



Public Works Update – Flash Flood 2023

April 12 - 21, 2023

Council of Fort Lauderdale Civic Associations

May 9, 2023



Agenda

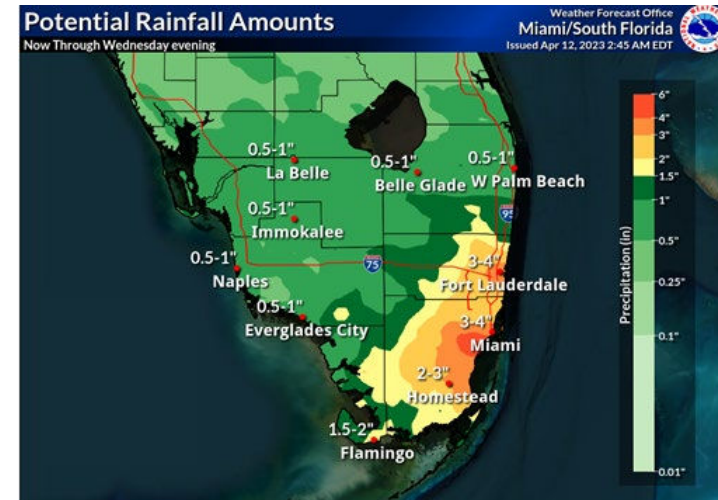
- Rain Event and Rescue Operations April 12 –13, 2023
- Recovery Operations April 13 –20, 2023
 - Task Force Unwatering
 - Daily Situation Update
- Stormwater System and Stormwater Master Plan
- Debris Removal Operations
- Lessons Learned
- Immediate Actions and Long Term Plan



Rain Event and Rescue Operations

April 12 – 13, 2023

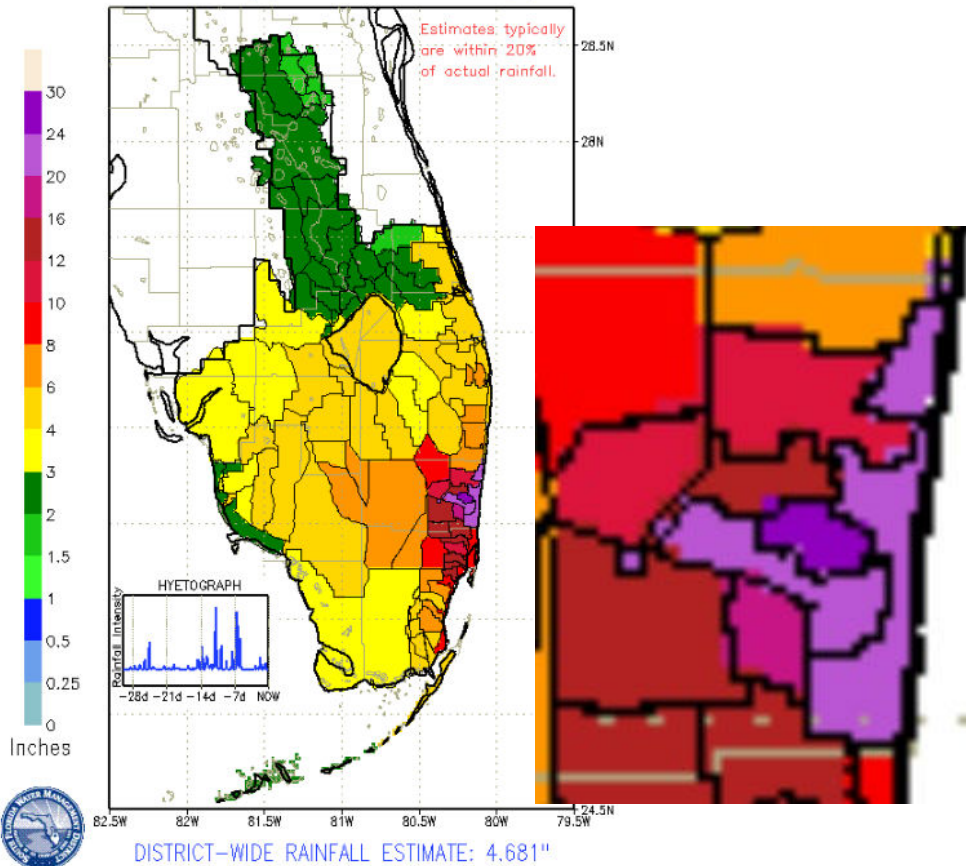
3:12 pm Melrose Manors flooding - 2 pump trucks respond
4:12 pm Flooding reported into homes in Edgewood
4:37 pm Edgewood received 8" rain
5:00 pm PW trucks pulled in for safety concerns
Kinney Tunnel Closed
5:30 pm Croissant Park received 10" rain
6:22 pm 11" rain reported across city
9:00 pm Partial Activation EOC
11:57 pm Emergency Proclamation Issued





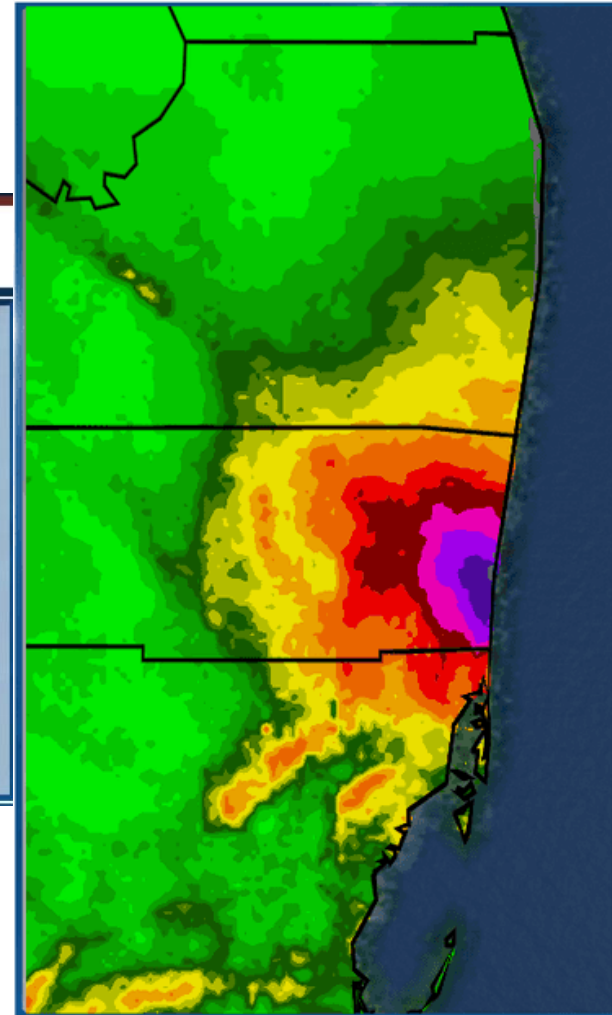
Rainfall Amounts April 12 – 13, 2023

SFWMD PROVISIONAL RAINFALL 30-DAY BASIN RAINFALL ESTIMATES
FROM: 0700 EST, 03/24/2023 THROUGH: 0700 EST, 04/23/2023



> TOP RAIN TOTALS » YESTERDAY

Fort Lauderdale	25.91"
Hollywood	18.16"
Dania Beach	17.30"
Plantation	15.06"
Lauderhill	14.58"
Coconut Grove	13.15"

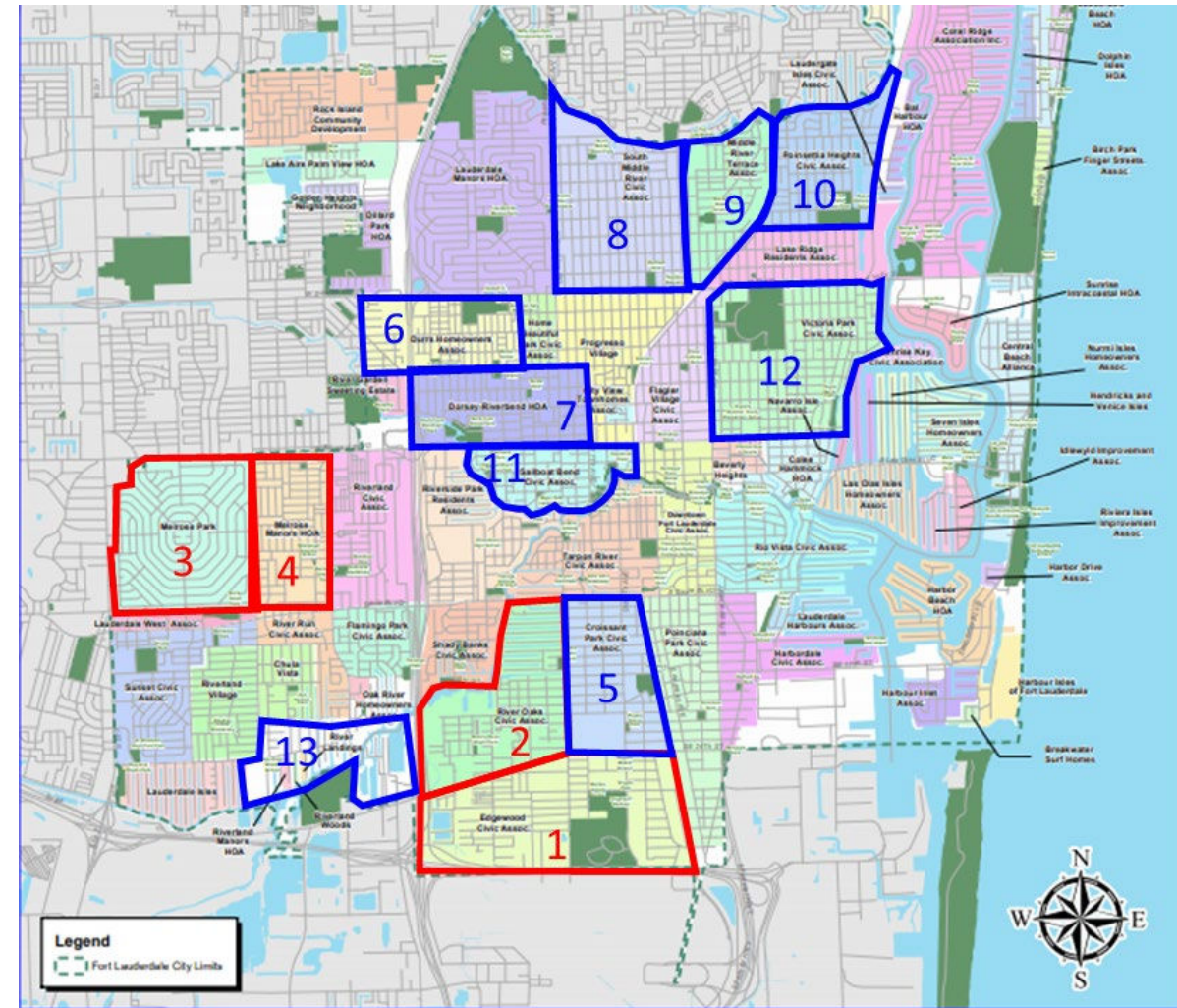




Neighborhoods Initially Reporting Major Impacts

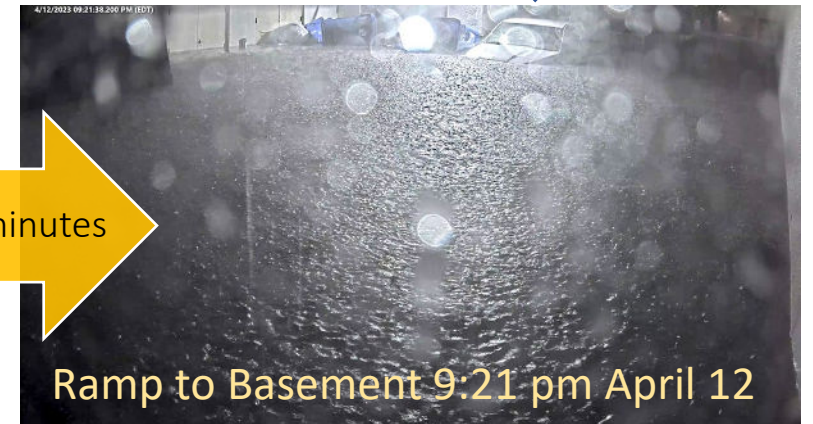
Initial Flooding Assessments

- 1) Edgewood
- 2) River Oaks
- 3) Melrose Park
- 4) Melrose Manors
- 5) Croissant Park
- 6) Durrs
- 7) Dorsey Riverbend
- 8) South Middle River
- 9) Middle River Terrace
- 10) Poinsettia Heights
- 11) Sailboat Bend
- 12) Victoria Park
- 13) River Landing





City Hall Impacts of Flash Flood



21 minutes



Recovery Operations

April 13, 2023

Initial Situation

- Numerous Areas Flooded – Up to 26" of rain
- Police/Fire Rescue operations ongoing
- City Hall/Communications down
- GTL exceeding 100 MGD
- 30+ Wastewater stations offline
- Multiple water/sewer breaks reported
- All PW vehicles deployed

12:00 am Monitoring activity and prioritizing response from EOC

7:00 am Area Assessments ongoing

10:00 am City Hall Unwatering ongoing

10:30 am Multiple vendors engaged for emergency pumping services

2:00 pm Vendor Trucks in operation

3:00 pm Additional rain began (3")

WebEOC request for additional pumping capacity



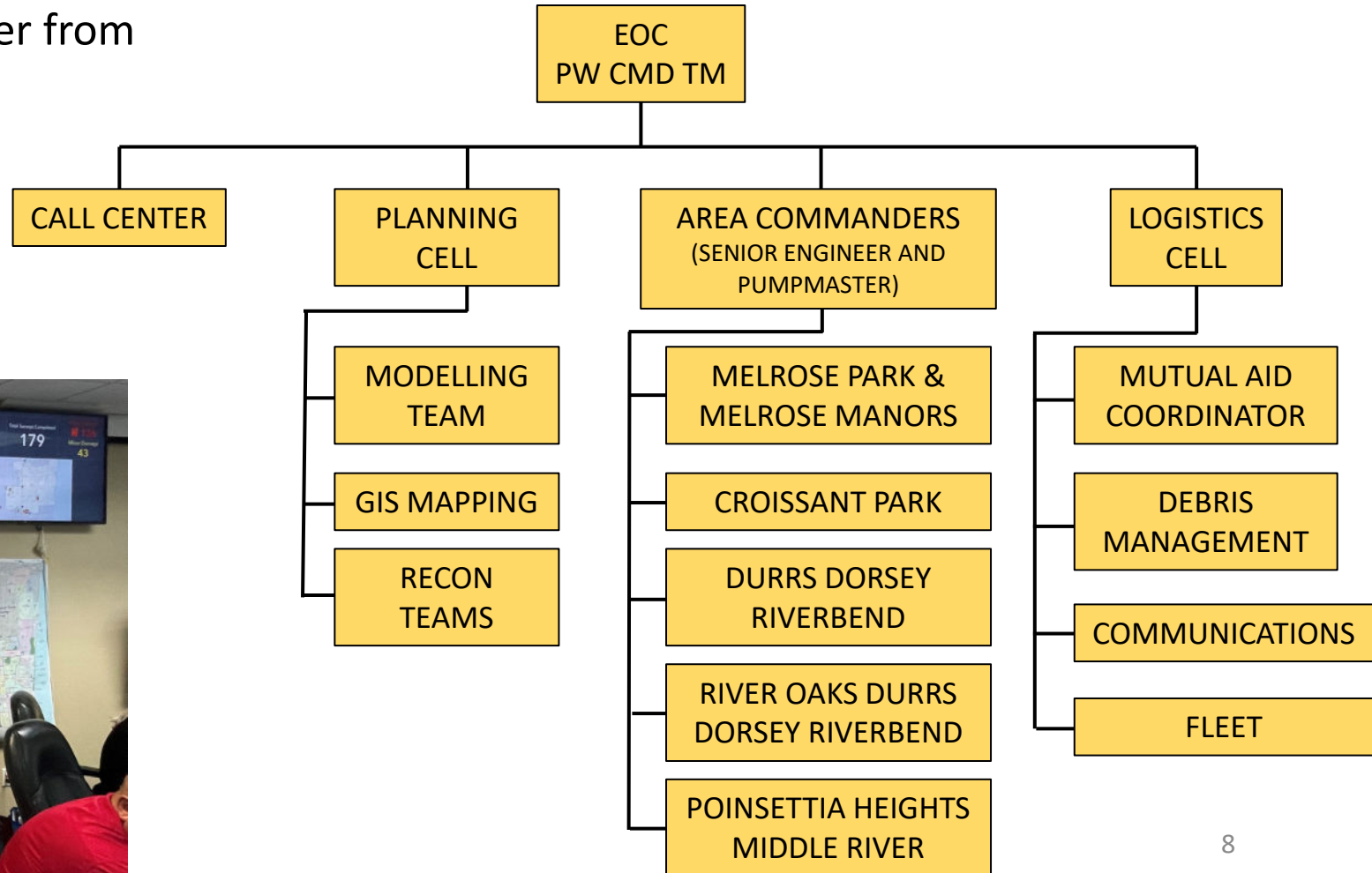


Recovery Operations Task Force (TF) Unwatering

MISSION: TF Unwatering will remove water from impacted areas in Fort Lauderdale

PRIORITIES:

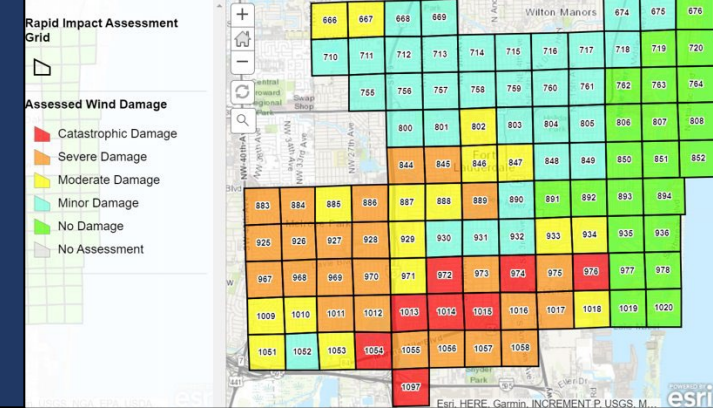
- Critical Facilities
- Roadways and Arterials
- Neighborhoods





Recovery Operations

April 14, 2023



Assets on Hand

28 Pumping and/or Vactor Trucks

5 City, 17 Contractor, 6 Mutual Support

Road and Arterials

SW 27 Ave between Broward and Davie (Passable)

SW 31 Ave between Broward and Davie (Passable)

Sistrunk (Passable Trucks/SUVs, cars not recommended)

NW 9 Ave (Passable trucks/SUVs, cars not recommended)

Riverland Road (Coned Off)

Multiple sink holes

Water and Wastewater

GTL: 98 MGD; discharging over the Emergency Outfall

Lift Stations: 120 surcharged: 6 without power

Water Main Breaks: 2

Call Center

1,257 calls since 6AM; 4,432 since incident began

City Hall

Basement drained; assessments initiated

Heavily Impacted Neighborhoods (above 1' Depth)

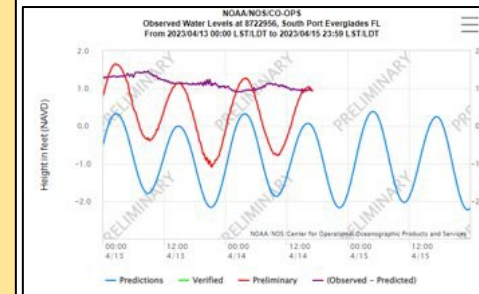
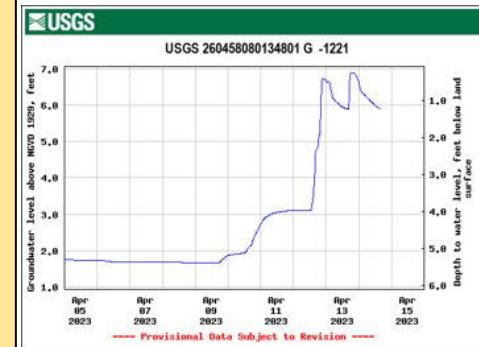
- **Edgewood** (2-3') Canals too high to pump; tankers only
- **River Oaks** (2-3') Initiated pumping w/new stormwater system
- **Melrose Manors** (2-3') Tankers only; no connection to waterways/outfalls. Meeting with County to discuss
- **Melrose Park** (2-3') Drainage ditch not flowing due to waterway elevations/sluice gate
- **Durrs** (2-3') Tankers only; water not flowing
- **Dorsey-Riverbend** (2-3') Tankers only; outfalls not discharging due to high levels in New River

Additional Areas of Concern

- Sailboat Bend
- Victoria Park (East Side)
- Croissant Park
- Riverland Areas
- SE Isles
- South Middle River
- Poinsettia Heights
- Middle River Terrace
- Holiday Park - Reunification Center entrance flooded

9:49 am FDOT authorizes discharging into FDOT systems

11:00 am Meeting to authorize discharge into Broward County system

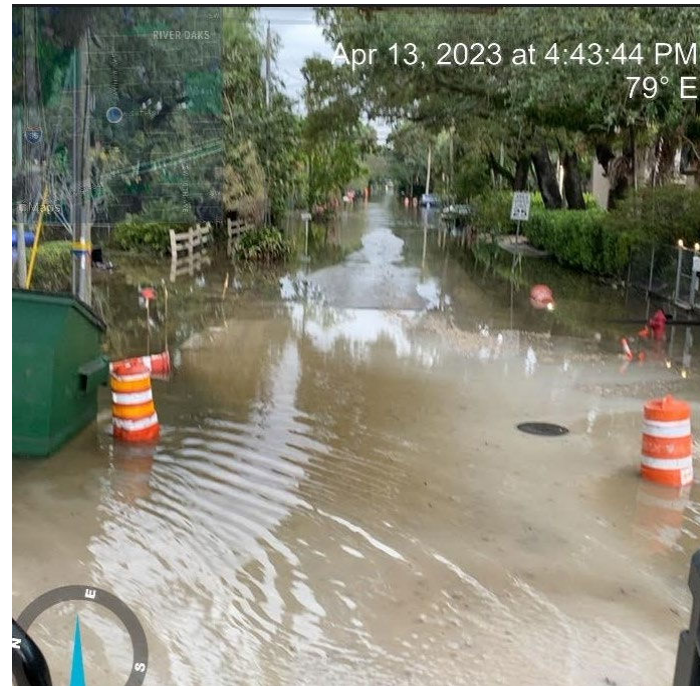
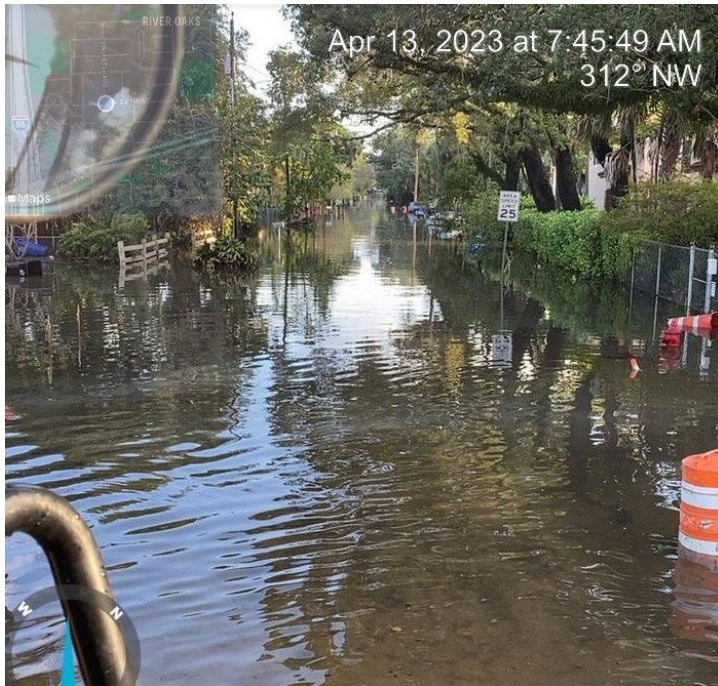




Recovery Operations

April 14, 2023

River Oaks Progress :



Holiday Park (Red Cross)





Recovery Operations

April 15, 2023

Assets on Hand

36 Pumping and/or Vector Trucks
8 City, 21 Contractor, 7 Mutual Support

Road and Arterials

All Roadways Passable
Road Crew responding to potholes and sinkholes
Road Assessments initiated
Muck removal initiated in Melrose Park

Water and Wastewater

GTL: 83 MGD; discharging over the Emergency Outfall
Lift Stations: 48 surcharged, all on FPL power; 2 out of service

Water Main Breaks: 0

Wastewater Break: 1

Call Center

5,127 calls since incident began

City Hall

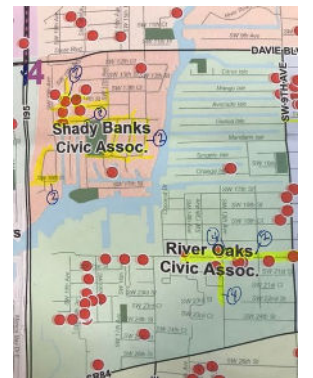
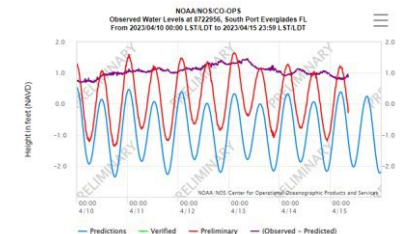
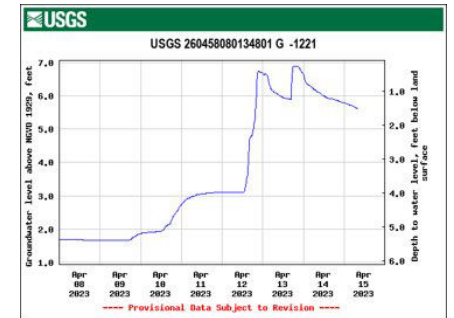
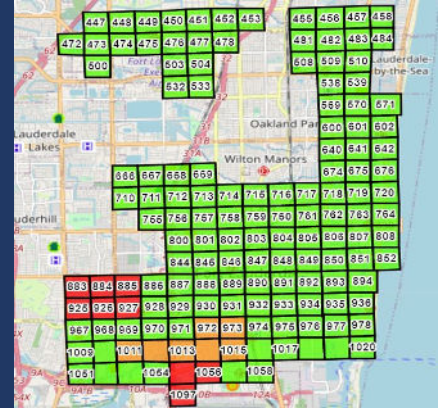
Emergency Repairs ongoing

Heavily Impacted Neighborhoods (1 to 3' Depth)

- **Edgewood** (1') Initiated pumping into FDOT system at SW 9th and 12th Ave;
- **River Oaks** (1-2') 2 x 12" pumps operating into South Fork New River
- **Melrose Manors** (2') Tankers only; no connection to waterways/outfalls
- **Melrose Park** (1') Levels fall by 1' following opening of sluice gate; cleaned debris buildup in system
- **Durrs** (ponding) All roads open and passable
- **Dorsey-Riverbend** (1-2') Tankers only; no connection to waterways/outfalls

Additional Areas of Concern

- Sailboat Bend: 6" flooding in some areas
- Victoria Park: (East Side) 6" – 9" in some areas
- Croissant Park: 2" of ponding water
- Riverland Areas – County response
- SE Isles
- South Middle River: Dry; small pockets of standing water
- Poinsettia Heights: Dry; small pockets of standing water
- Middle River Terrace
- Holiday Park: pump truck needed to maintain access





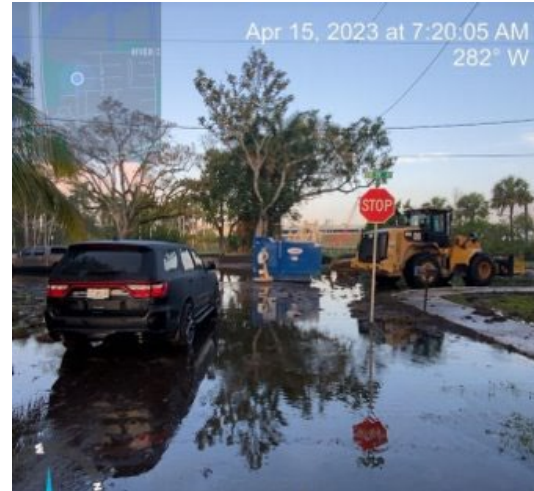
Recovery Operations

April 15, 2023

Edgewood



River Oaks



Melrose Manors





Recovery Operations

April 16, 2023

Assets on Hand

36 Pumping and/or Vector Trucks
1 City, 25 Contractor, 10 Mutual Support

Road and Arterials

Day 2 Road assessments ongoing
Road Crew responding to potholes and sinkholes
Muck removal ongoing in areas no longer flooded
Durrs roads swept

Water and Wastewater

GTL: 81 MGD; emergency outfall discharge resumed

After rainfall started

Lift Stations: 37 surcharged, 2 out of service

Water Main Breaks: 0

Wastewater Breaks: 0

Call Center

5,909 calls since incident began

City Hall

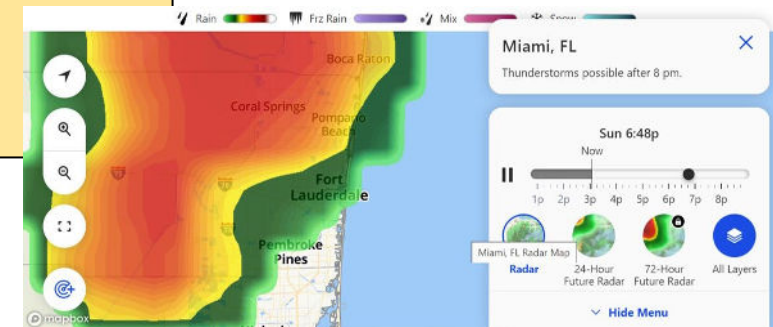
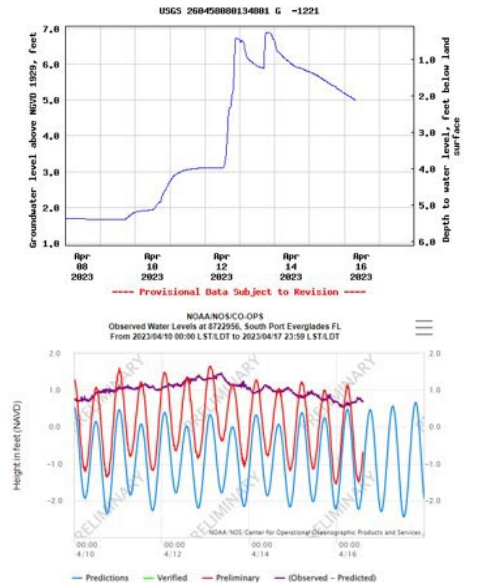
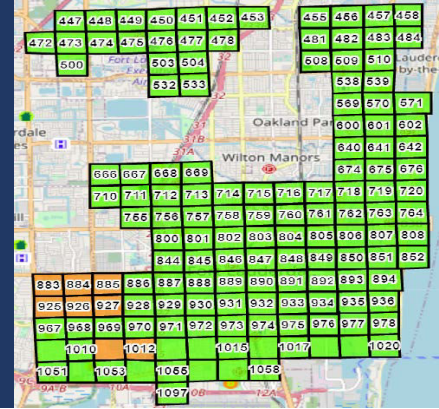
Emergency Repairs ongoing

Heavily Impacted Neighborhoods (1 to 3' Depth)

- **Edgewood** (4") Pumping into FDOT system at SW 9th and 12th Ave; unable to pump into River Oaks due to surcharging
- **River Oaks** (1-2') 2 x 12" pumps operating into South Fork New River
- **Melrose Manors** (over 6") Tankers only; no connection to waterways/outfalls
- **Melrose Park** (4"-6") Flooding persists in middle of neighborhood. Debris cleared at grates to improve flow
- **Durrs** (ponding) All roads open and passable
- **Dorsey-Riverbend** All roads open and passable

Additional Areas of Concern

- Sailboat Bend: Dry; small pockets of standing water
- Victoria Park: Dry; small pockets of standing water
- Croissant Park: 2" of ponding water
- Riverland Areas – County response





Recovery Operations

April 16, 2023

River Oaks



Melrose Manors





Recovery Operations

April 17, 2023

Assets on Hand

27 Pumping and/or Vector Trucks
2 City, 18 Contractor, 7 Mutual Support

Road and Arterials

Day 3 Road assessments ongoing
Road Crew responding to potholes and sinkholes
Muck removal in Melrose Manors, River Oaks
Durrs and Dorsey-Riverbend roads swept

Water and Wastewater

GTL: 89 MGD; discharging over emergency outfall
Lift Stations: 48 surcharged
Water Main Breaks: 5
Wastewater Breaks: 0

Call Center

6,761 calls since incident began

City Hall

Emergency Repairs ongoing

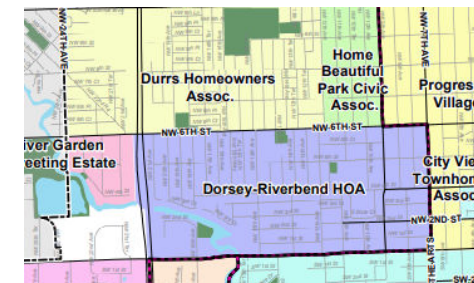
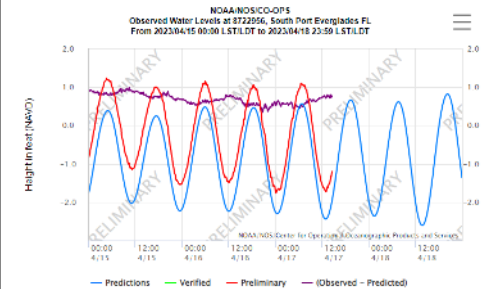
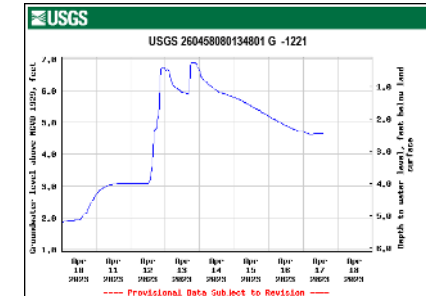
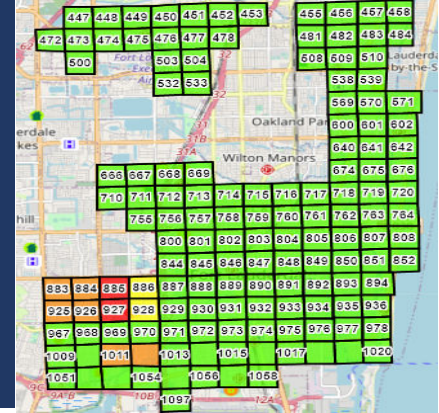
Heavily Impacted Neighborhoods (1 to 3' Depth)

- **Edgewood** (Ponding) Pumping into FDOT system at SW 9th and 12th Ave; unable to pump into River Oaks due to surcharging
- **River Oaks** (Ponding) 2 x 12" pumps operating into South Fork New River
- **Melrose Manors** (over 6") Added 6" pump on SW 1st St, discharging to Broward Blvd and continued tanker use
- **Melrose Park** (4"-6") Flooding persists in middle of neighborhood
- **Durrs** (ponding) All roads open and passable
- **Dorsey-Riverbend** All roads open and passable

Additional Areas of Concern

- Sailboat Bend: Dry; small pockets of standing water
- Victoria Park: Dry; small pockets of standing water
- Croissant Park: 2" of ponding water
- Riverland Areas – County response

*Conditions worsened due to additional rainfall during the previous 24 hours





Recovery Operations

April 17, 2023

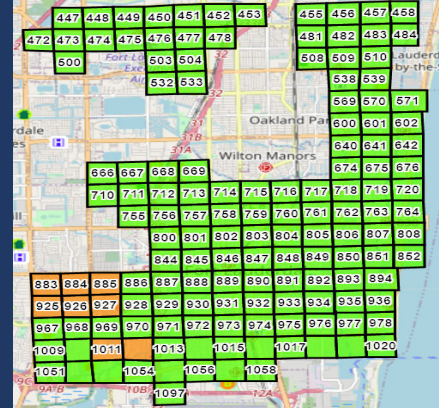
Melrose Manors





Recovery Operations

April 18, 2023



Assets on Hand

24 Pumping and/or Vector Trucks
2 City, 11 Contractor, 10 Mutual Support

Road and Arterials

Day 4 Road assessments ongoing
Road Crew responding to potholes and sinkholes
Muck removal through all impacted areas
Roadway sweeping of areas no longer flooded

Water and Wastewater

GTL: 79 MGD; intermittently discharging over emergency outfall

Lift Stations: 31 surcharged

Water Main Breaks: 0

Wastewater Breaks: 0

Call Center

8,214 calls since incident began

City Hall

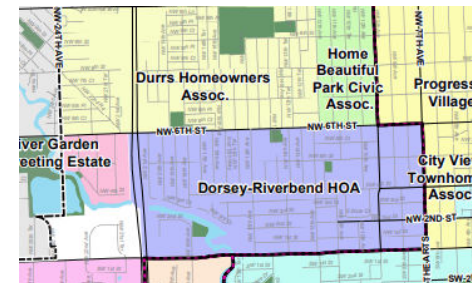
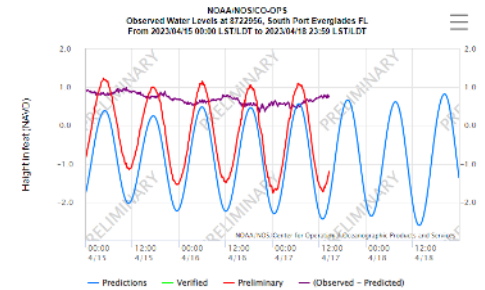
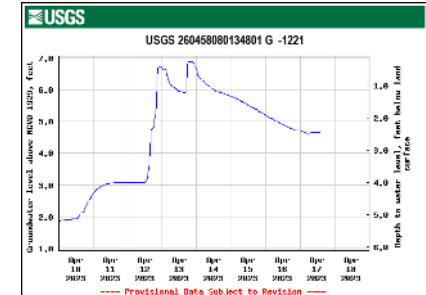
Emergency Repairs ongoing

Heavily Impacted Neighborhoods (1 to 3' Depth)

- **Edgewood** (Ponding'') Pumping into FDOT system at SW 9th and 12th Ave; unable to pump into River Oaks due to surcharging
- **River Oaks** (Ponding') 2 x 12" pumps operating into South Fork New River
- **Melrose Manors** (4" or less) Flooding persists in eastern portion of neighborhood; continued use of tankers and 2 stationary pumps
- **Melrose Park** (4"-6") Flooding persists in middle of neighborhood
- **Durrs** All roads open and passable
- **Dorsey-Riverbend** All roads open and passable

Additional Areas of Concern

- Riverland Areas – County response





Recovery Operations

April 18, 2023

Melrose Manors



Melrose Park





Recovery Operations

April 19, 2023

Assets on Hand

All Contractor and Mutual Aide Dewatering Assets released at 3:00PM

Road and Arterials

Muck removal ongoing in impacted areas and initiated in Melrose Park and Melrose Manors

Swept roads in Riverland area

Water and Wastewater

GTL: 70-80 MGD; no longer discharging over emergency outfall

Lift Stations: 26 surcharged

Water Main Breaks: 0

Wastewater Breaks: 0

Call Center

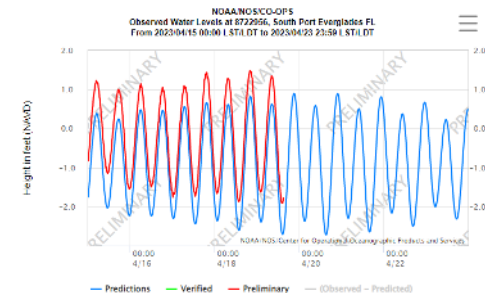
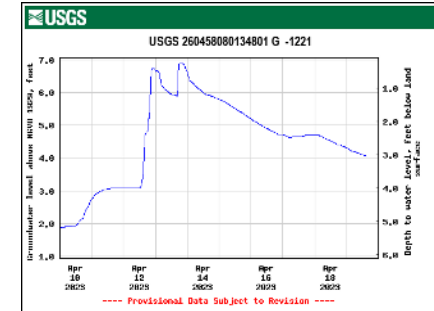
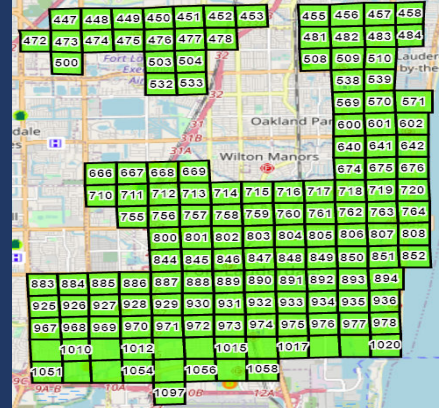
9,371 calls since incident began

City Hall

Emergency Repairs ongoing

Heavily Impacted Neighborhoods (1 to 3' Depth)

- **Edgewood** All roads open and passable
- **River Oaks** All roads open and passable
- **Melrose Manors** (Ponding) All roads open and passable; Flooding restricted to swales
- **Melrose Park** (Ponding) All roads open and passable; Flooding restricted to swales
- **Durrs** All roads open and passable
- **Dorsey-Riverbend** All roads open and passable





Recovery Operations

April 19, 2023

Melrose Manors



Melrose Park





Recovery Operations

April 19, 2023

Melrose Park Drainage Ditch and Catch Basin Clearing





Recovery Operations

April 20, 2023

Road and Arterials

Muck Removal Activities continue in the Melrose Manors, Melrose Park, Riverland, River Oaks, Edgewood, Dorsey Riverbend, and Durrs Neighborhoods

Streetsweeping continues in impacted areas

Water and Wastewater

GTL: 75 MGD

Lift Stations: 19 surcharged

Water Main Breaks: 1

Wastewater Breaks: 0

Call Center

9,690 calls since incident began; Call Center experienced significant technical issues preventing calls from being answered (resolved 7AM)



Stormwater Master Plan

Tranche 1

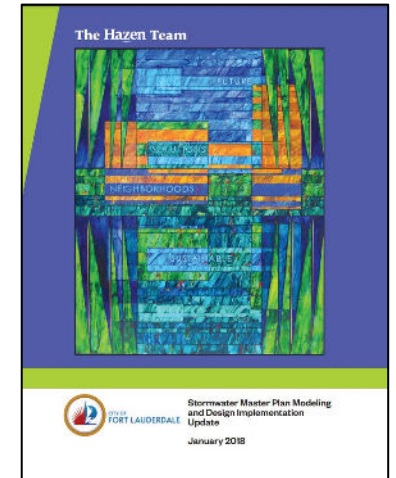
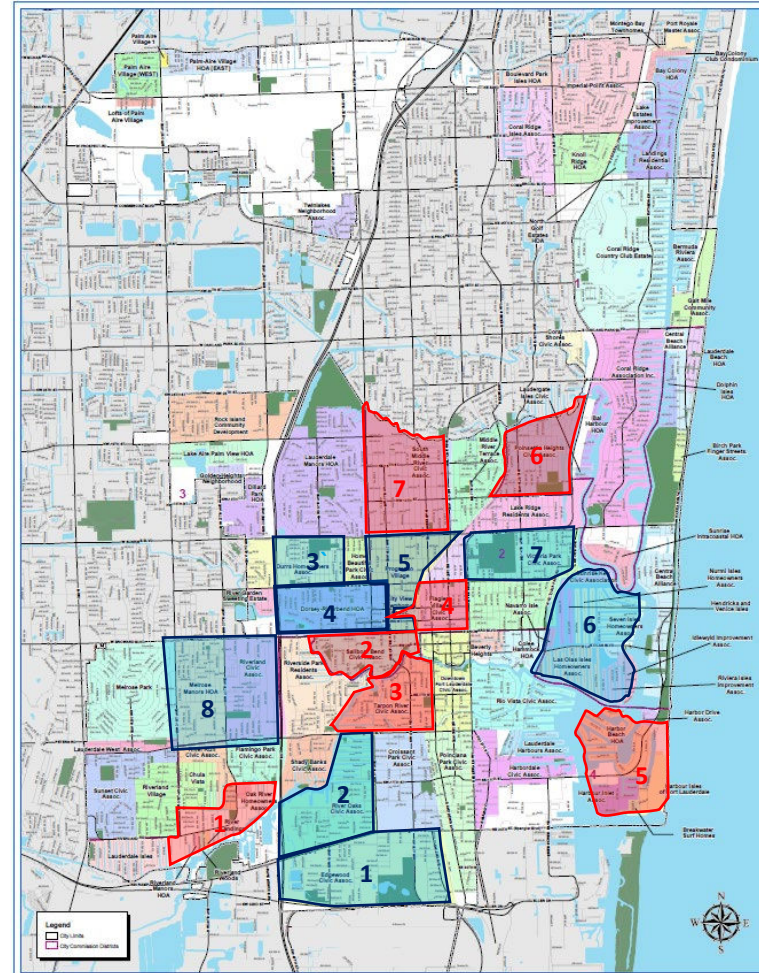


1. Edgewood: In Construction
2. River Oaks: In Construction
3. Durrs: Design Complete; Bidding May 2023
4. Dorsey-Riverbend: Design Complete; Bidding May 2023
5. Progresso Village: Design Complete; Bidding May 2024
6. Southeast Isles: Design Complete; Bidding May 2025
7. Victoria Park: Design Complete; Bidding May 2024
8. Melrose Manors/Riverland Civic: In Design; est completion Dec 2024

Tranche 2 (Planning and Design to begin 2025)



1. Riverland Road Areas
2. Sailboat Bend
3. Tarpon River
4. Flagler Village
5. Harbor Isles/Inlet
6. Poinsettia Heights
7. South Middle River





Recovery Operations Pump/Vactor Trucks vs. Pumps



Example: 4" of rainfall over a 100-acre watershed ➡ **10,750,000** gallons of ponding water.

Pump/Vactor Truck Specs:

- Capacity: 3000 gallons
- 10-15 Trips per day (depending on dewatering location)

Resources Required to Dewater 10,750,000 gallons Using Pump/Vactor Trucks :

- Assuming 15 Trucks working in the example
- 15 trips for each truck per day

Results:

- 3584 total trips required
- **16 days** required for (15 trucks at 15 trips/per truck to dewater 10,750,000 gallons

6" Pump Specs:

- Capacity: Min/Max 500/3300 gpm (gallons per minute)
- Assume 1750 gpm with 24-hr per day run time

Resources Required to Dewater 10,750,000 gallons Using 6" Pumps:

- Assuming 2 pumps working in the example
- Running 24-hrs

Results:

- **2.1 days (51 hours)** required to dewater 10,750,000 gallons with (2) 6" pumps

8" Pump Specs:

- Capacity: Min/Max 500/4000 gpm (gallons per minute)
- Assume 2500 gpm with 24-hr per day run time

Resources Required to Dewater 10,750,000 gallons Using 8" Pumps:

- Assuming 2 pumps working in the example
- Running 24-hrs

Results:

- **1.5 days (36 hours)** required to dewater 10,750,000 gallons with (2) 8" pumps

12" Pump Specs:

- Capacity: Min/Max 1300/9000 gpm (gallons per minute)
- Assume 5000 gpm with 24-hr per day run time

Resources Required to Dewater 10,750,000 gallons Using 12" Pumps:

- Assuming 2 pumps working in the example
- Running 24-hrs

Results:

- **18 hours** required to dewater 10,750,000 gallons with (2) 12" pumps

Pump/Vactor Trucks

Pros:

- Mobility - can reach flooded areas easily
- High visibility
- Ability to dewater at away location

Cons:

- Limited capacity: takes 10X or more time to dewater a given volume of water compared to stationary pumps
- Requires many resources (financial and equipment/staff)

Pumps

Pros:

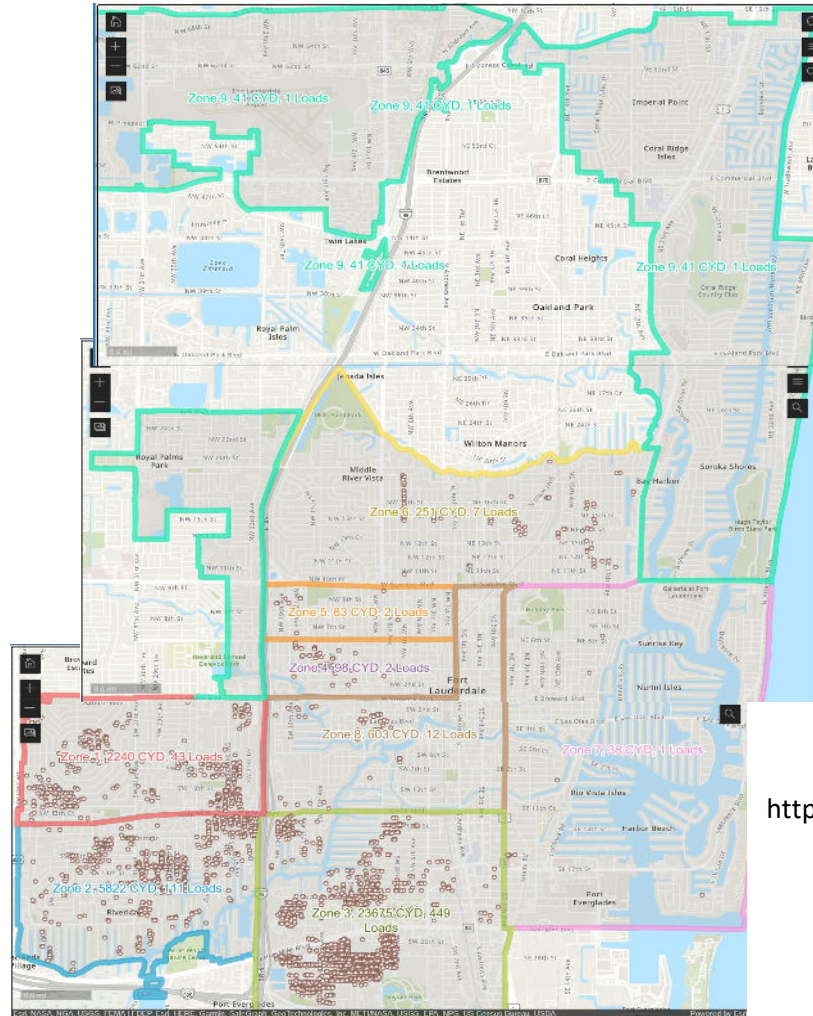
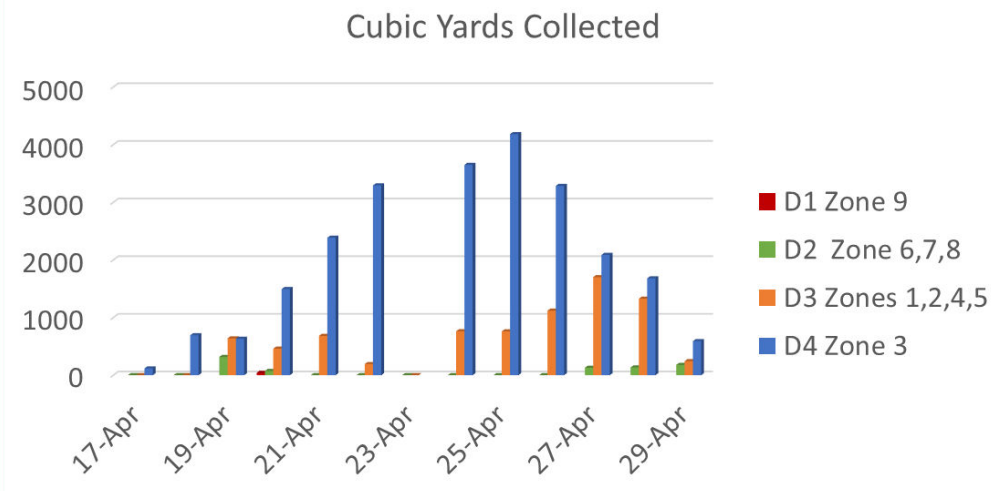
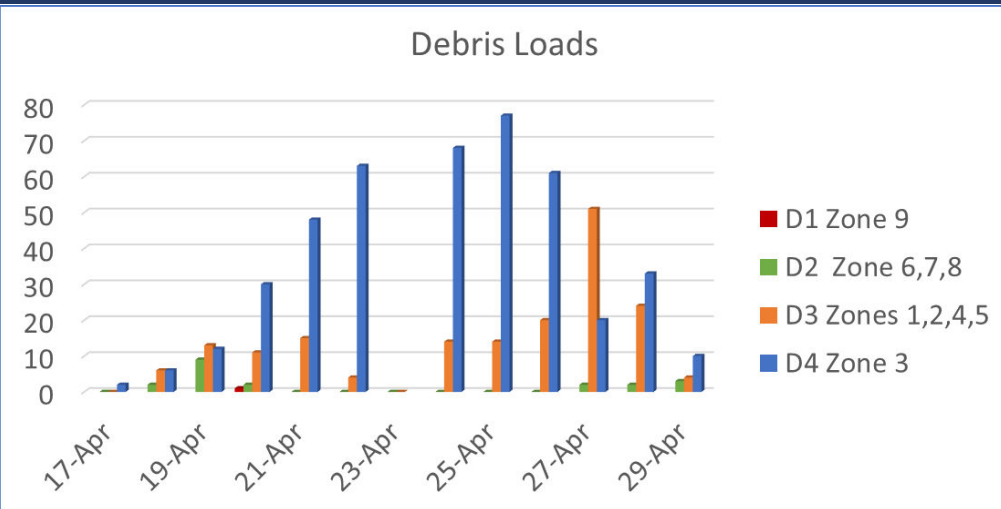
- Highly efficient compared to Pump/Vactor Trucks
- Cheaper to operate, using less resources

Cons:

- Flooding locations must meet certain criteria:
 - Near dewatering location to minimize impacts (discharge hoses) to residents
 - Requires a drainage system with sumps, so pumps can properly operate



NOTE: District Boundaries do not exactly align with the Debris Zones



Debris Load Piles

628 Loads Collected

Debris Dashboard

<https://fort-lauderdale-flooding-thompsoncs.hub.arcgis.com/>





Recovery Operations Lessons Learned

- **Effectiveness of Portable Pumps vs Vector/Pumping Trucks**
- Stormwater Operations not staffed for 24/7 operations; organizational changes needed during emergencies for operations greater than 48 hours to maintain continuous coverage
- **Impact of canal levels and groundwater levels on drainage capacity and unwatering operations**
- **Importance of ILAs with Broward County, Lauderhill and adjacent communities to operate & maintain systems**
- Emergency use of Broward County / FDOT drainage systems necessary when flood thresholds reached
- Use of emergency contracts to augment vector/pump truck capacity
- Area commanders & pump masters to manage operations in each neighborhood
- Coordination of mutual aid support
- Airtags to track location of vendors/mutual support vehicles to augment GPS tracking of City vehicles
- Use of drones and helicopters for rapid assessments
- Debris clearing of stormwater systems to aid in water flow (Melrose Park ditch)
- **Integration of Qalerts, GIS mapping, and recon teams for situational awareness (assessment and prioritization)**
- Muck removal and debris management scheduled immediately following unwatering operations



Recovery Operations Immediate Actions

- Temporary Pumping Plan for Melrose Manors with sump pits, pre-identified equipment, and ILAs with Broward County and FDOT
- Accelerate Melrose Manors design and permitting to the extent possible
- Procure additional Vactor truck and 4"/6" pumps with hoses
- Work with IT to develop GIS tracking program to directly input recon data



Recovery Operations Long Term Plan

- Review priorities for Stormwater Master Plan
 - Tranche 1
 - Edgewood & River Oaks – In Construction
 - Durrs & Dorsey Riverbend – Solicitation May 2023, start construction January 2024
 - Progresso & Victoria Park - Solicitation May 2024, start construction January 2025
 - Southeast Isles – Solicitation May 2025, start construction January 2026
 - Melrose Manors – Design complete December 2024, solicitation January 2025, start construction September 2025
 - Tranche 2 development – planning and design January 2025 – December 2027

Riverland Road Areas
Sailboat Bend
Tarpon River
Flagler Village

Harbor Isles/Inlet
Poinsettia Heights
South Middle River

- Adjust staffing levels to prioritize and accelerate stormwater project execution (project management)



Conclusion

Although much more intense than any storm system is designed to handle, the rain event of April 2023 demonstrated the City's strong emergency response capacity and the ability to quickly implement response plans to alleviate flooding