Mapping Flood and Climate Hazards to Guide Resilience Planning

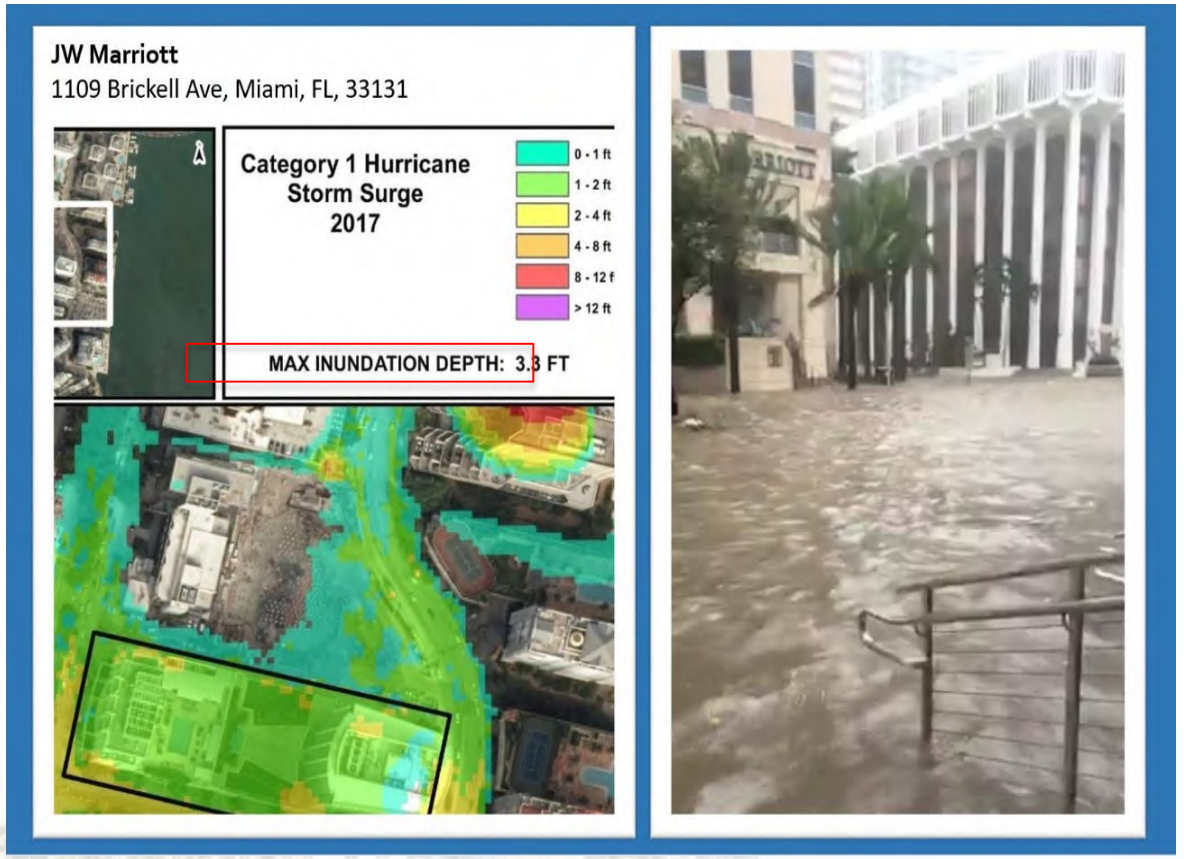
Hilary Stevens

COASTAL RISK CONSULTING

What Has Coastal Risk Created?

- Holistic flood and natural hazard risk modeling **and** risk communication
- Includes four types of flood risks:
  - Riverine
  - Heavy Precipitation
  - Storm surge
  - Tidal/sea level rise
- Automated risk reports for every property in the US

Hurricane Irma, Brickell Ave., Miami, FL



Coastal Risk Model **Actual Flooding**

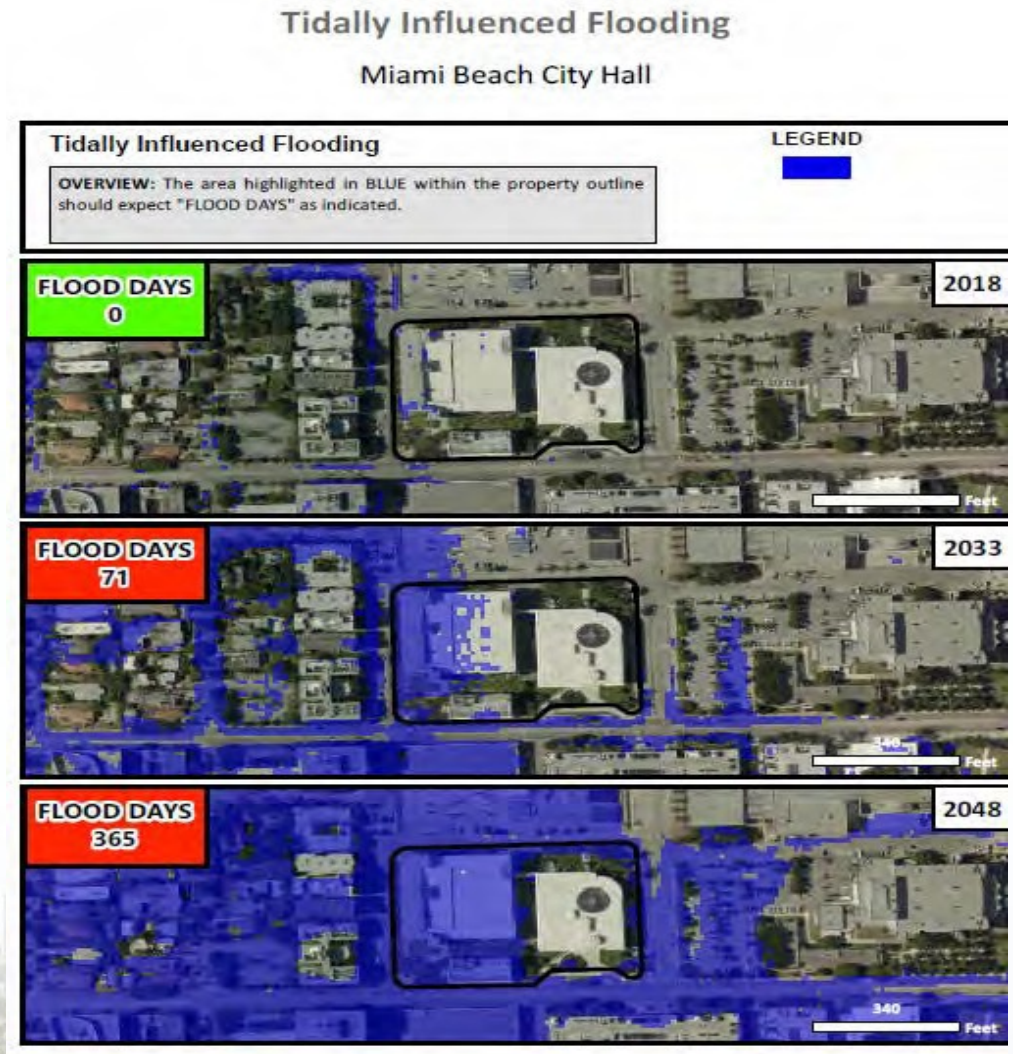
COASTAL RISK CONSULTING

What's the "Fuel" that Runs the "Engine"?

1. LIDAR elevation/DEMs
2. Property boundary data
3. Tide gauge data
4. Riverine models (not just FEMA)
5. Sea Level Rise Models
6. Storm Surge Models (NOAA, etc.)
7. Groundwater and Soils data
8. Erosion and land-subsidence
9. Other Natural Hazard risks

Coastal Risk Models Tidal Flooding/Sea Level Rise

- Coastal Risk calculates the number of tidal flood days on the property, now and in the future
- Highly visual reports



COASTAL RISK CONSULTING

Christ and St. Luke's Church, Norfolk VA

- 110 year old historic building
- basement floods
- street flooding limiting access

COASTAL RISK CONSULTING

Tidal Flooding

Christ and St. Luke's Episcopal Church,
560 West Olney Road, Norfolk, VA 23507
Flood Inundation Risk Score and Table (FIRST SCORE™)

Date Range	2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045
# Total Tidal Flood Days	9	21	40	72	129	264
Risk Meter						

CUMULATIVE FIRST SCORE™ = 535

COASTAL RISK CONSULTING

Miami Shores Village Case Study

- Small municipality (population ~10K) adjacent to Miami
- Almost entirely residential, including high value waterfront
- Climate impacts currently experienced:
  - Seawall overtopped during Irma
  - King tide flooding
  - Septic tank failure

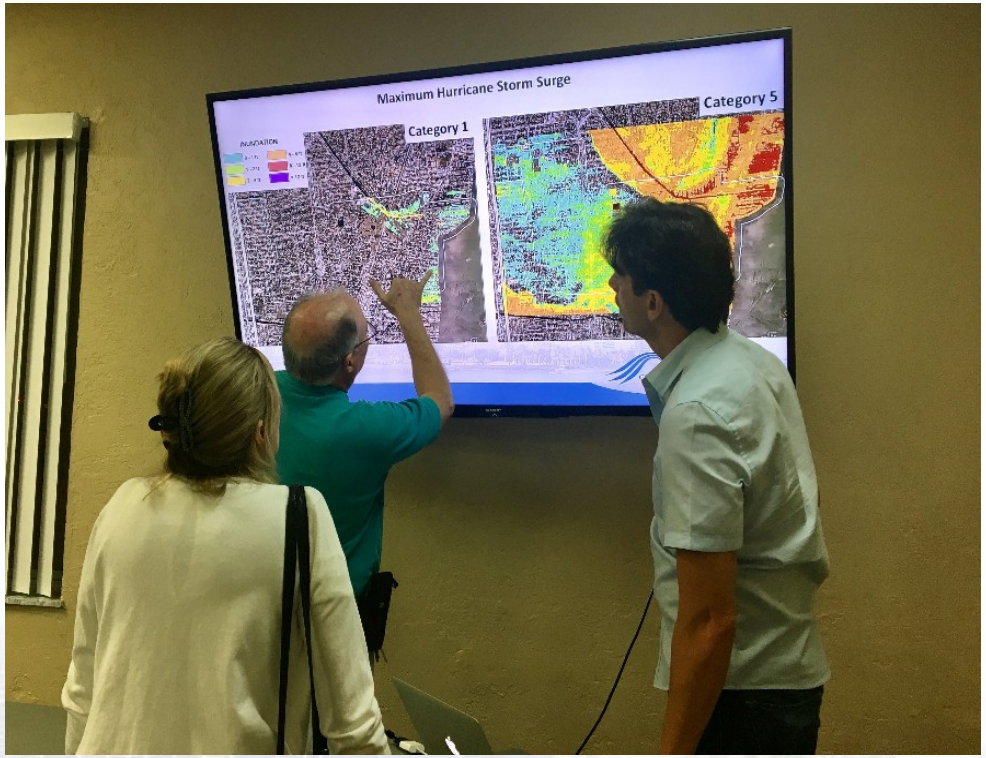
COASTAL RISK CONSULTING

Vulnerability Assessment and Adaptation Plan

- Modeled flood risk to entire community
- Public outreach
- Partnered with engineering firm Pennoni to model flood risk overlaid with infrastructure
    - Storm drainage, seawalls, sewer/septic, roads, critical facilities
- Developed neighborhood-level recommendations with cost estimates

COASTAL RISK CONSULTING

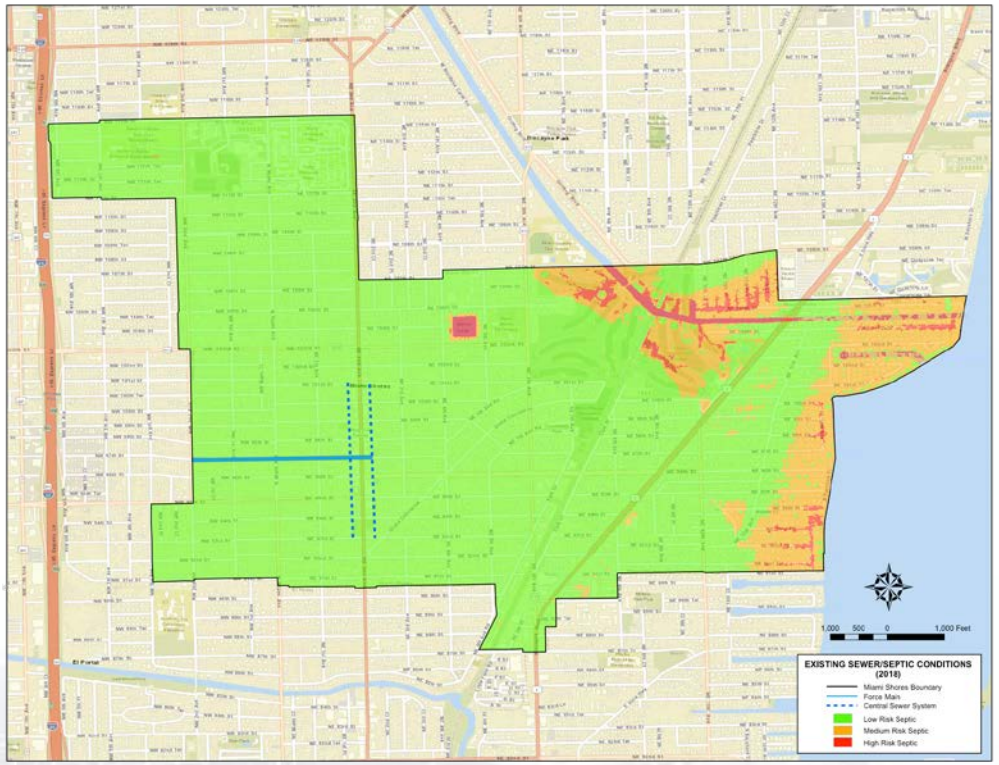
Public Meeting



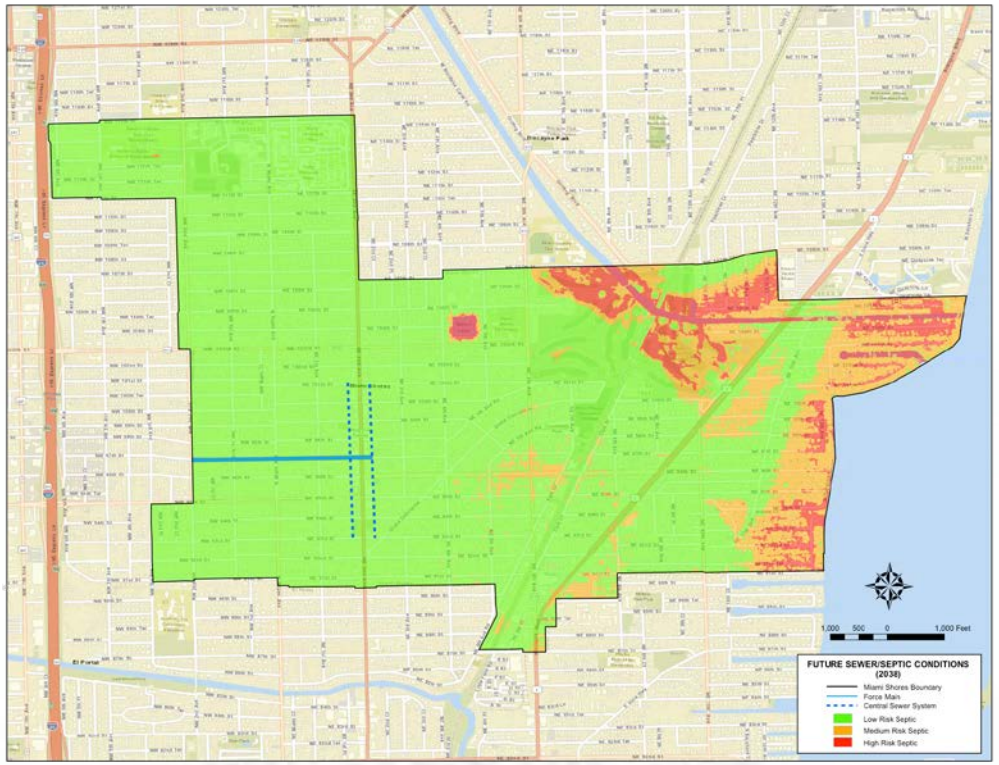
- Crucial step for program success
- Explained flood risk maps to public
- Took questions, asked for feedback on hotspots
- Confirmed our model results

COASTAL RISK CONSULTING

Septic Tank Exposure to High Groundwater



2018

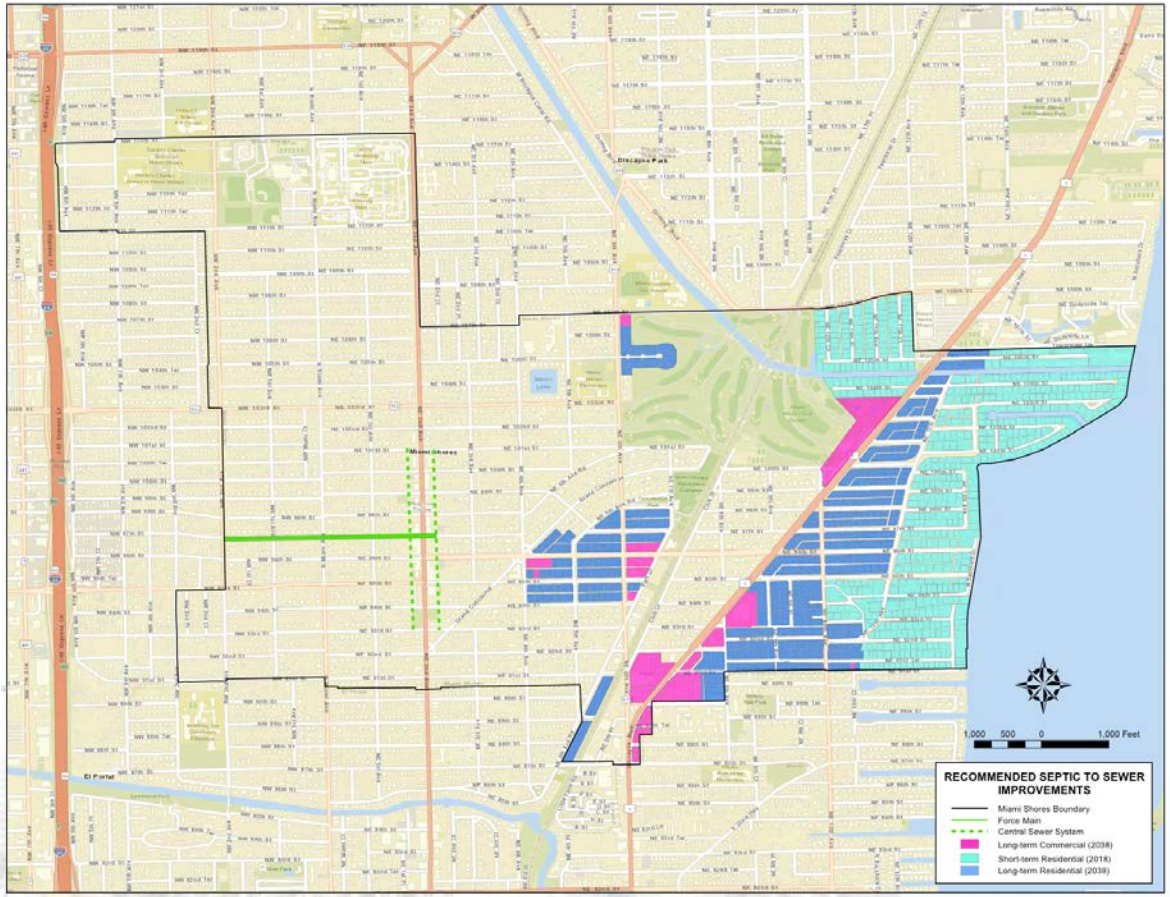


2038

COASTAL RISK CONSULTING

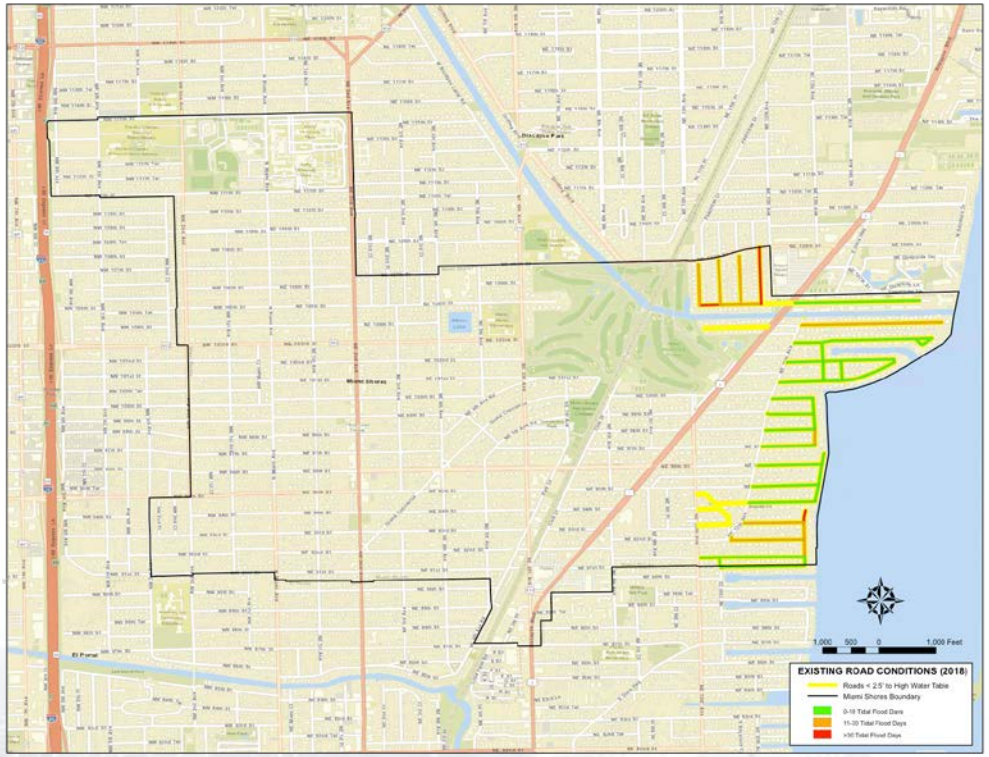
Recommended Septic/Sewer Conversion

- Must tie in to Miami or North Miami, access limited by railroad and canals
- Short term and long term plans
- Commercial and residential

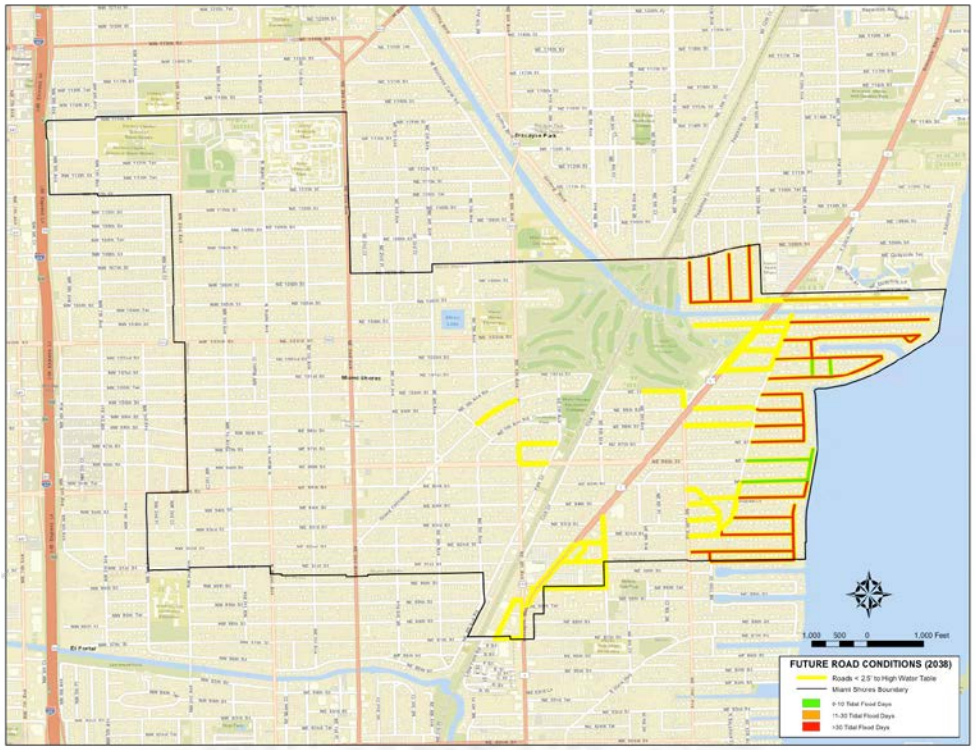


COASTAL RISK CONSULTING

Roads Exposed to High Water



2018

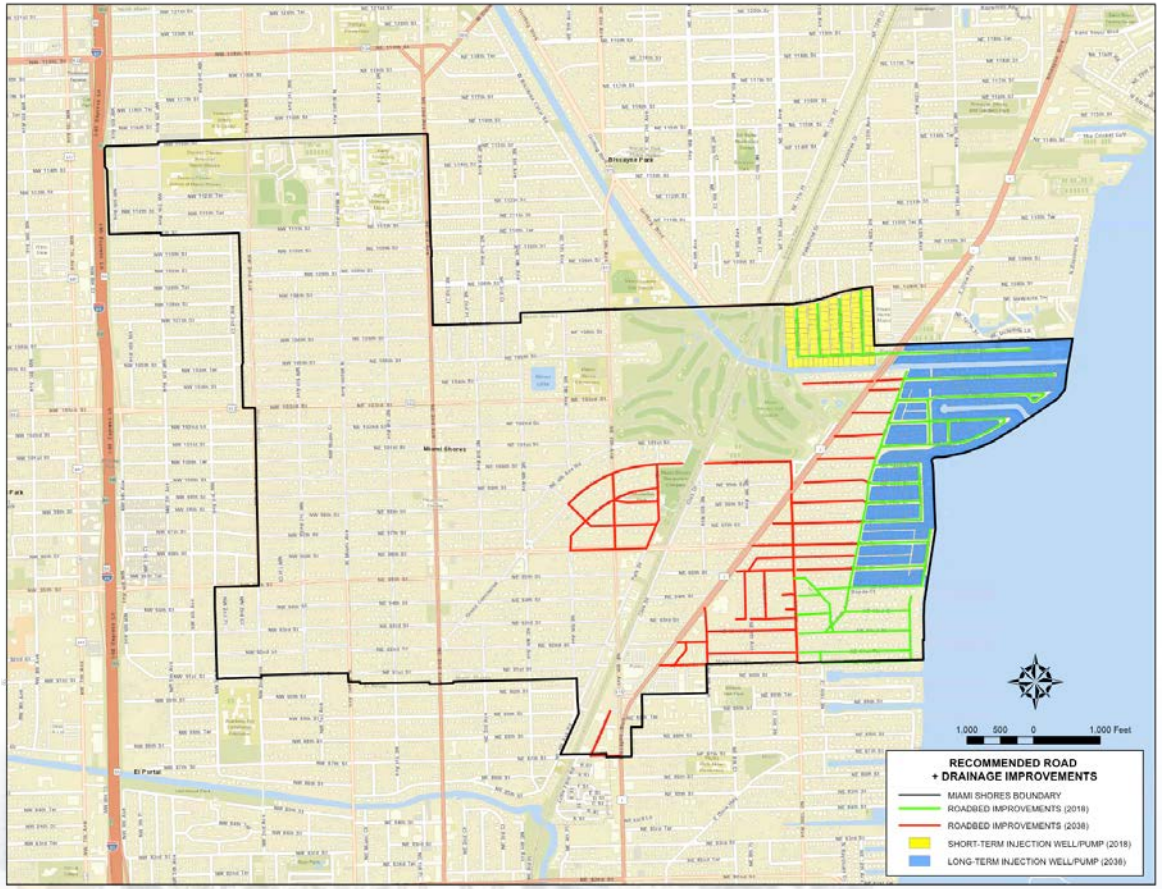


2038

COASTAL RISK CONSULTING

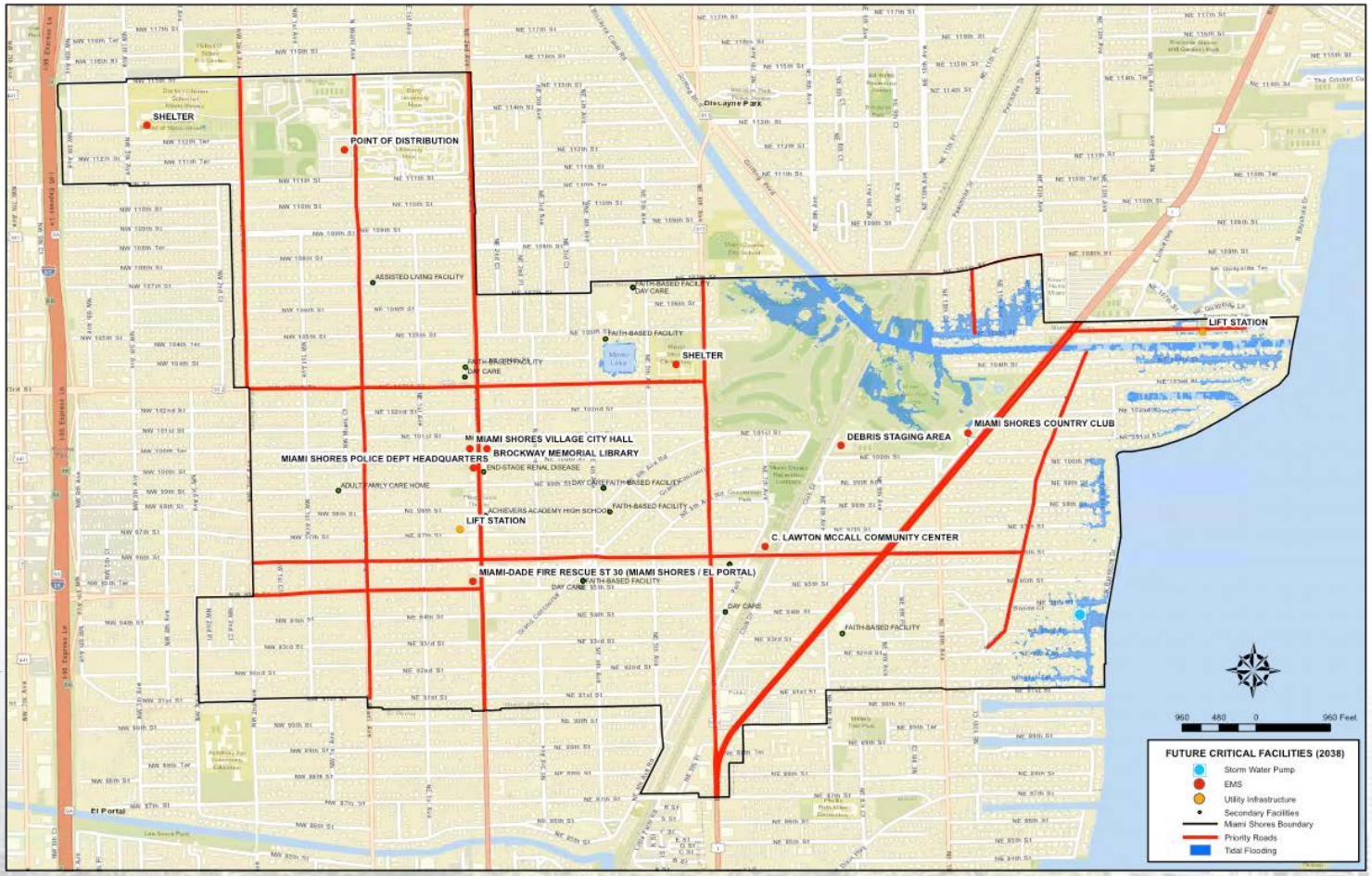
Recommended Road and Drainage Improvements

- Short term and long term
- Pumps and deep injection wells recommended for drainage
- Roadbed improvements to withstand high groundwater



COASTAL RISK CONSULTING

Critical Facilities in 2038



COASTAL RISK CONSULTING

Adaptation Plan Summary

Project	Budget Estimate	Urgency
Sewer Facility Plan	$40,000	Short-term
Stormwater Facility Plan	$80,000	Short-term
Septic to Sewer Conversion and Stormwater Improvements for Areas with Current Damage	$49,000,000	Short-term
Stormwater Improvements Only for Areas with Existing Sewer and Predicated Flooding	$2,000,000	Long-term
Septic to Sewer Conversion and Stormwater Improvements for Areas with Predicted Damage	$34,330,000	Long-term

Total = $85,450,000 *

Note: * Includes approximately $ cost number of seawall upgrades on/adjacent to private property.

Other

- Seawall Ordinance implementation
- Funding Plan (grants, loans, bonds, etc.)

COASTAL RISK CONSULTING

Hilary Stevens
HilaryStevens@CoastalRiskConsulting.Com
302-379-3771

COASTAL RISK CONSULTING