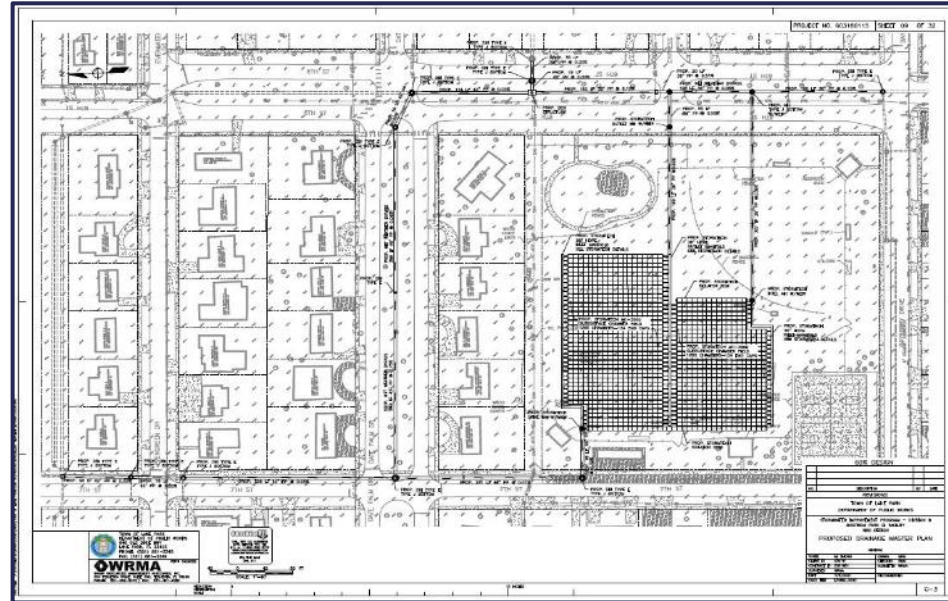
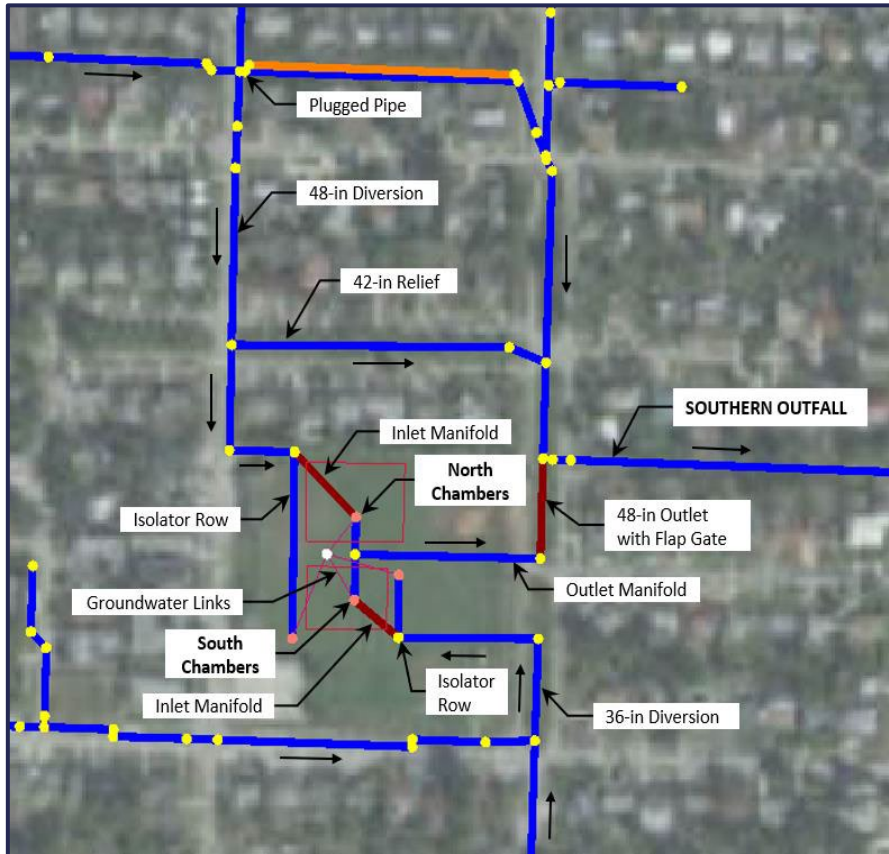
Five acres Park underground location is ideal as there is no land available for large surface detention pond facility in the Southern Outfall watershed

State Of The Art GSI BMP Design

Largest Underground Stormwater Chamber Farm in SE Florida



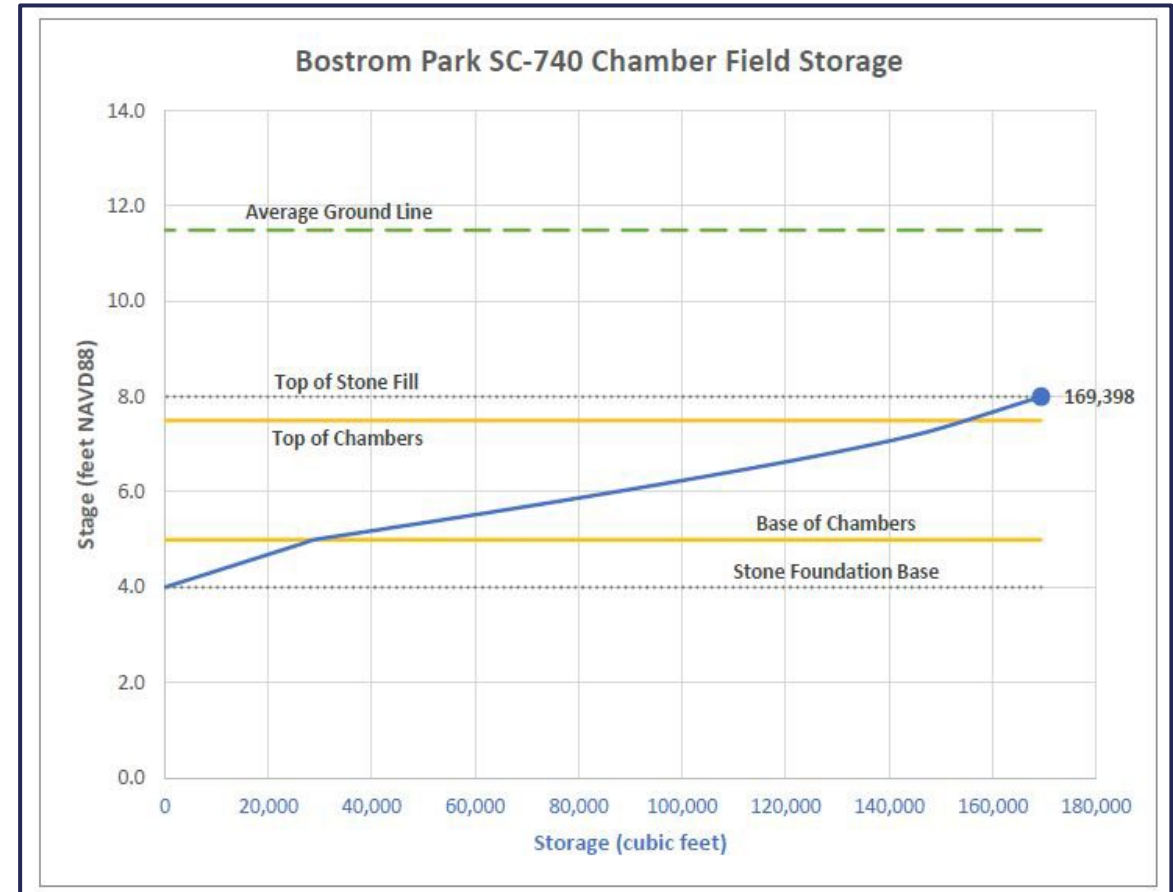
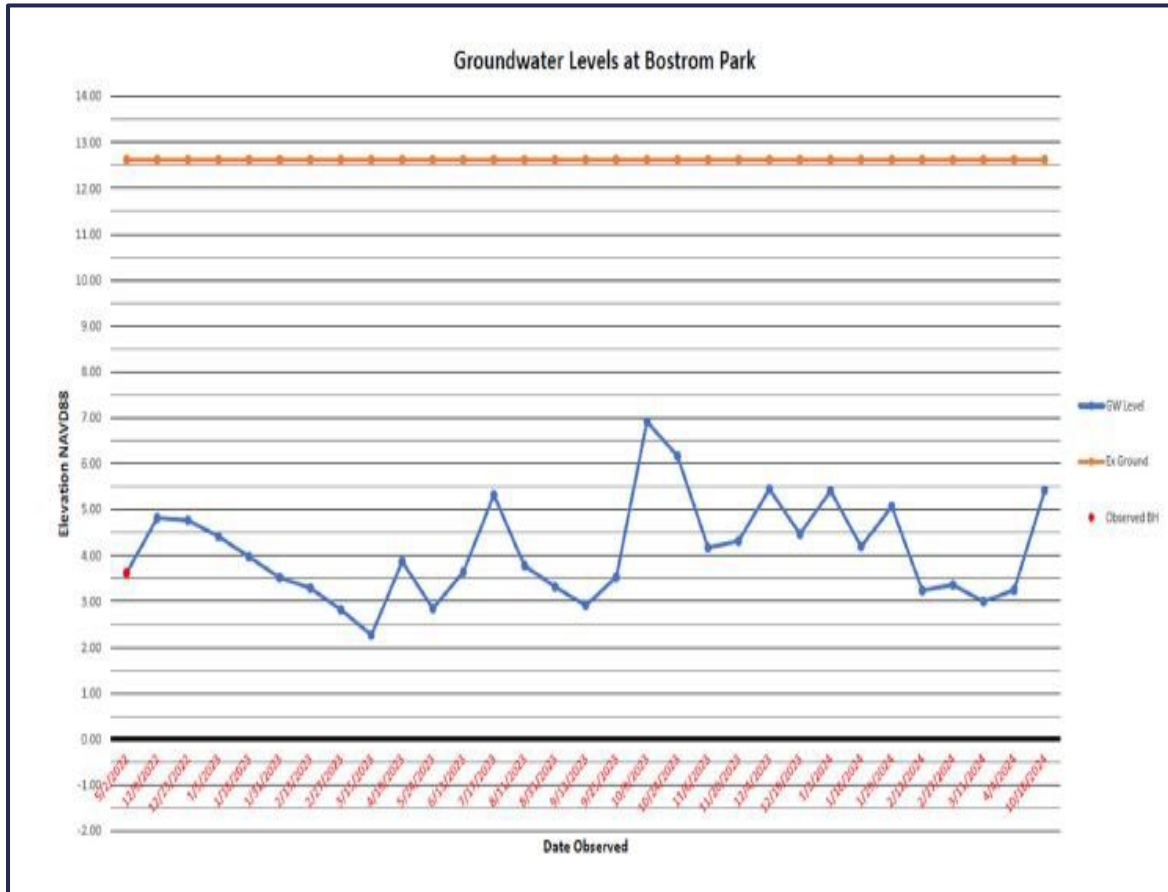
Key existing conditions undersized stormsewers & pipe junctions choking flow from the north and south are removed



- Underground **Storage Filtration** Chambers provide peak runoff detention
- Underground **Storage Filtration** runoff volume treatment capacity

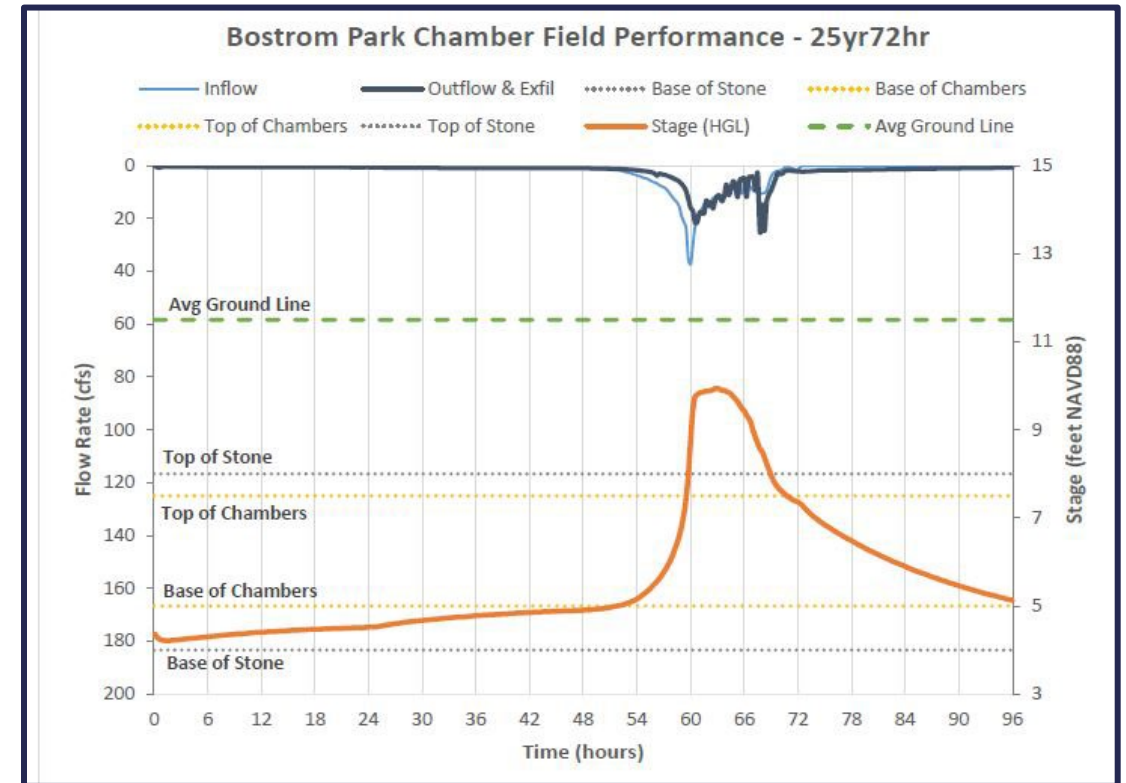
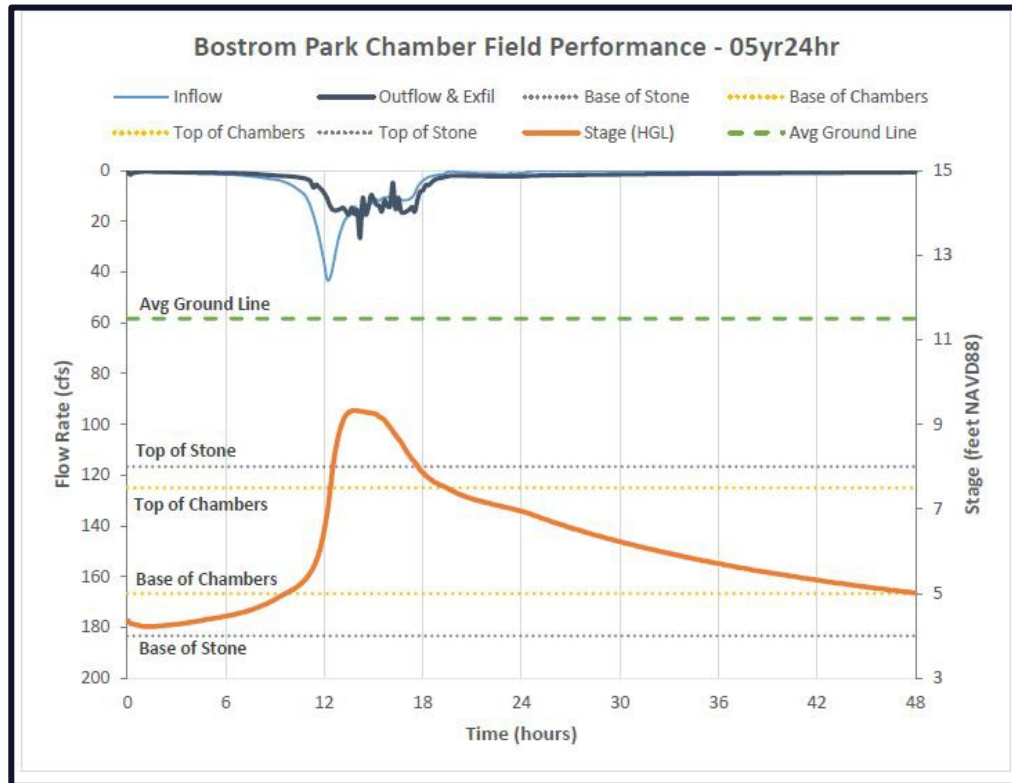
- ❑ Interconnected 3-acre farm chambers for maximum utilization of underground storage space
- ❑ Chambers can be accessed for maintenance to clear debris
- ❑ Combined with Phase I (Southern Outfall Replacement Project,) Bostrom Park drainage improvements will significantly decrease lack of capacity flooding issues in the watershed

Underground Storage Filtration Chambers Capacity

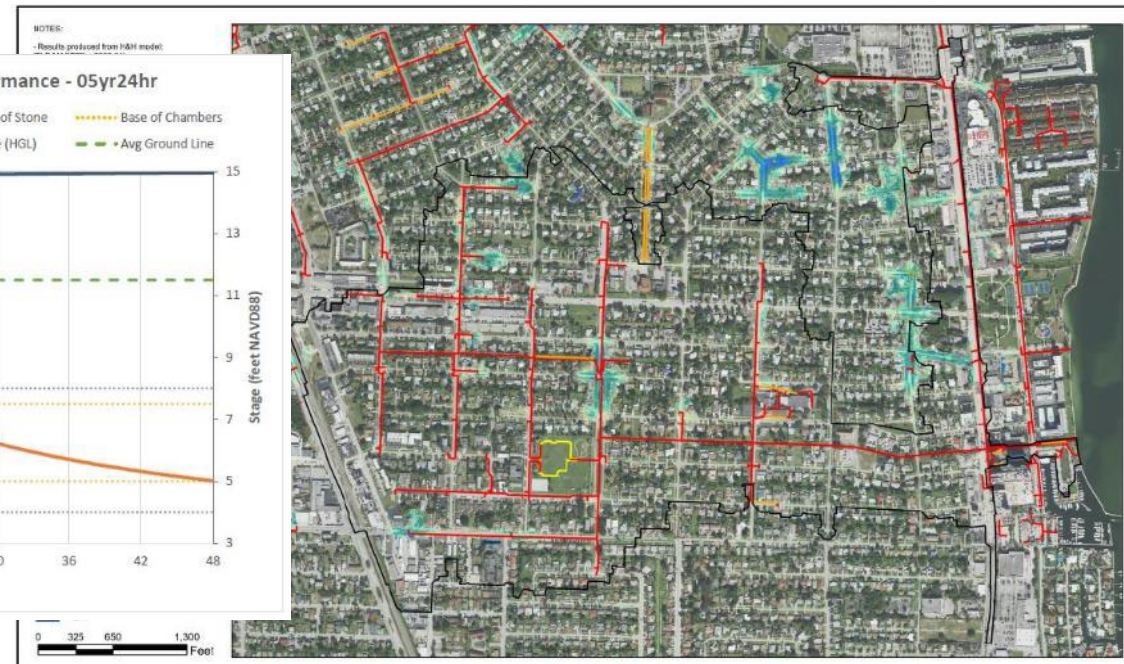
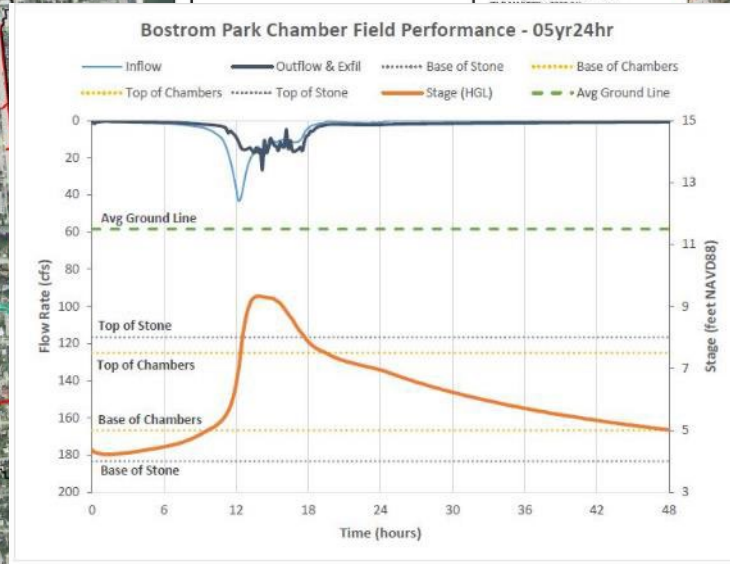


Underground Storage Filtration Chambers

Hydraulic Performance



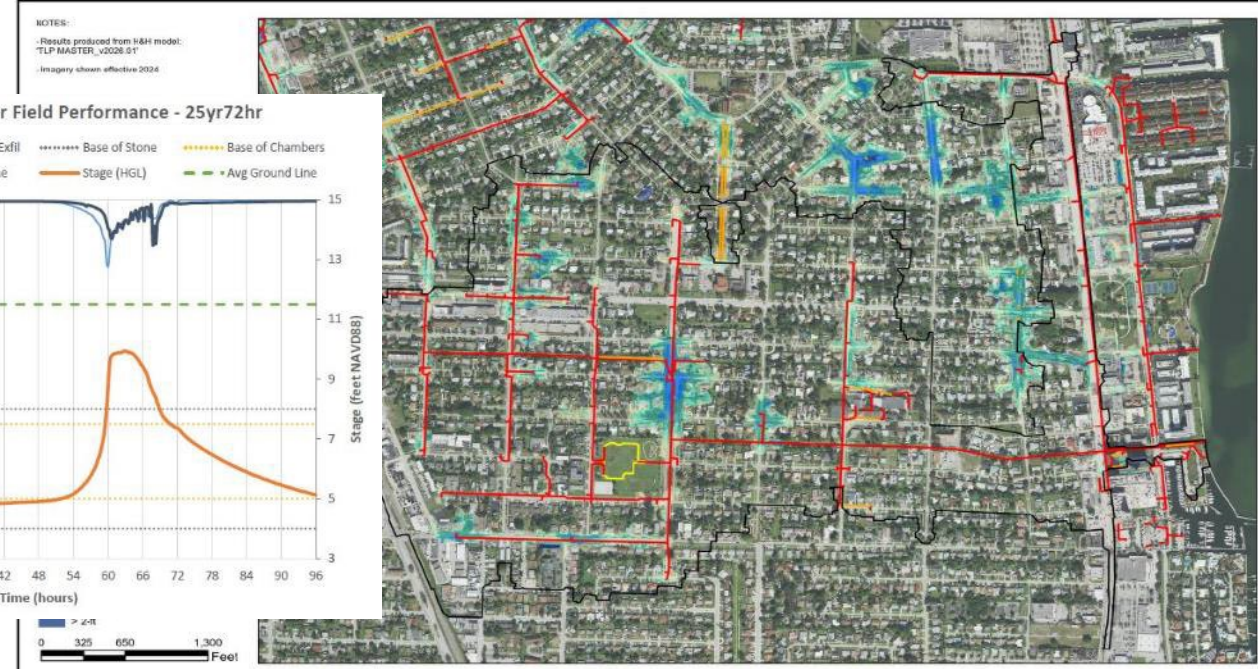
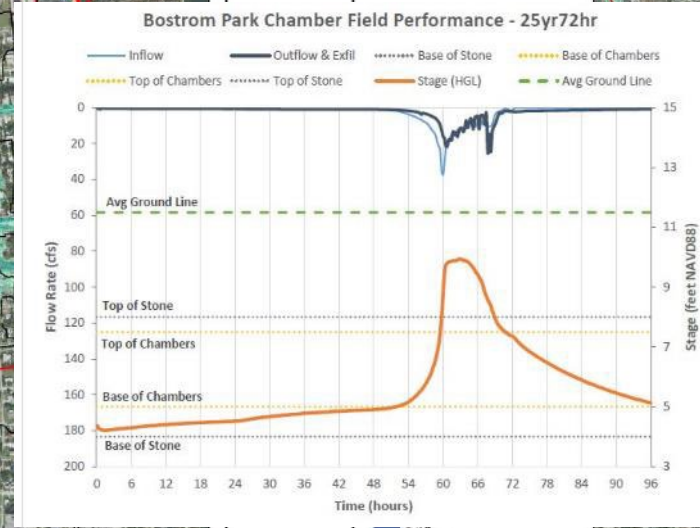
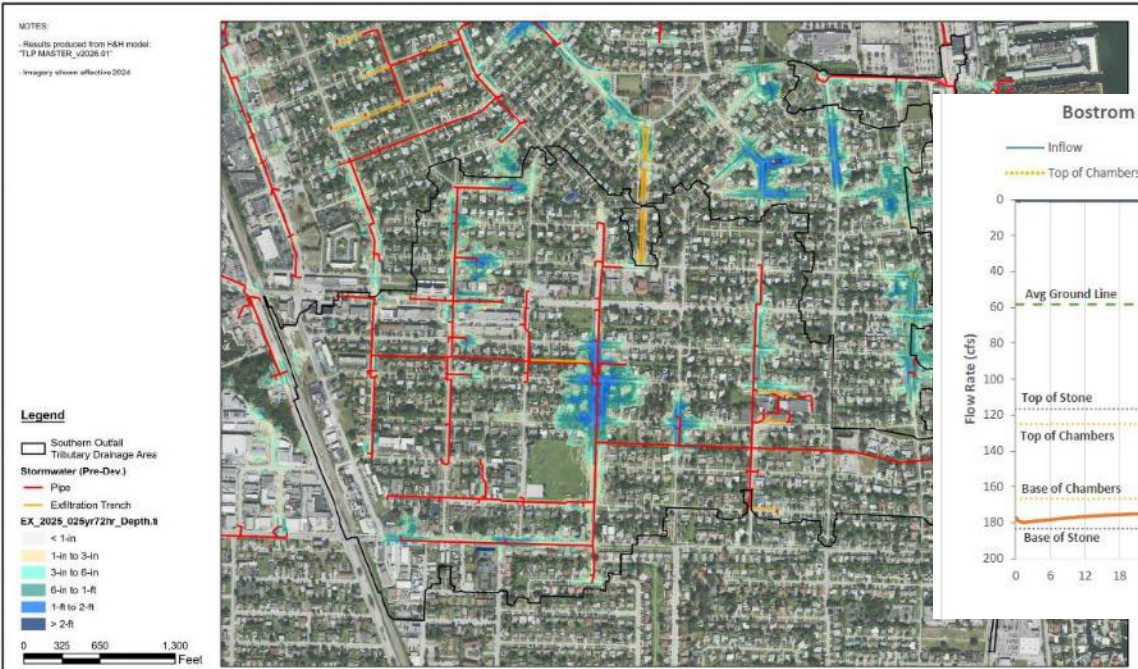
Underground Storage Filtration Chambers Flooding Extent Reduction - 3yr/24Hr



	PROJECT DESCRIPTION:	MAP DESCRIPTION:	DATE:	BY:
	TOWN OF LAKE PARK, FL BOSTROM PARK GREEN INFRASTRUCTURE	PRE-DEVELOPMENT FLOOD MAP 5-YEAR 24-HOUR STORM EVENT	APR 2026	A.M.
			COUNTY:	CHECKED:
			PALM BEACH	R.M.
		STATE:	REVISED:	
		FLORIDA	N/A	

	PROJECT DESCRIPTION:	MAP DESCRIPTION:	DATE:	BY:
	TOWN OF LAKE PARK, FL BOSTROM PARK GREEN INFRASTRUCTURE	POST-DEVELOPMENT FLOOD MAP 5-YEAR 24-HOUR STORM EVENT	APR 2026	A.M.
			COUNTY:	CHECKED:
			PALM BEACH	R.M.
		STATE:	REVISED:	
		FLORIDA	N/A	

Underground Storage Filtration Chambers Flooding Extent Reduction - 25yr/72Hr



			PROJECT DESCRIPTION:	MAP DESCRIPTION:	DATE:	BY:
			TOWN OF LAKE PARK, FL BOSTROM PARK GREEN INFRASTRUCTURE	PRE-DEVELOPMENT FLOOD MAP 25-YEAR 72-HOUR STORM EVENT	APR. 2026	A.M.
			COUNTY:	CHECKED:	PALM BEACH	R.M.
			STATE:	REVISED:	FLORIDA	N/A

			PROJECT DESCRIPTION:	MAP DESCRIPTION:	DATE:	BY:
			TOWN OF LAKE PARK, FL BOSTROM PARK GREEN INFRASTRUCTURE	POST-DEVELOPMENT FLOOD MAP 25-YEAR 72-HOUR STORM EVENT	APR. 2026	A.M.
			COUNTY:	CHECKED:	PALM BEACH	R.M.
			STATE:	REVISED:	FLORIDA	N/A

Project Timeframe



■ Design & Bidding

- ❖ 100% Design Plans & Specifications: November 2022
- ❖ Final Regulatory Permits: December 2022
- ❖ Bidding Advertisement: January 2023
- ❖ Contractor Selection: February – March 2023
- ❖ Contract Negotiations: April – May 2023

■ Construction

- ❖ Mobilization/Start Up: June 2023
- ❖ Completion: June 2025

Project Funding



DESIGN

- **Basis of Design Report (30% Plans) - Town of Lake Park Stormwater Utility (\$30,000)**
(Seed funding for State of Florida Grant Application)
- **60% Design Plans - University of Florida Sea Grant PD-20-02 Coastal Resiliency Grant (\$25,000)**
- **90 & 100% Design Plans – FL CDBG Mitigation General Infrastructure Program Project (\$189,055)**
(As part of 3-phase Southern Outfall CDBG Mitigation GI Program Funding)

CONSTRUCTION

- **FL CDBG Mitigation General Infrastructure Program Project – (\$3.8 Million)**
(As part of \$11.1 Million Governor Award to the Town of Lake Park – one of 32 best GI/Sustainability projects statewide)

Underground Storage Filtration Chambers

Construction



Underground Storage Filtration Chambers Completion - Finished Product



BOSTROM PARK DRAINAGE IMPROVEMENT PROJECT

LAT/LON: 26.794708, -80.065774
DATE: 10.30.2025



BOSTROM PARK DRAINAGE IMPROVEMENT PROJECT

LAT/LON: 26.794708, -80.065774
DATE: 10.30.2025



BOSTROM PARK

GREEN STORMWATER INFRASTRUCTURE COASTAL RESILIENCY PROJECT SUMMARY



- Largest underground (3-acre) Green Stormwater Infrastructure (GSI) Chamber Farm Facility in SE Florida.
- The facility provides flooding relief, water quality and sustainability, and fully qualified for state and federal funding for design and construction.
- The project received the Florida Stormwater Association (FSA) Excellence Award.

“...Congratulations! Your submission, “Green Stormwater Infrastructure Underground Storage and Filtration Chambers for Flood Mitigation, Water Quality Improvement, and Climate Resilience at Bert Bostrom Park,” has been selected to receive a 2026 FSA Stormwater Project Excellence Award!”

Thank You



Questions?