MIAMIBEACH
RISING ABOVE

FLOOD MEASURING AND TRACKING

City of Miami Beach – Public Works Department
May 26th, 2020

Presented by: Nelson Perez-Jacome, P.E.
City Engineer

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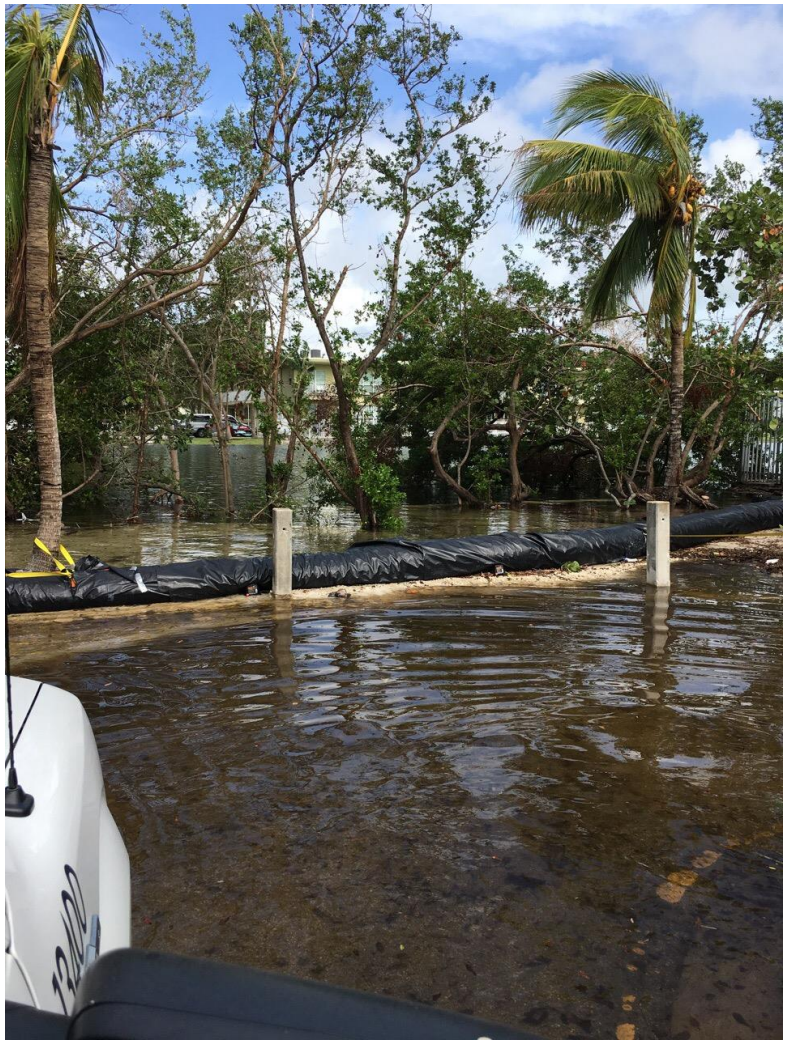
Types of Flooding

- Tidal
- Rainfall
- Storm Surge
- Combination of any of the above



Tidal Flooding

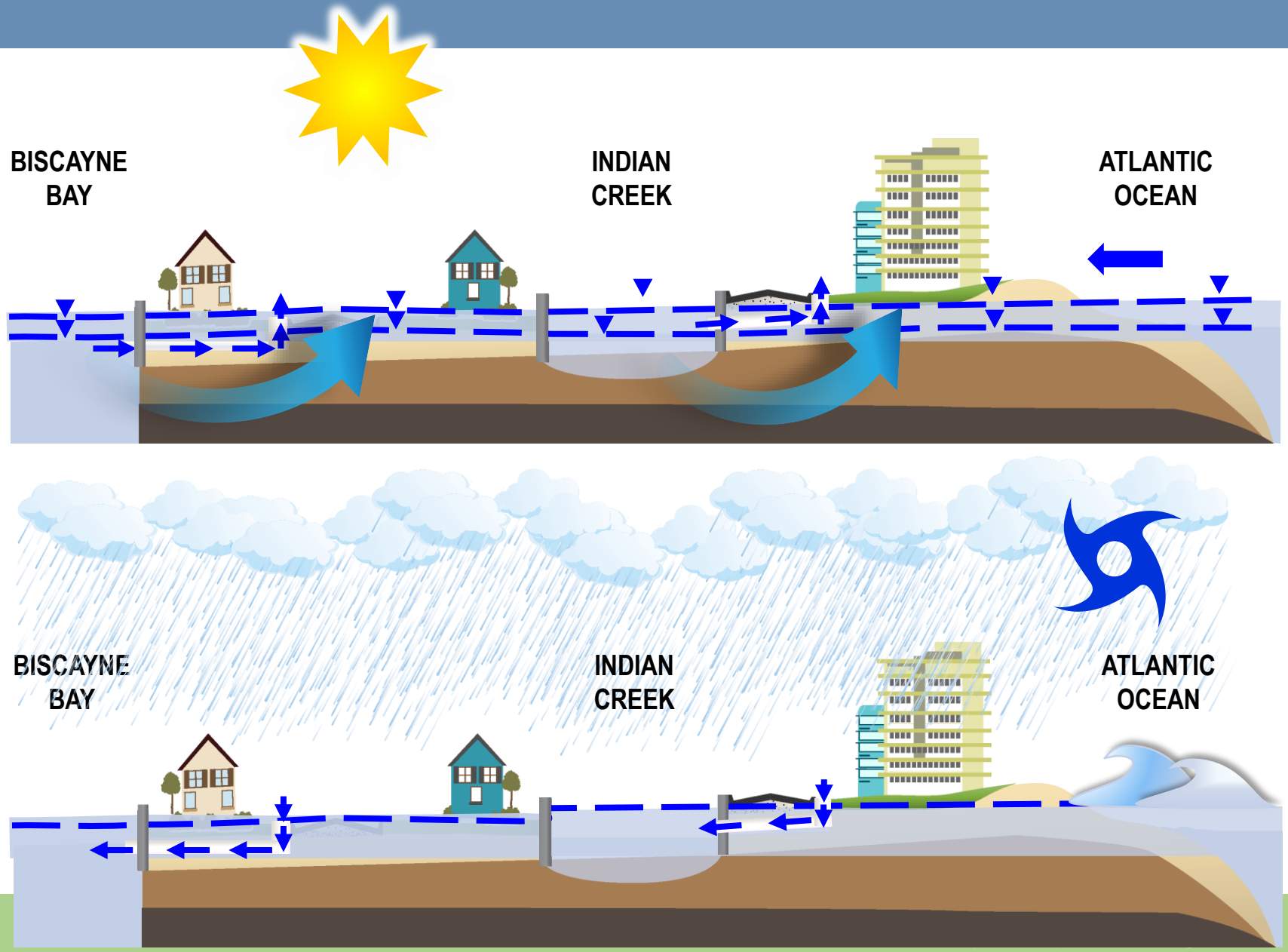
Rainfall Flooding

Flooding in Miami Beach, like all coastal cities, can come from 3 different sources, separately or together.

- Tidal flooding can occur on **sunny days**:
  - Through storm drains
  - Through groundwater
  - Exacerbated with SLR
  - Problematic in low lying areas

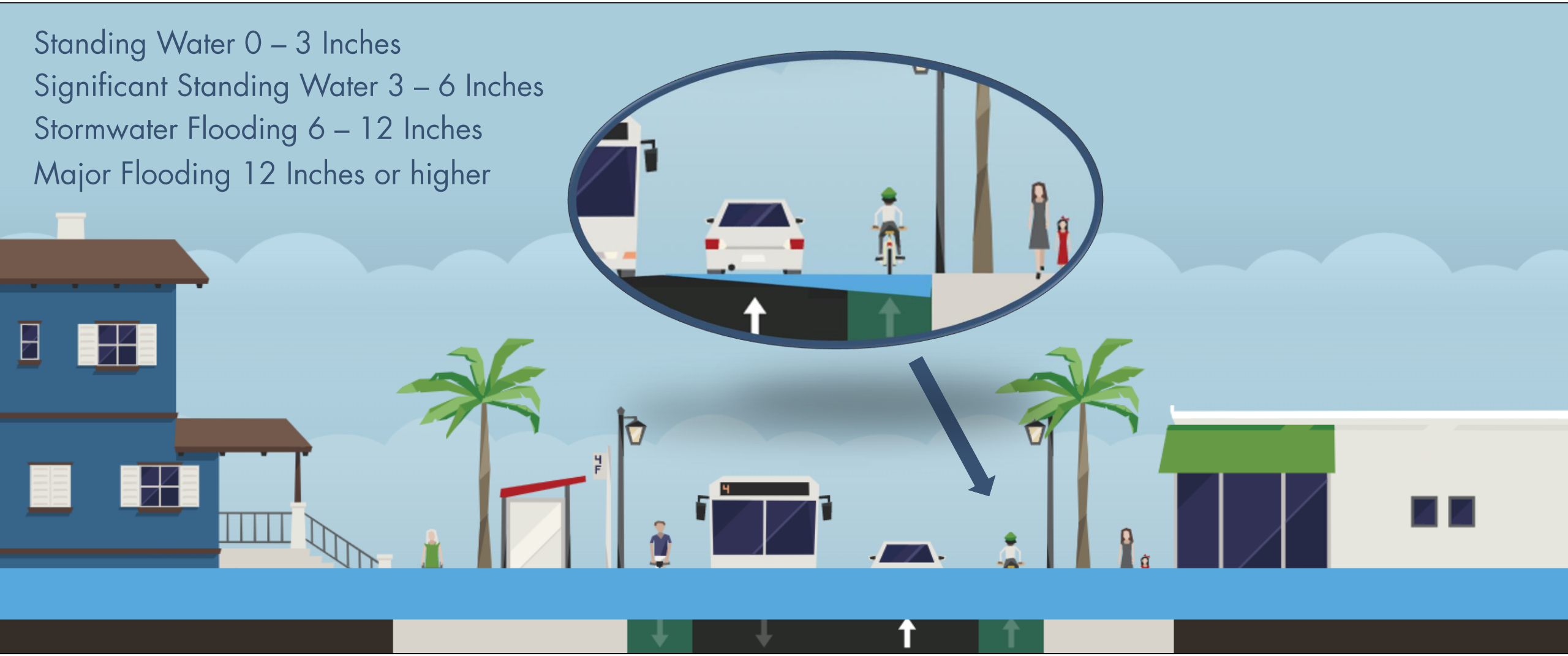
- **Rainfall flooding**

- **Storm Surge**
  - Overtopping of coastal barriers (ea. Seawalls)



How do we measure flooding?

Standing Water 0 – 3 Inches
Significant Standing Water 3 – 6 Inches
Stormwater Flooding 6 – 12 Inches
Major Flooding 12 Inches or higher



How NOAA Measures Flooding

Miami Beach Flood Category	NOAA Flood Category	Definition	Alerts	Examples
Standing Water (Miami Beach)	None	Minor puddle or standing water that doesn't present a risk to pedestrians, property owners or vehicular traffic.	• No Alerts needed	• Minor puddle on the street or sidewalk • The water doesn't overtop roads • Water drains reasonably fast • No affected infrastructure or traffic
Significant Standing Water (Miami Beach)	None	Partial roadway blockage that presents inconveniences to pedestrians and vehicles. Reasonable drainage time frame expected.	• Issue traffic alert	• Water is partially blocking streets and or sidewalks • Water drains reasonably fast • No damaged infrastructure but inconveniences to pedestrians and vehicular traffic
Stormwater Flooding (Miami Beach) **Comparable to NOAA minor and moderate flooding definitions**	None	Water that has risen and/or causing a complete obstruction of vehicular and pedestrian traffic on one or more streets in addition to impacting low-lying properties.	• Activate approved Flood Awareness Messages	• Water overtopping roads/sidewalks • Water causes complete obstruction of traffic • Water impacts low-lying properties • Potential damage to infrastructure
Stormwater Flooding (Miami Beach)	**Minor Flooding (NOAA)**	NOAA Definition: A general term indicating minimal or no property damage but possibly some public inconvenience.	• A **FLOOD ADVISORY** is issued to advise the public of flood events that are expected not to exceed the minor flood category.	• Water over banks and in yards • No building flooded, but some water may be under buildings built on stilts (elevated) • Personal property in low lying areas needs to be moved or it will get wet • Water overtopping roads, but not very deep or fast flowing
Stormwater Flooding (Miami Beach)	**Moderate Flooding (NOAA)**	NOAA Definition: The inundation of secondary roads; transfer to higher elevation necessary to save property -- some evacuation may be required.	• A **FLOOD WARNING** should be issued if moderate flooding is expected during the event.	• Several buildings flooded with minor or moderate damage • Various types of infrastructure rendered temporarily useless • Elders and those living in the lowest parts of the village are evacuated to higher ground • Access to the airstrip is cut off or requires a boat
Major Flooding (Miami Beach) A general term including extensive inundation and property damage. (Usually characterized by the evacuation of people and the closure of both primary and secondary roads).	**Major Flooding (NOAA)**	NOAA Definition: A general term including extensive inundation and property damage. (Usually characterized by the evacuation of people and livestock and the closure of both primary and secondary roads).	• A **FLOOD WARNING** could be issued if major flooding is expected during the event.	• Many buildings flooded, some with substantial damage or destruction • Infrastructure destroyed or rendered useless for an extended period of time • Multiple homes are flooded or moved off foundations • Everyone in threatened area is asked to evacuate

How do we categorize flooding?

Standing Water

Definition: 0 to 3 inches
Minor puddle or standing water that doesn't present a risk to pedestrians, property or vehicular traffic.

Significant Standing Water

Definition: 3 to 6 inches
Partial roadway blockage that presents inconveniences to pedestrians and vehicles. Reasonable drainage time frame expected.

How do we categorize flooding? (cont.)

Stormwater Flooding

Definition: 6 to 12 inches

Water that has risen and/or causing a complete obstruction of vehicular and pedestrian traffic on one or more streets in addition to impacting low-lying properties. This is comparable to the NOAA minor or moderate flooding definitions.

How do we categorize flooding? (cont.)

Pictures taken during Tropical Storm Emily

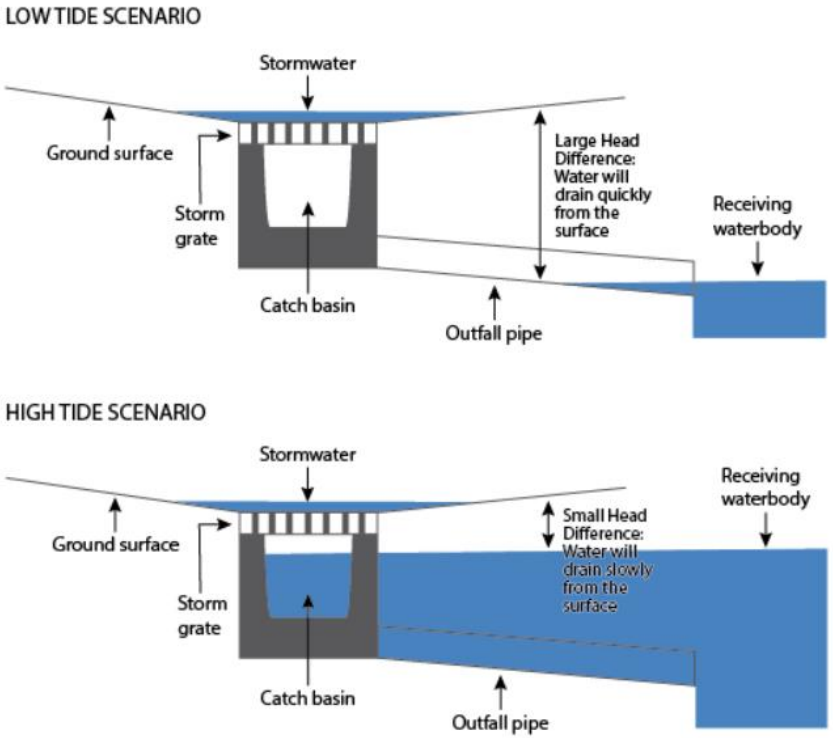
Major Flooding

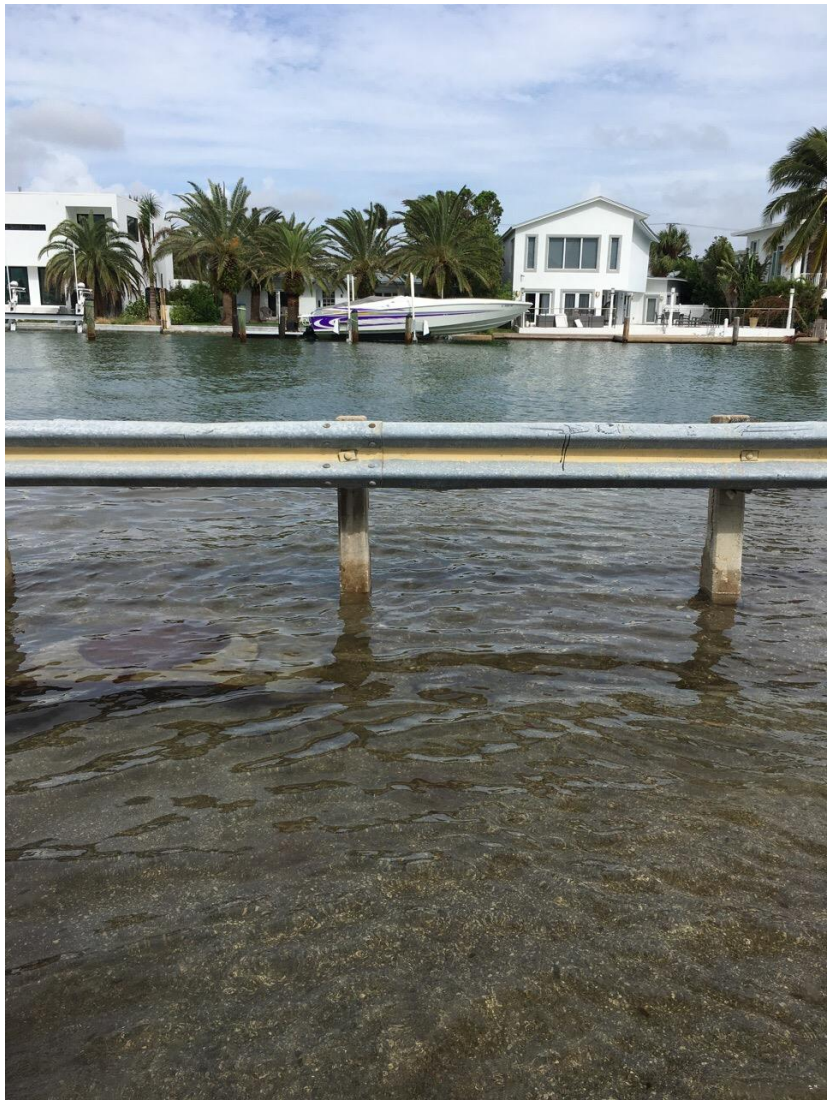
Definition: 12 inches or more

A general term including extensive inundation and property damage. (Usually characterized by the evacuation of people and the closure of both primary and secondary roads.) This category can be used for major sudden rain events and named storms.

High tides can only make any rain event worse:

- Storm sewer gravity system capacity becomes limited or null
- Low laying areas may already be flooded by the time it begins to rain
- Degrades water quality
- Increased risks to public health
- Economic Impacts



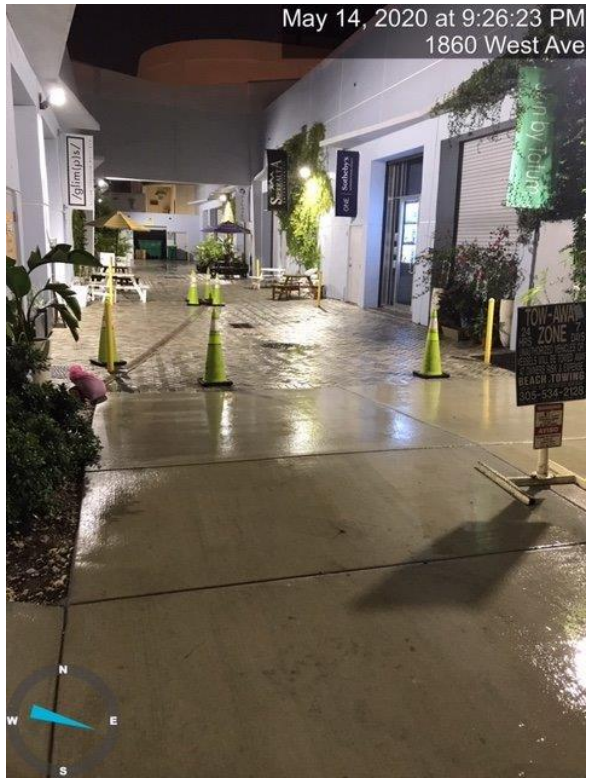


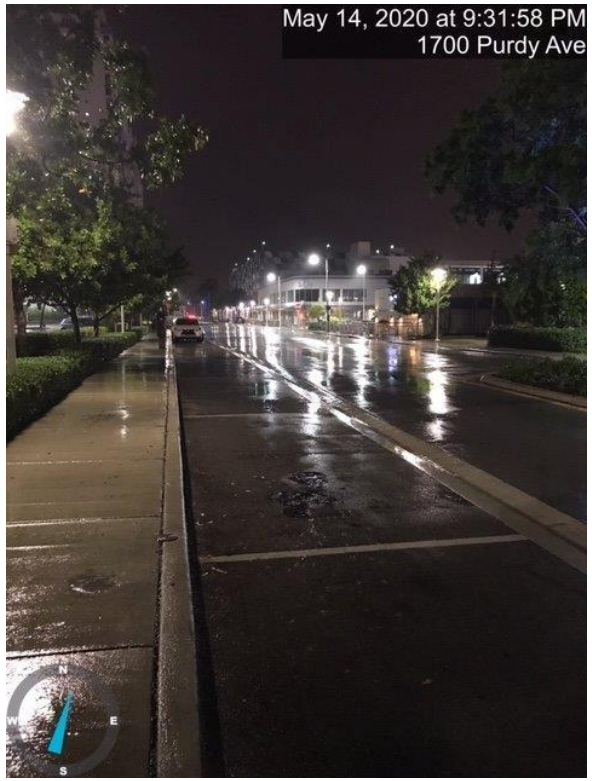
How do we report flooding?

- Reporting through community engagement and employee deployment during king tides and high intensity rain events.
- Control Room
- Cityworks
- MB eGov
- Crisis Track

City Personnel Site Visits / Rain Patrol

Rain patrolling occurs during high intensity events, qualified personnel performs a drive thru to identify potential issues and report them accordingly. In the event it is deemed necessary this personnel is also able to operate the pump stations.





Rain Event - Sunset Harbour 3pm-11pm shift

Querol, Yazmin
To Control Room Operators

Mon 9:25 PM

Good Evening:

Operator McClain patrolled the area and found no issues with standing water. All water was running into the storm drains which are clear and unobstructed.

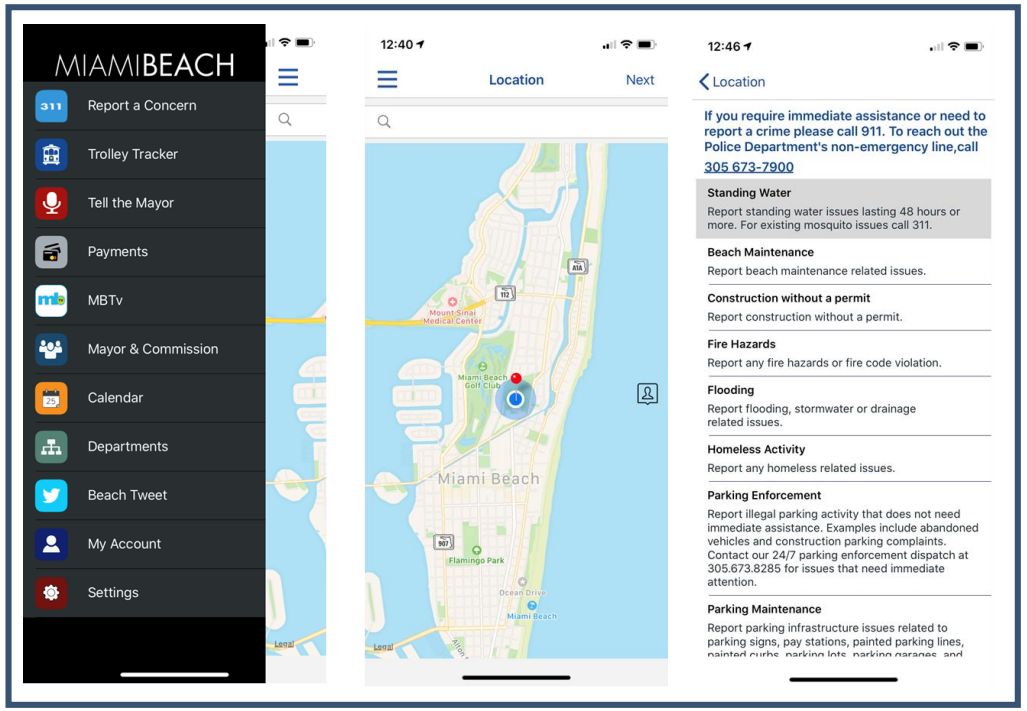
Respectfully

MIAMI BEACH
Yazmin Querol, Control Room Operator
PUBLIC WORKS DEPARTMENT / Operations Division
451 Dade Boulevard, Miami Beach, FL 33139
Tel:305-673-7625; Cell 305-684-0016; Fax: 305-673-7364
yazminquerol@miamibeachfl.gov

Photos and reporting email from patrolling operations on the evening of May 14th and early hours of May 15th

Egov / Call Center

- User friendly application, allows anyone with the app to report on multiple issues within the City including complaints of Standing Water or Flooding, complaints are automatically updated on CityWorks.
- Complaints received via phone call at the Control Room are also created in EGov.
- **Crews are deployed** to further investigate.
- App currently being updated to include the different categories of flooding.



EGov Application

Standing Water Concerns
May 15 - 19, 2020

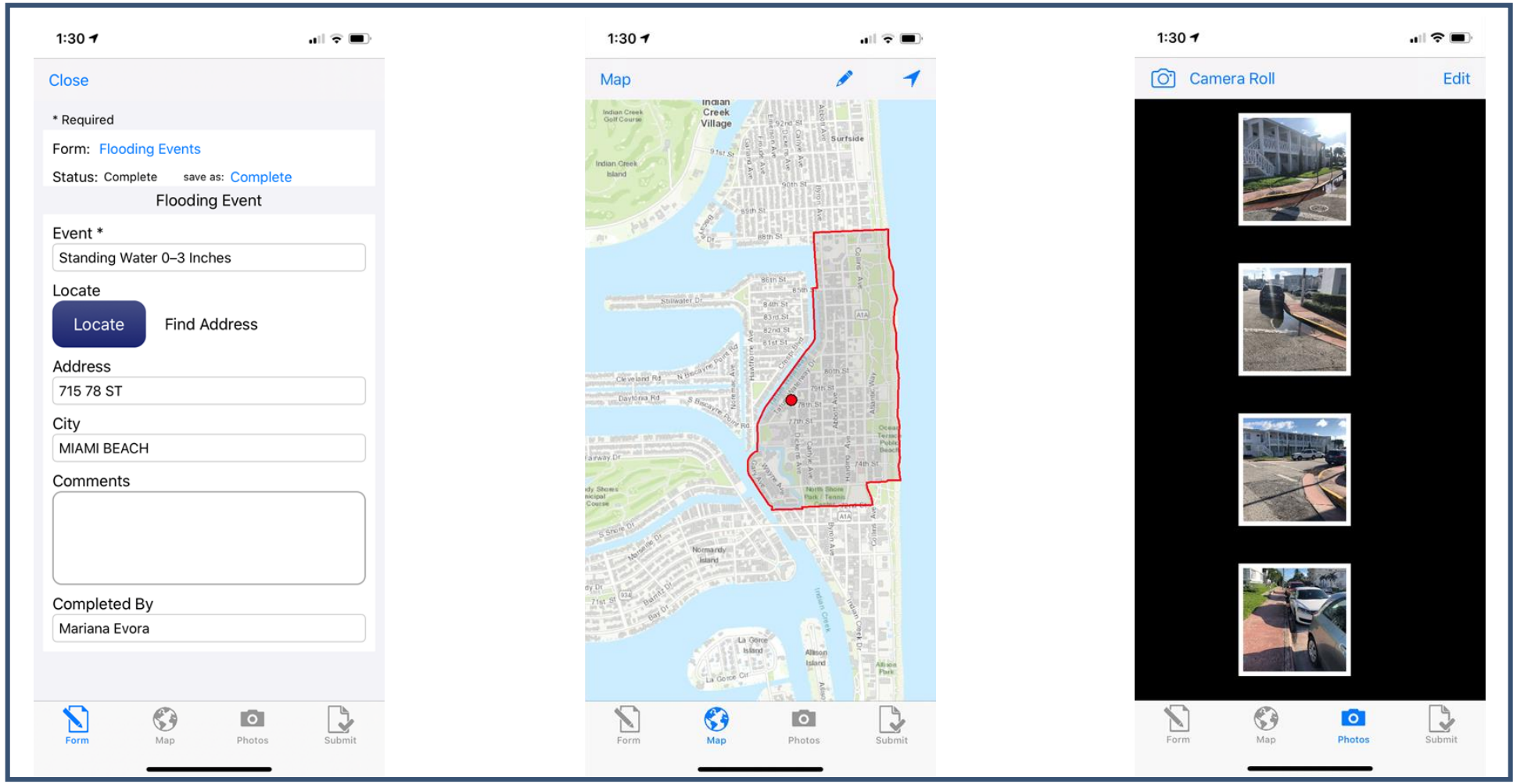
Request ID	Date Initiated	Description	Address
242694	05/15/2020 12:17	Stormwater Flooding (6-12 inches)	
242695	05/15/2020 12:18	Standing Water (0-3 Inches)	
242696	05/15/2020 12:19	Stormwater Flooding (6-12 inches)	
242697	05/15/2020 12:21	Stormwater Flooding (6-12 inches)	
242699	05/15/2020 01:56	Standing Water (0-3 Inches)	
242731	05/18/2020 08:59	Standing Water (0-3 Inches)	
242733	05/18/2020 09:14	Standing Water (0-3 Inches)	
242758	05/18/2020 03:30	Standing Water (0-3 Inches)	
242766	05/18/2020 08:18	Standing Water (0-3 Inches)	
242769	05/19/2020 08:37	Stormwater Flooding (6-12 inches)	
242794	05/19/2020 07:43	Standing Water (0-3 Inches)	

Complaints received via Phone Call

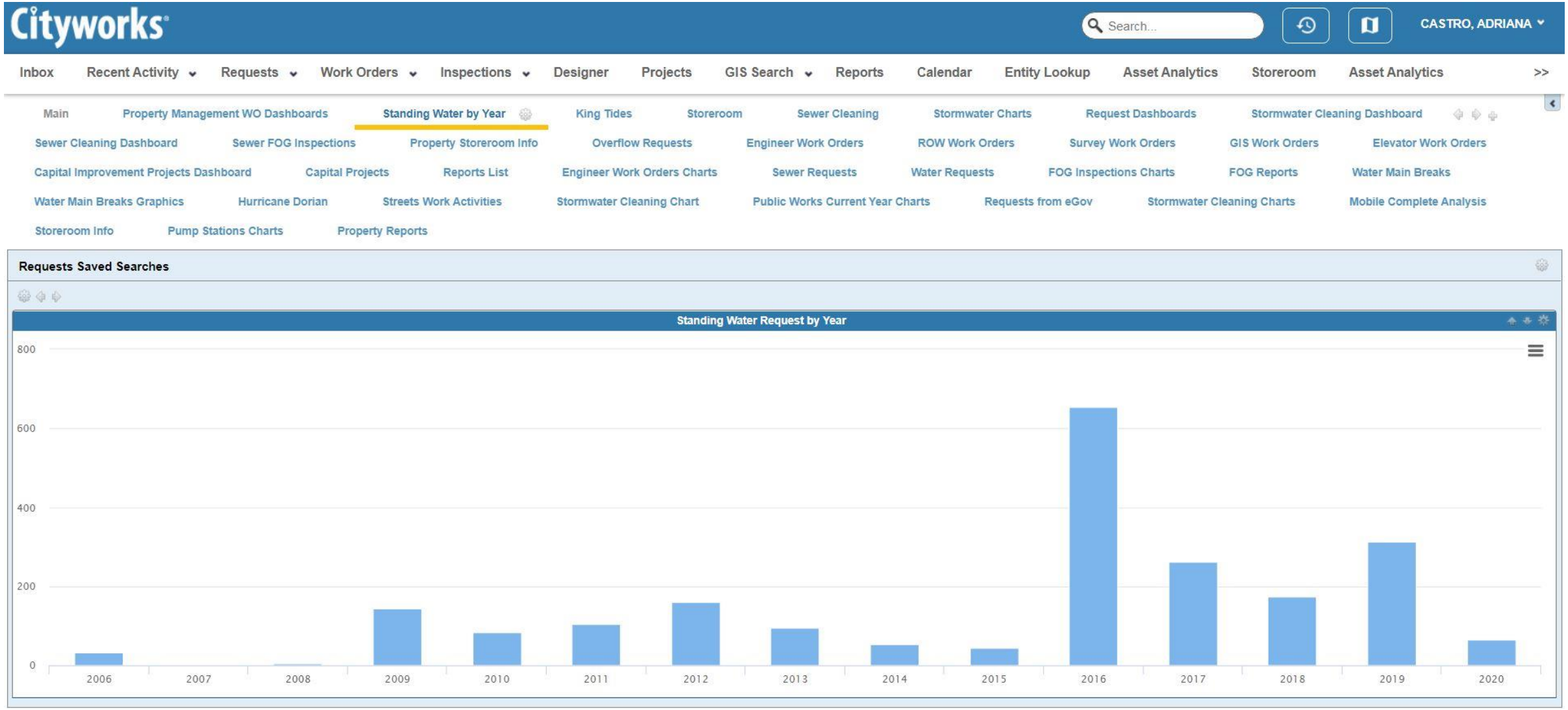
Request ID 242696

CrisisTrack

During predicted **high tide** events and **high intensity rain events** the Engineering group is deployed to different locations city-wide to report on conditions for record keeping and planning purposes:
This tool allows a fast and accurate tracking of the reporting with detailed data on the route surveyed and data gathered.



CityWorks Dashboard – Record of Complaints



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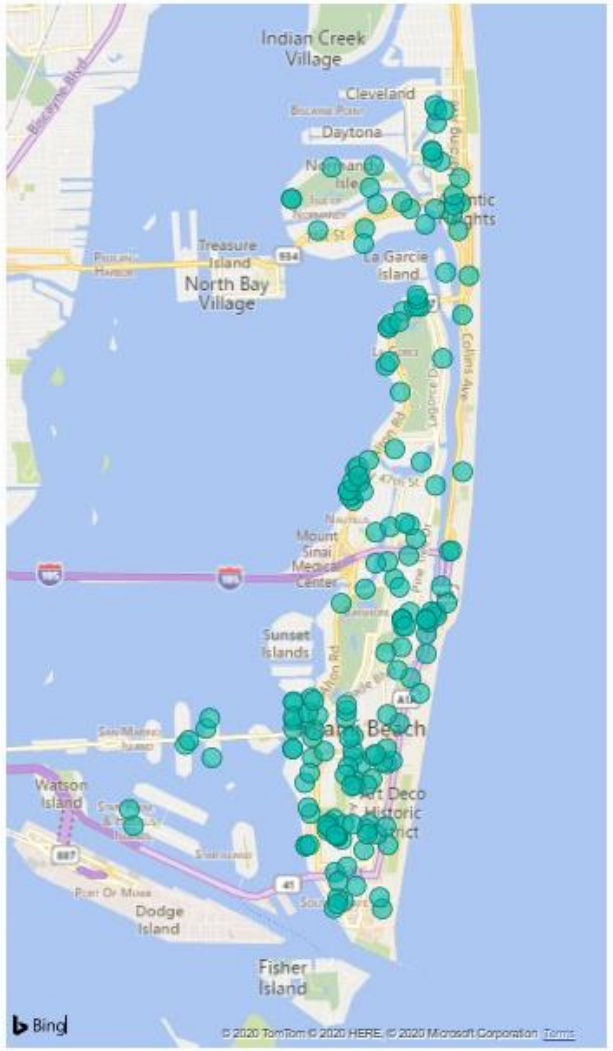
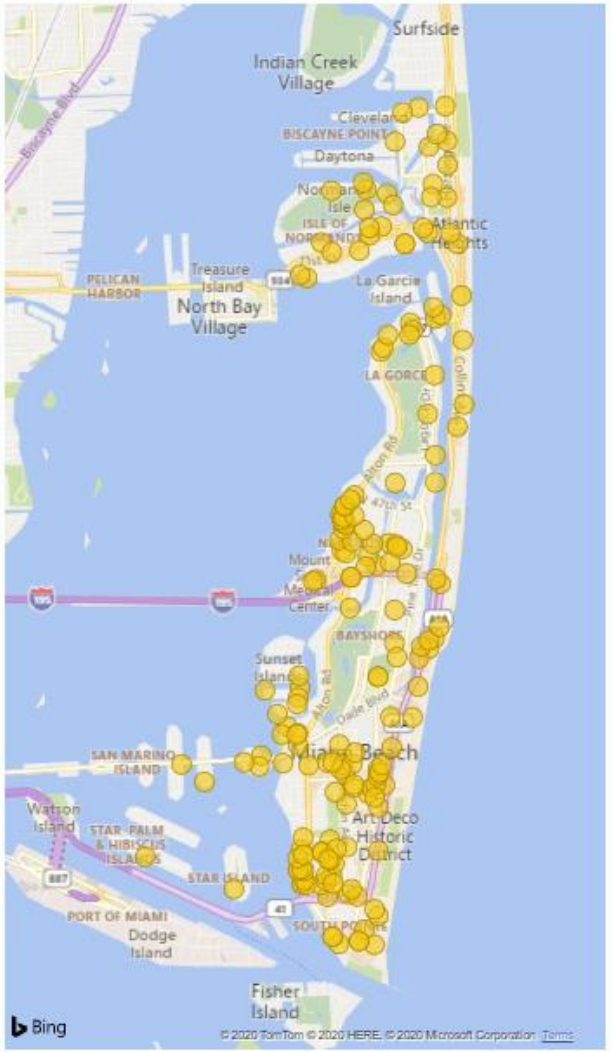
Flooding Requests & Work Orders

Flooding Requests and Work Orders by Location

Flood Requests Locations



Flood Work Orders Locations



Filter Data by Date

1/1/2019 12/31/2019

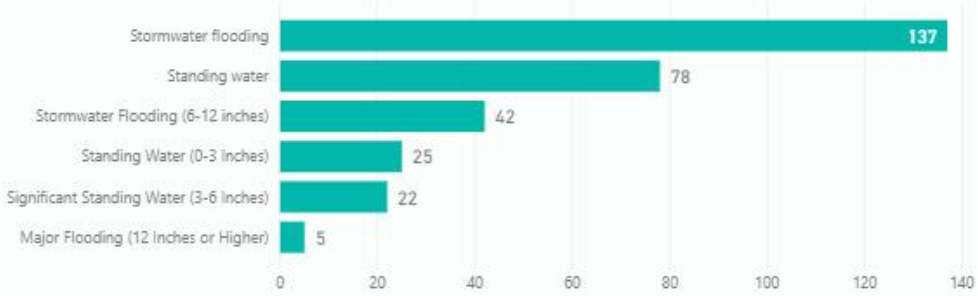
Apply

Flood requests are initiated by residents to report standing water or flooding. The requests are submitted through the city's eGov app or through the control room.

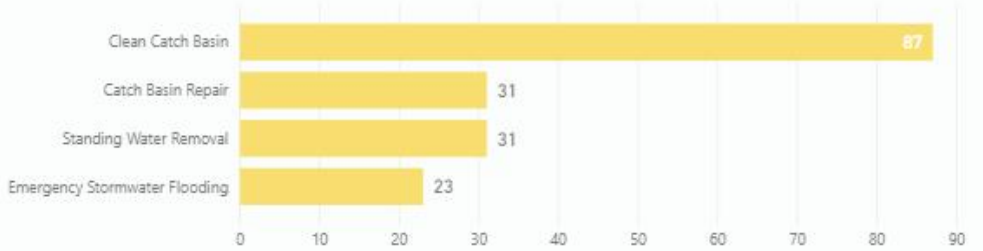
Work orders are initiated by Public Works Operations to respond to standing water and flooding issues.

Note that one work order may address multiple standing water/flood requests.

Flood and Drainage Related Requests By Description



Flood and Drainage Related Workorders By Description



Stormwater Dashboard – 2019 Summary

Stormwater Management Dashboard

From: To:
1/1/2019 12/31/2019
Apply

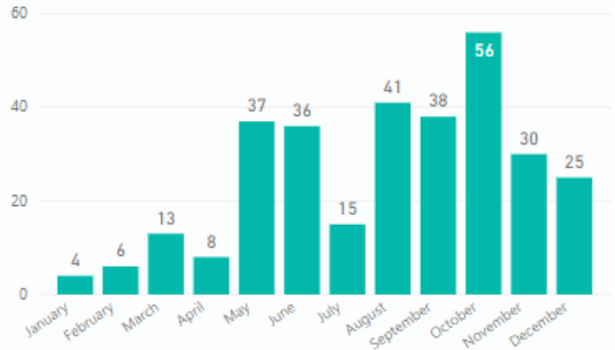
Flood and Drainage Related Events Resolved Within 5 Days
63.1%

Number of Flood and Drainage Related Events
309

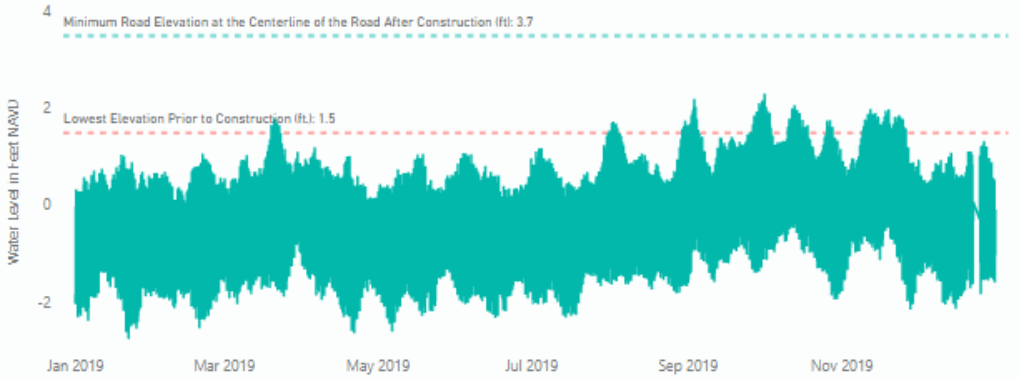
Number of Tidal Flooding Incidents Avoided Due to Road Raising (Sunset Island)
56

Display Help

Flood and Drainage Related Events by Date

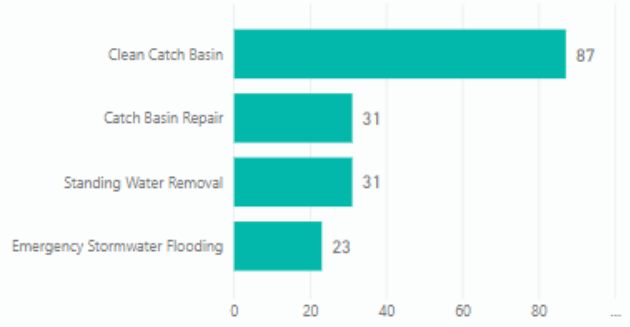


Avoided Tidal Flooding in Sunset Harbour

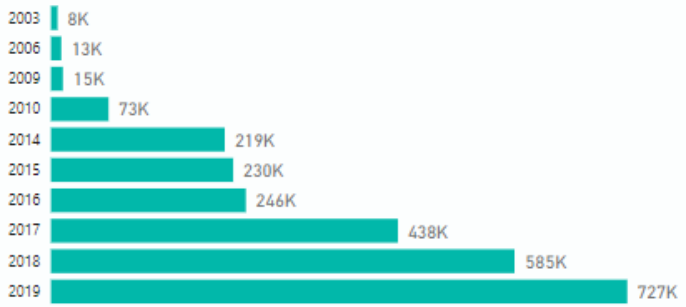


Date	Location	Tidal Level
11/26/2019	Sunset	1.59
11/25/2019	Sunset	1.79
11/24/2019	Sunset	1.83
11/23/2019	Sunset	1.86
11/22/2019	Sunset	1.83
11/21/2019	Sunset	1.68
11/20/2019	Sunset	1.69
11/19/2019	Sunset	1.98
11/18/2019	Sunset	1.96
11/17/2019	Sunset	1.76
11/16/2019	Sunset	1.68

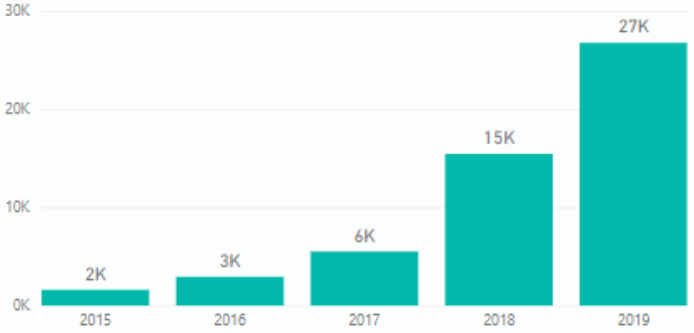
Flood and Drainage Related Work Orders By Description



Pump Capacity Cum. Increase (Gallons per Minute)



Linear Feet of Cumulative Elevated Roadways



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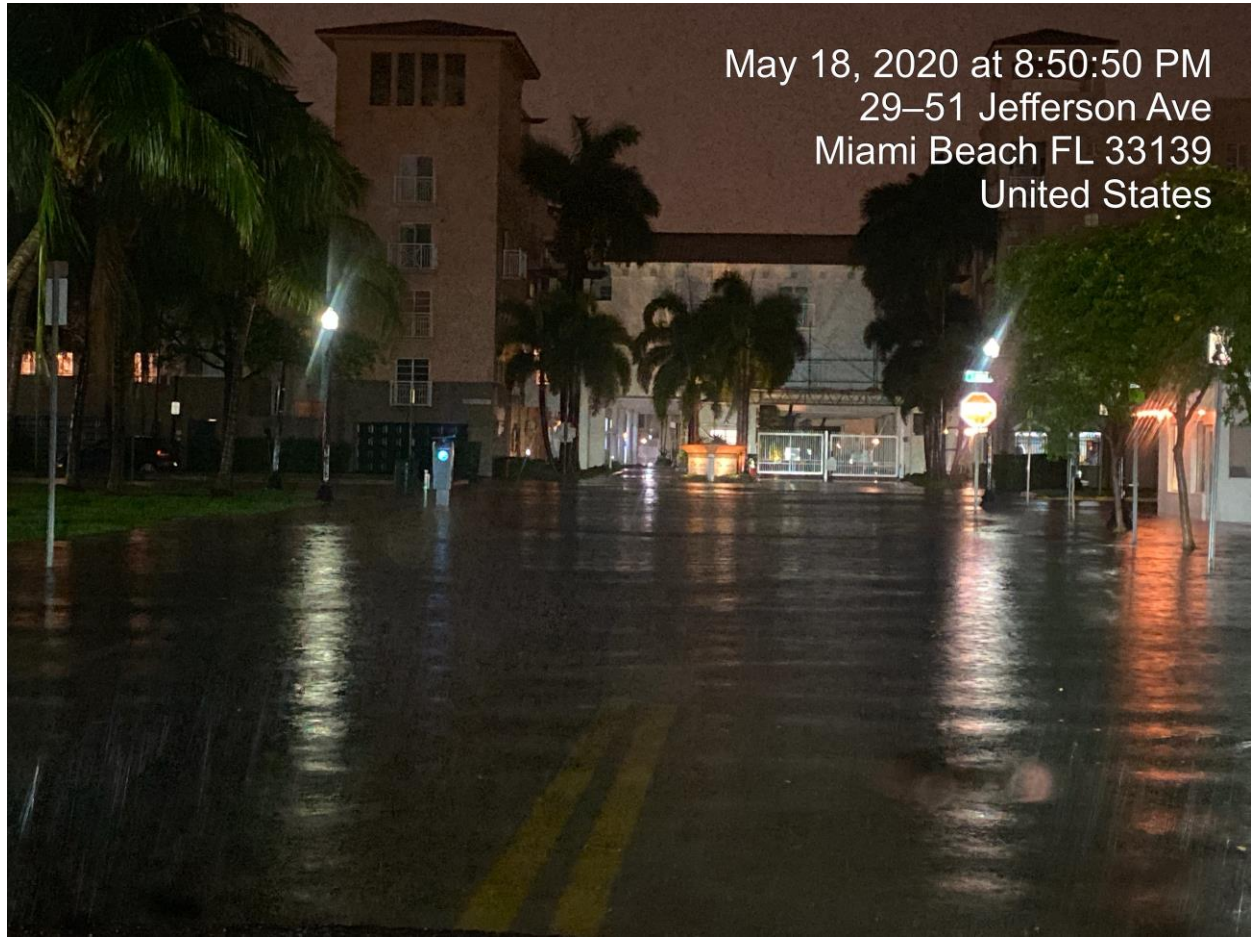
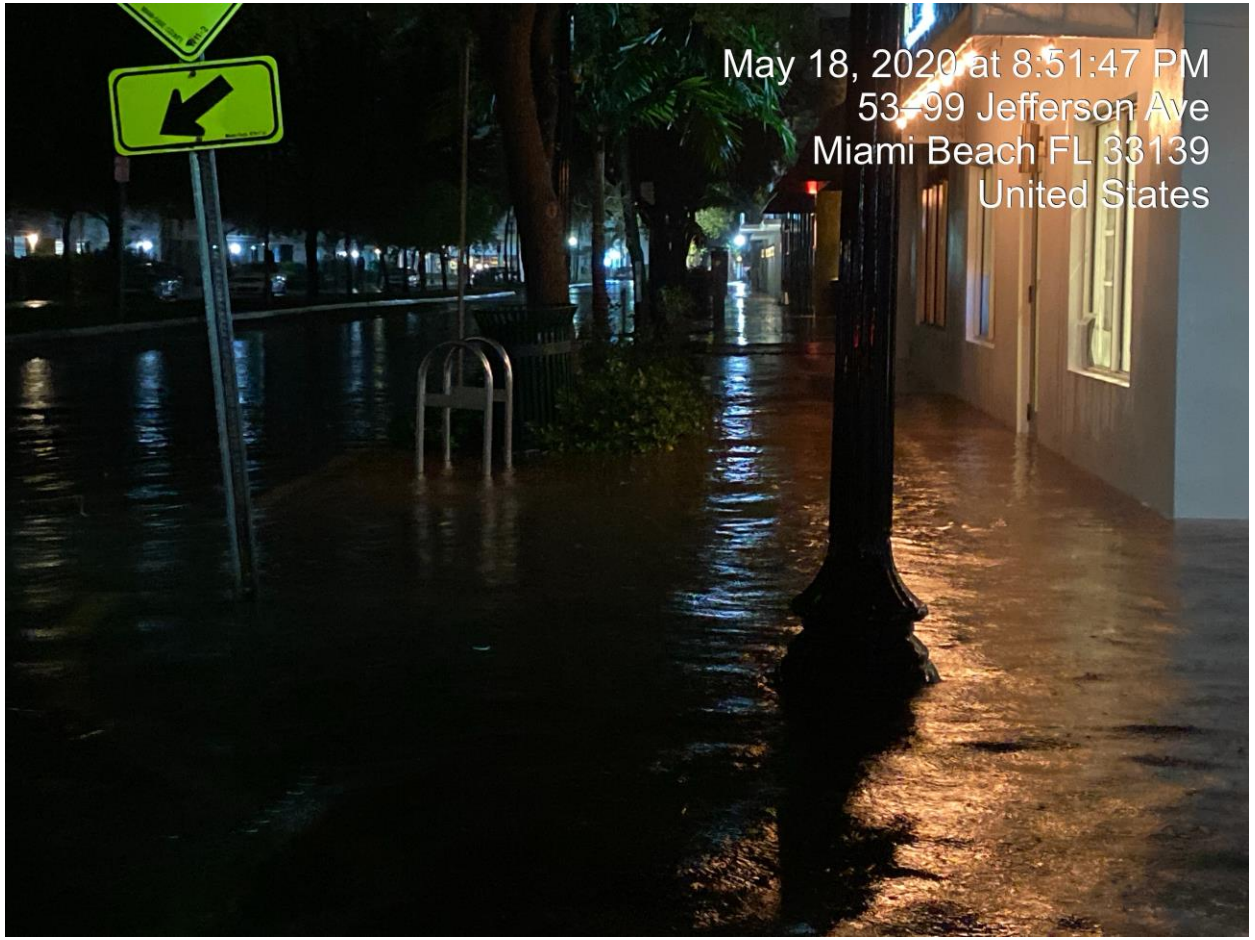
Rainfall Flooding – 1St Street - 0.97 inches in 1.5 hrs

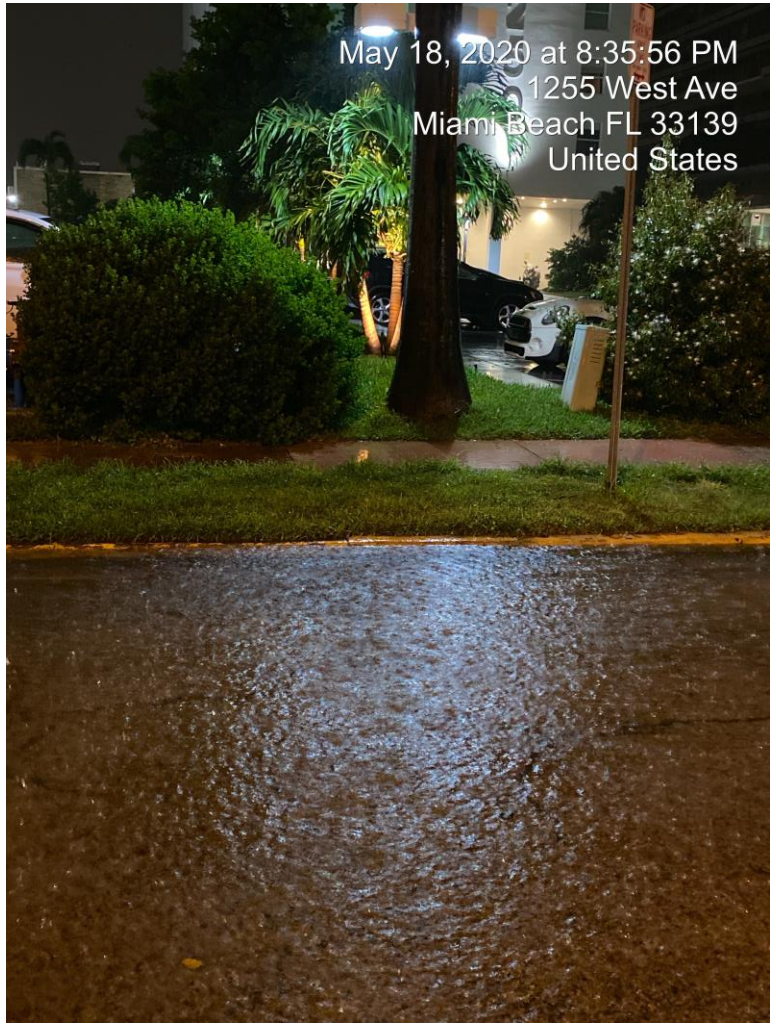


Stormwater Flooding

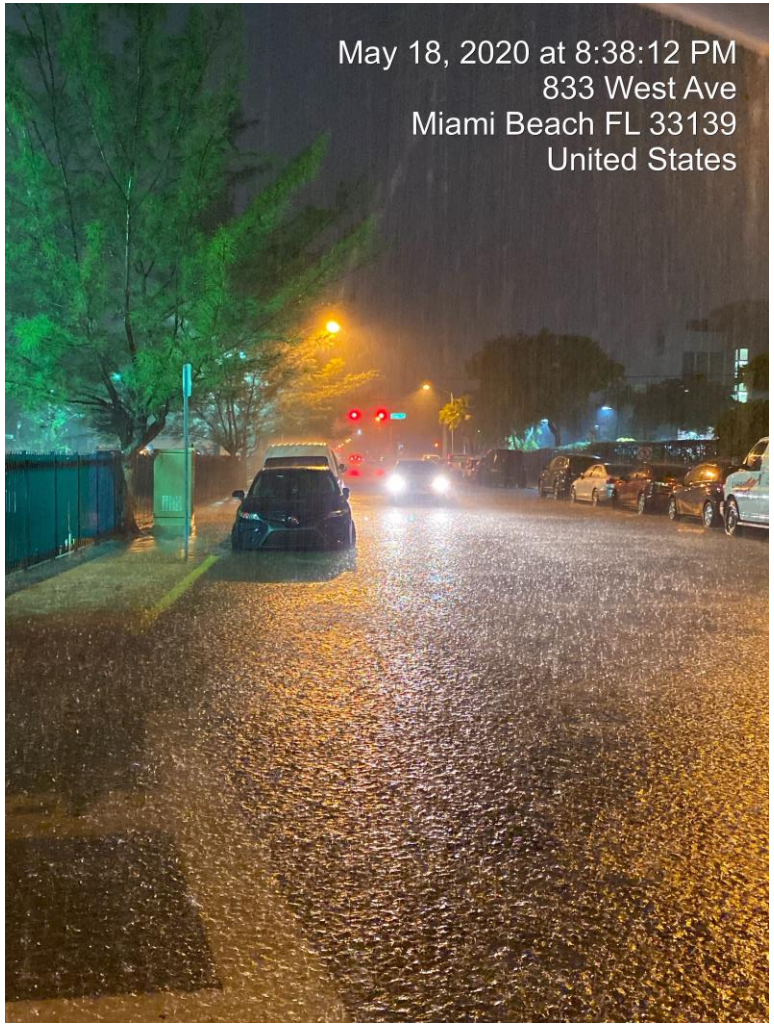


Stormwater Flooding

Rainfall Flooding – West Ave - 0.97 inches in 1.5 hrs



Significant Standing Water



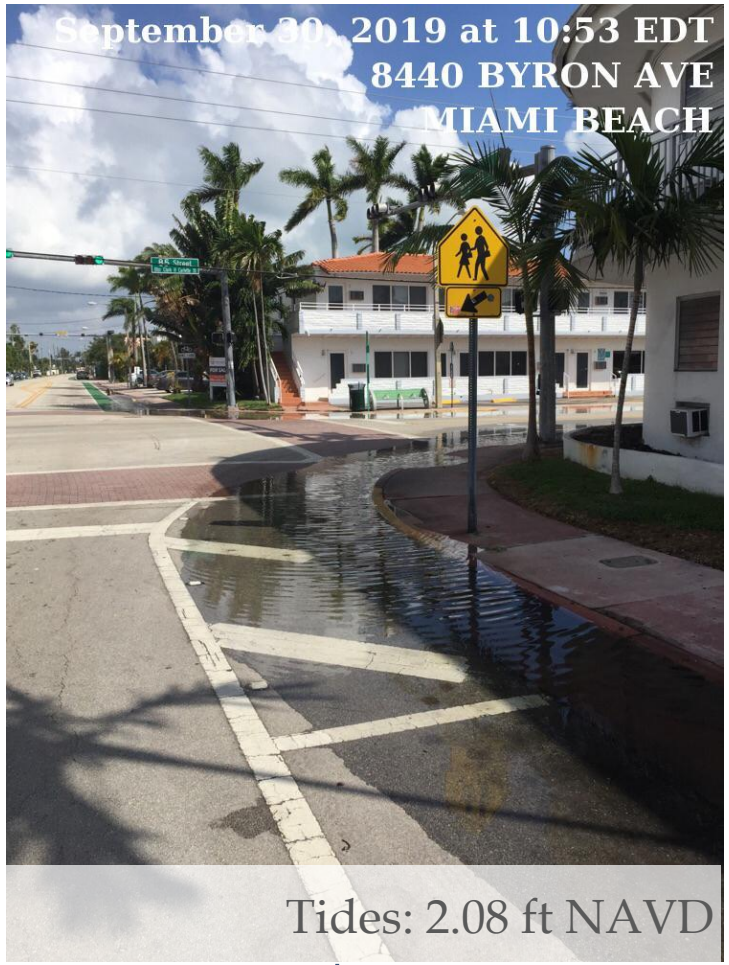
Stormwater Flooding

Stormwater Flooding

King Tides 2019 in photos

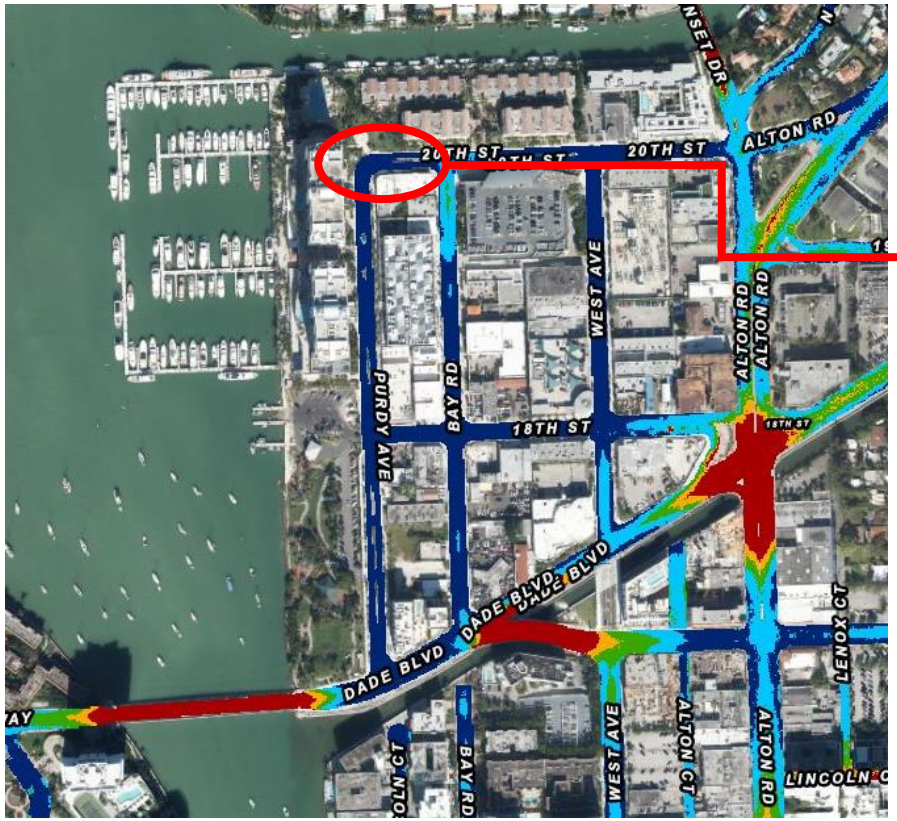
Significant Standing Water

Stormwater Flooding



Standing Water

Our Program is Working

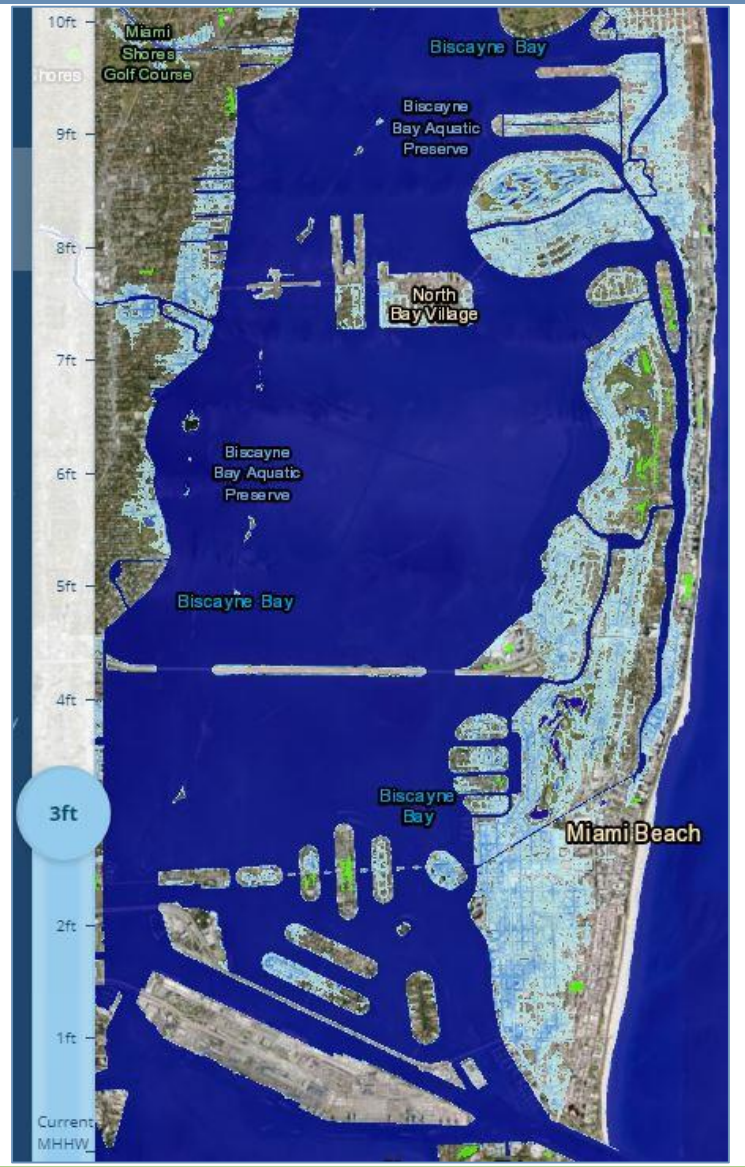


Palm and Hibiscus Islands

September 3rd, 2019
Combined King Tides
Hurricane Dorian Storm Surge
Tide Elevations: 2.05' NAVD

Questions?

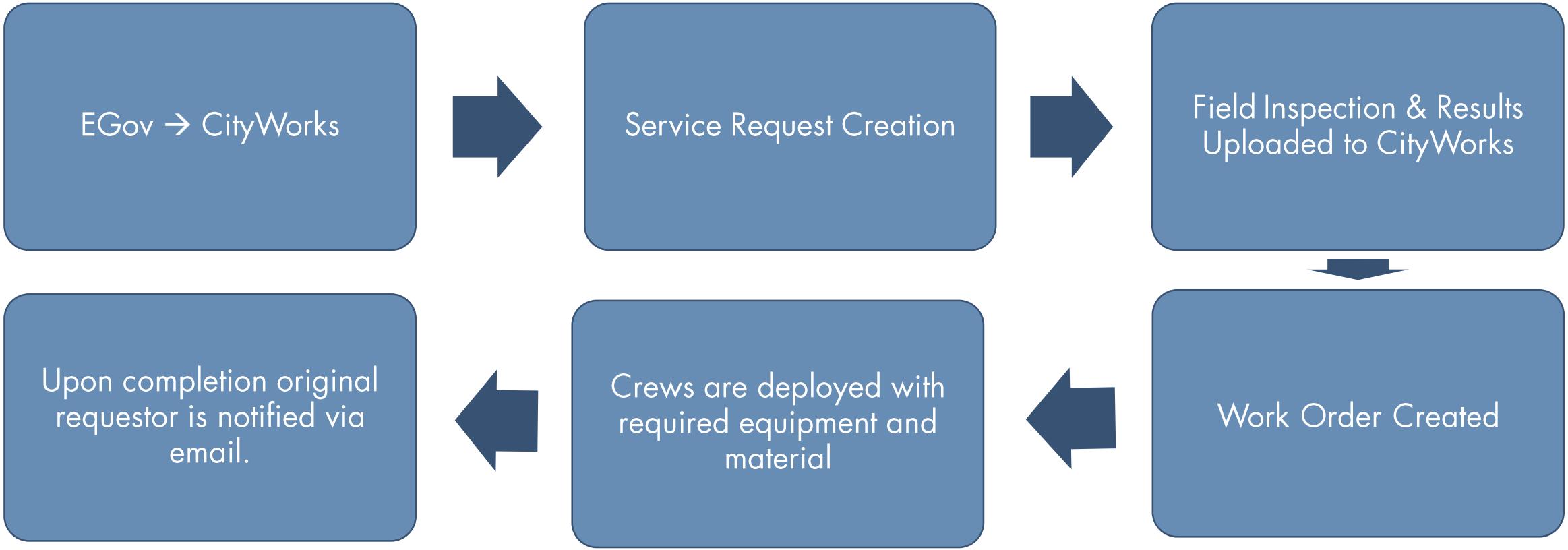
Elevation Challenges



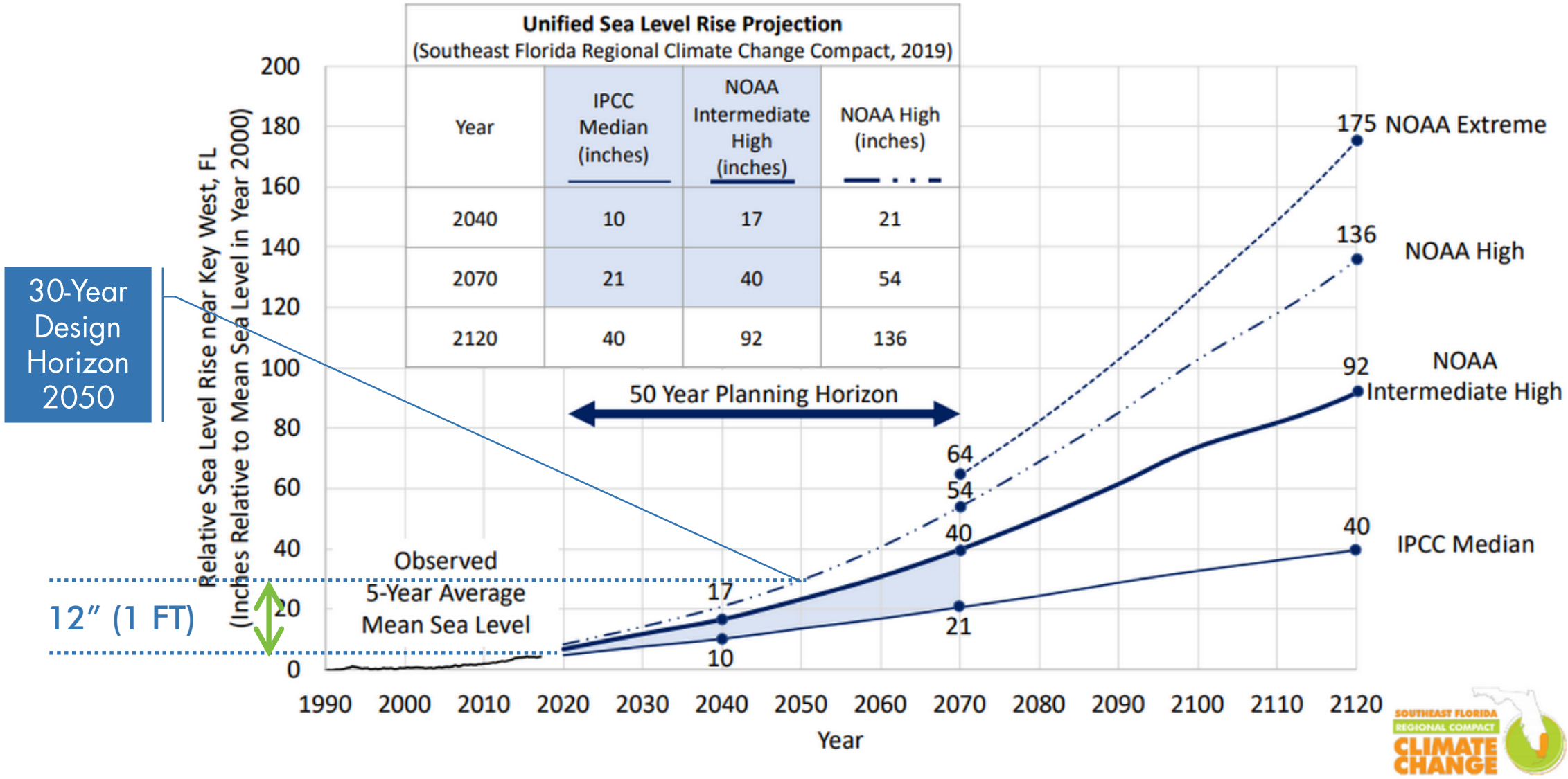
CityWorks

Comprehensive tool used for reporting and tracking.
All Data collected is entered into EGov which automatically uploads it to CityWorks

CityWorks Process:



2019 SLR Projections



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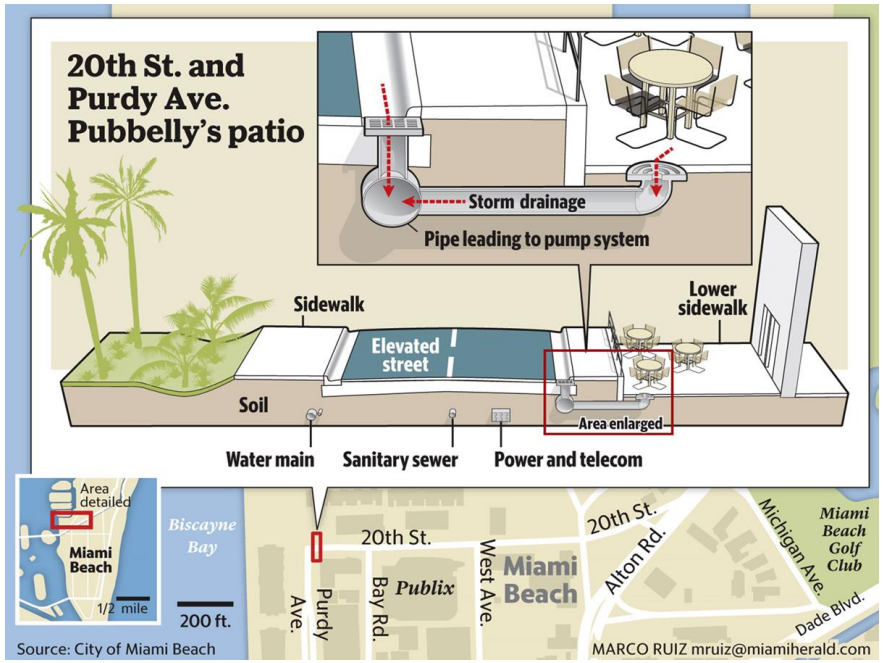
Basic strategy of flood risk reduction

- Elevate roads and seawalls to mitigate tidal flooding
- Install pipes with more capacity and pumps to manage storm water

2.8 ft
Hurricane Irma
Sept 10 - 2017

2.3 ft
KING TIDES
Oct 5 -2017

1.7 ft
Old Crown
Road Elev.



Flood Mitigation Results

18th Street and Bay Road

BEFORE

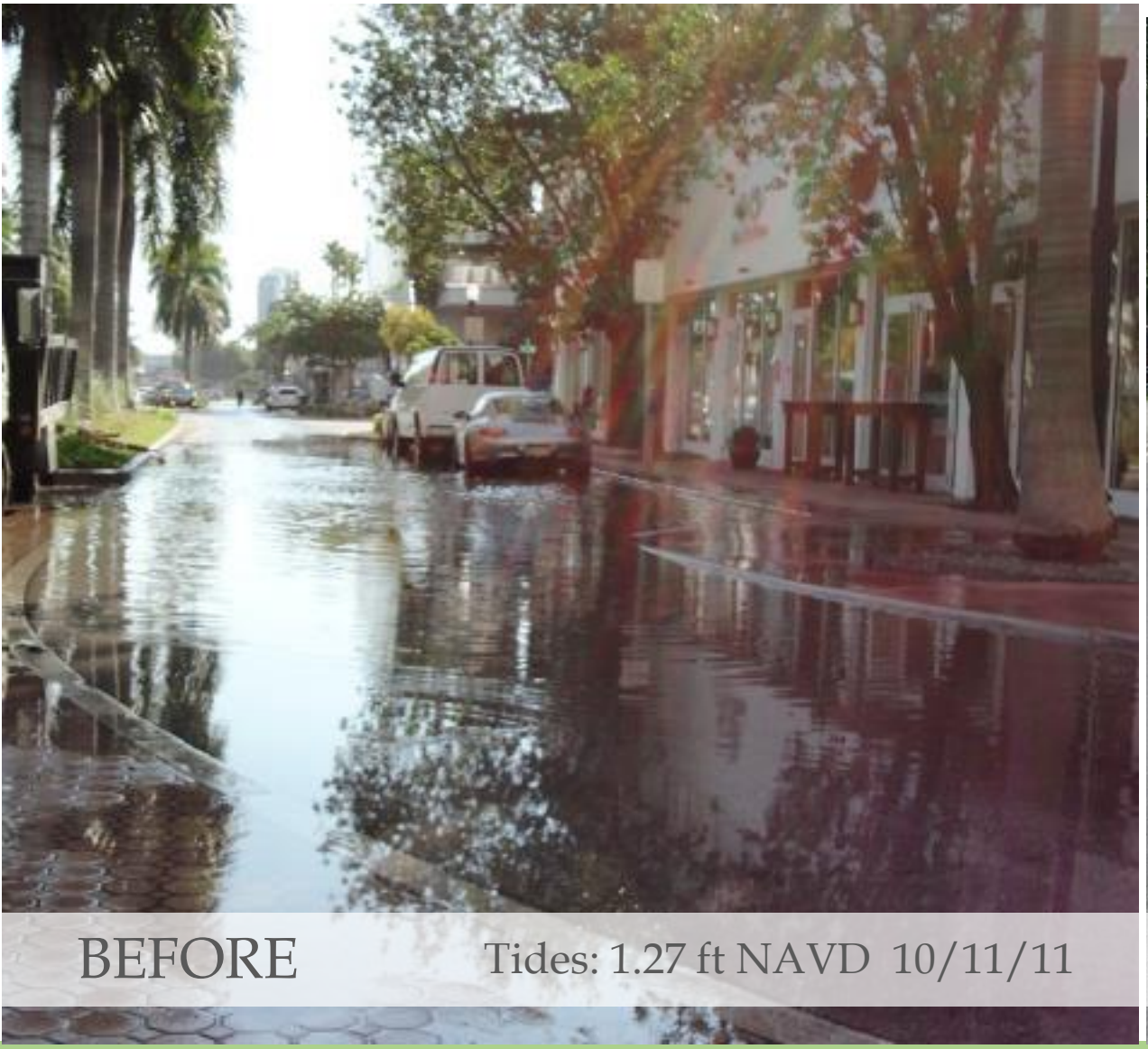
Tides: 1.27 ft NAVD 10/11/11

AFTER

Tides: 1.88 ft NAVD 10/15/19

Flood Mitigation Results

Purdy Ave and 20th Street



BEFORE Tides: 1.27 ft NAVD 10/11/11

AFTER Tides: 1.88 ft NAVD 10/15/19

Flood Mitigation Results

Purdy Ave - Dade Blvd

BEFORE Tides: 2.00 ft NAVD 10/29/12

AFTER Tides: 1.88 ft NAVD 10/15/19

Flood Mitigation Results

Palm Island 303 North Coconut Ln

BEFORE Tides: 1.42 ft NAVD

AFTER Tides: 1.88 ft NAVD 10/15/19

Flood Mitigation Results

Palm Island 316 South Coconut Ln

BEFORE

Tides: 1.40 ft NAVD 10/17/12

AFTER

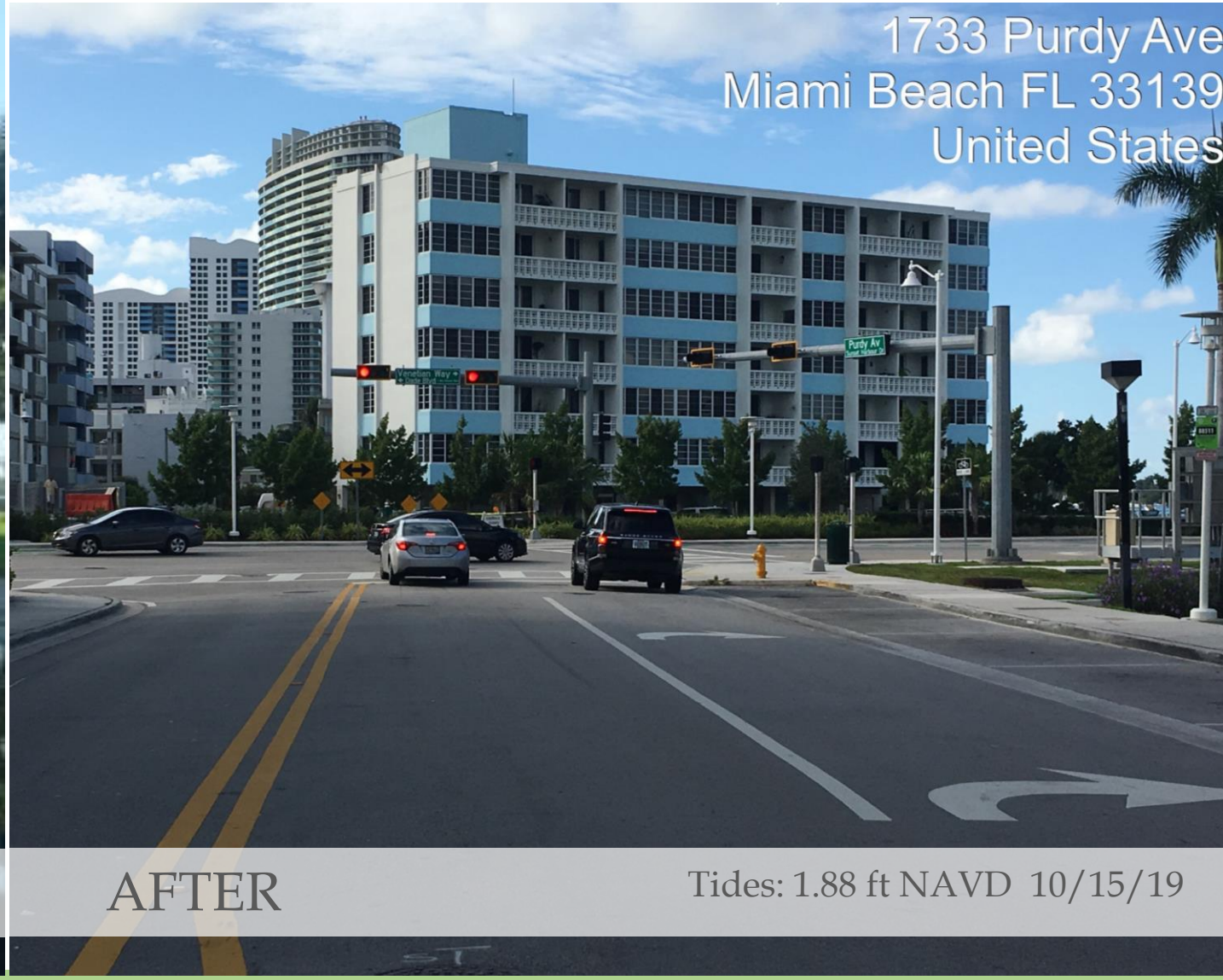
Tides: 1.88 ft NAVD 10/15/19

Flood Mitigation Results

Purdy Ave and Dade Blvd

BEFORE

Tides: 1.27 ft NAVD 10/11/11



AFTER

Tides: 1.88 ft NAVD 10/15/19

King Tides 2019 in photos

Flood Mitigation Results

Dade Blvd and Purdy Ave