Update of the Stormwater Master Plan of Miami-Dade County for Current and Future Conditions

Department of Regulatory and Economic Resources, Division of Environmental Resources Management (RER-DERM)

Presenter:

Alberto Pisani, PE, ENV SP (MDC)

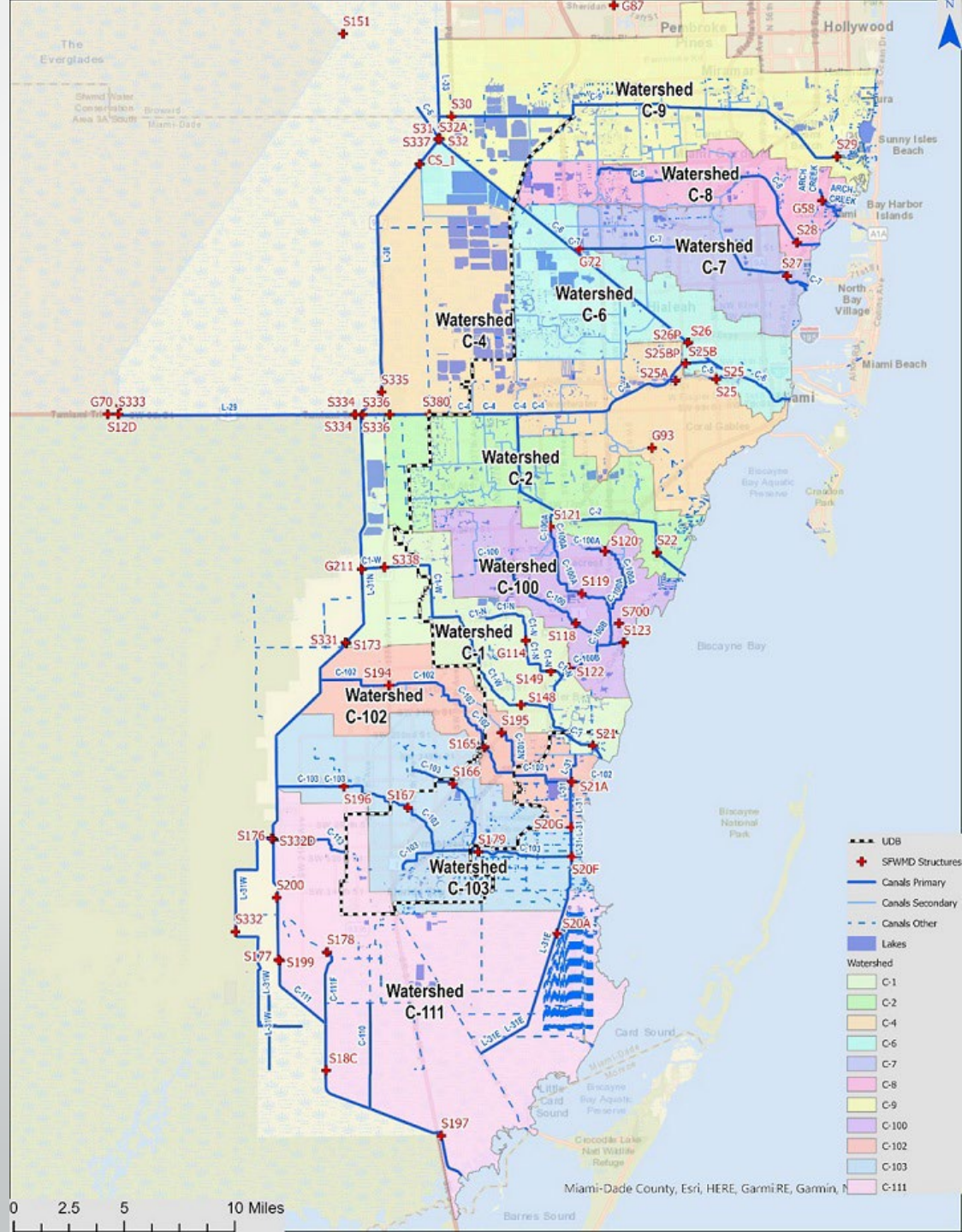
MIAMI-DADE COUNTY

Summary

- Overview of Miami-Dade County drainage system
- Division of Environmental Resources Management – Water Management Section – What we do
- Brief history of the Miami-Dade County Stormwater Master Plan (SWMP)
- SWMP updates – new data, future projections, planning horizon
- What are the County Flood Criteria (CFC) and the Water Control Map (WCM)?
- How do the proposed changes provide resilience to flood, surge, and groundwater risk over the planning horizon?

Miami-Dade County Drainage System

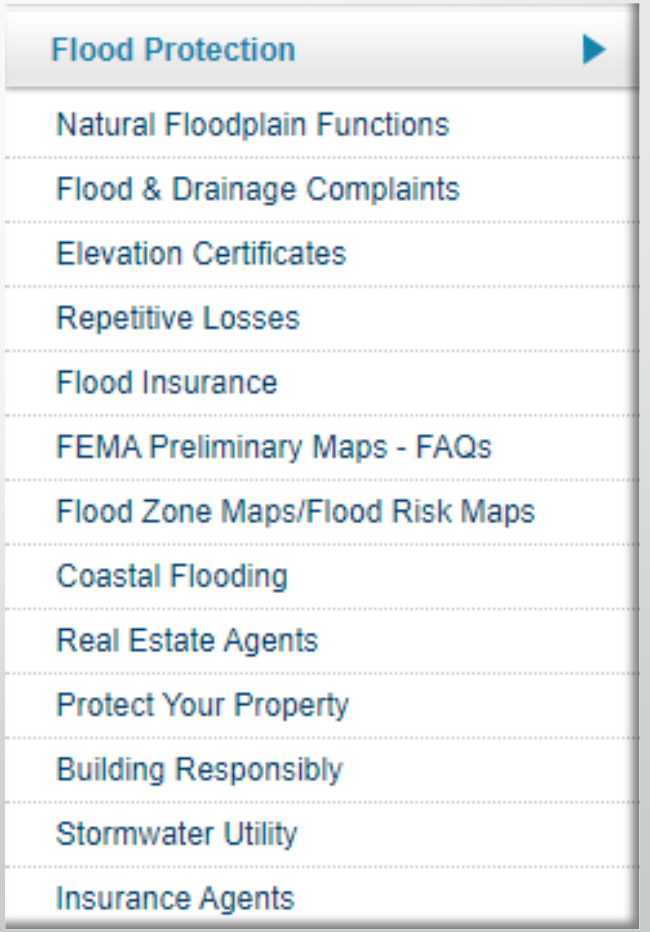
- **Primary drainage system**
  - U.S. Army Corps of Engineers (USACE) & South Florida Water Management District (SFWMD)
  - Primary canals discharging to Biscayne Bay and associated control structures
- **Secondary drainage system**
  - Miami-Dade County
  - Tributary canals mainly discharging into the primary canal system
- **Tertiary drainage system**
  - Municipalities / private property owners
  - Localized flood protection



Department of Regulatory and Economic Resources – Division of Environmental Resources Management

Water Management Section

- Coordinates flood protection with federal and state agencies
- Runs the Miami-Dade County stormwater utility – collects funds to operate, manage, and maintain the Secondary drainage system and fund capital improvement projects
- Develop and maintain Stormwater Master Plan and supporting watershed numerical models
- Provides regulatory oversight and support, and develops regulatory updates

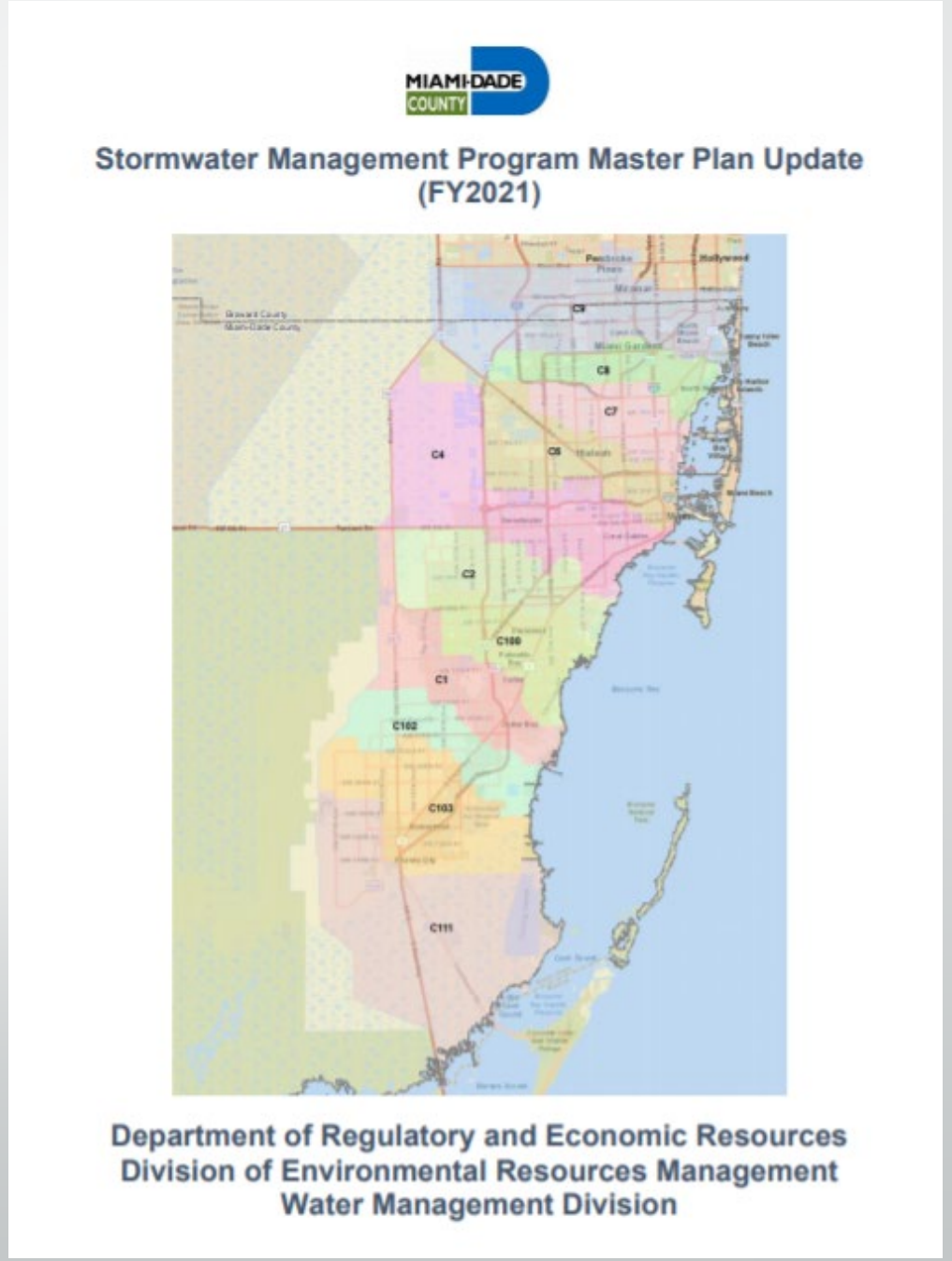


MIAMI-DADE COUNTY

Stormwater Master Plan

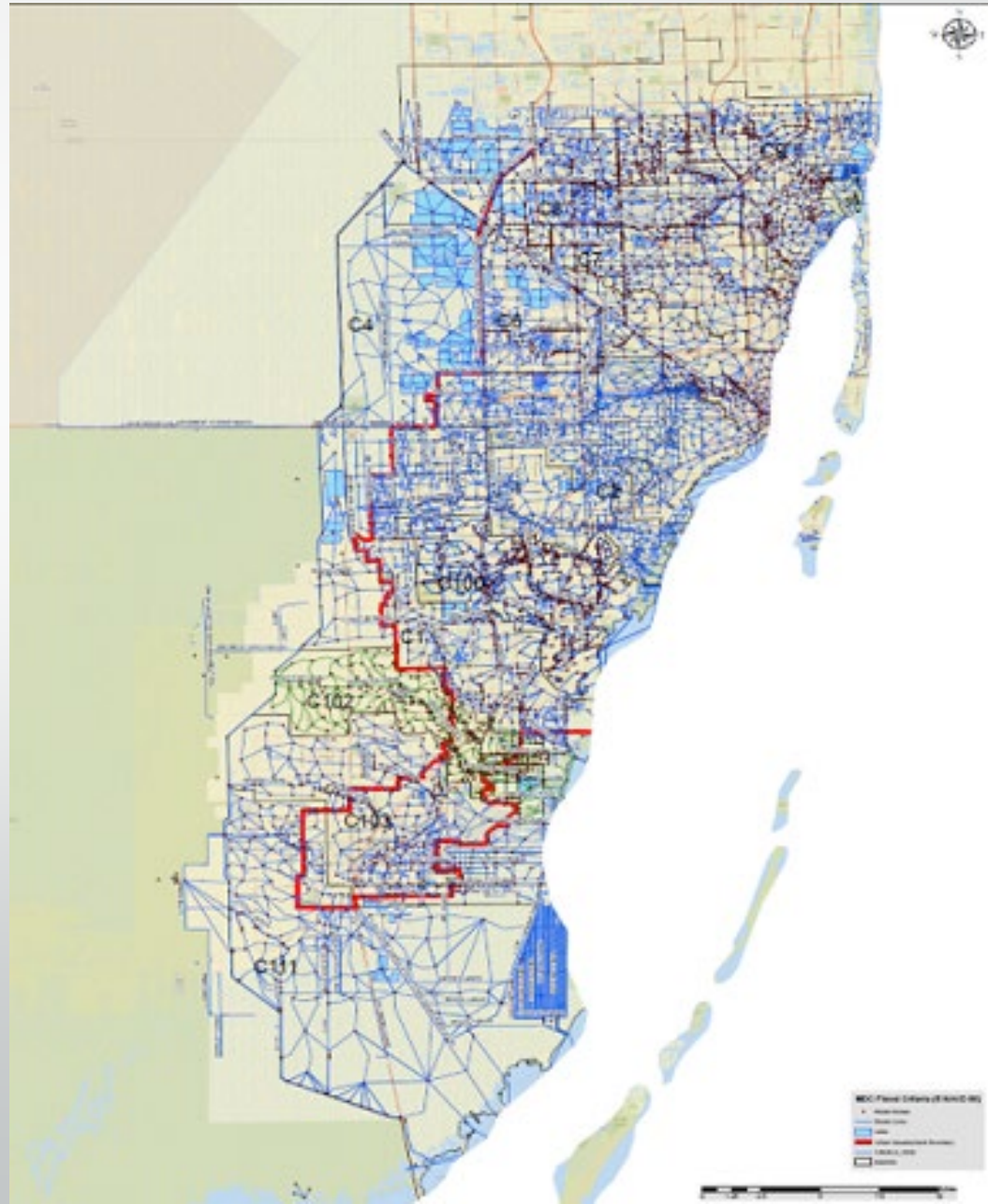
Brief History

- First developed in 1993
    - Established criteria for developing a watershed stormwater model
- First stormwater models developed between 1996 and 1998
- Substantial updates developed in segments for the major watersheds between 2003 and 2008
    - Identified water quantity and quality problems and provided strategies for reducing drainage and water quality impacts
- Continuous in-house updates



Stormwater Master Plan Update - H&H Models

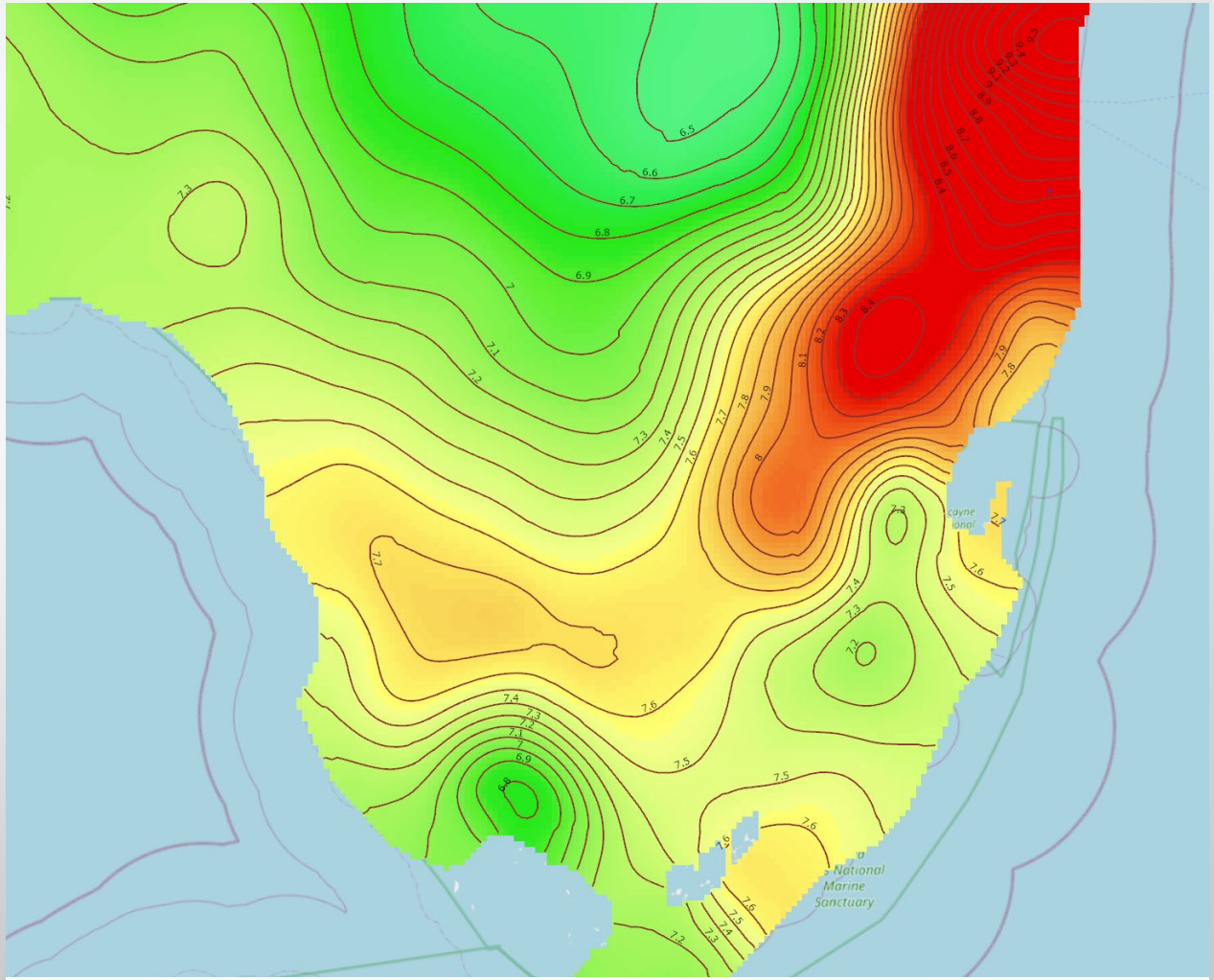
- The Stormwater Master Plan is based on eleven XPSWMM watershed numerical models
- Accounts for current and future County hydrologic and hydraulic conditions
- More than 10,000 links with most recent updates of infrastructure (inclusive of pipes greater than 1 ft in diameter)
- Land use (current and future) and soils were revised
- Latest available county-wide topographic LIDAR data
- Design rainfall volumes from NOAA Atlas 14
- Groundwater elevations from latest 10-year monitoring data
- Sea level rise projections incorporated as boundary condition for planning horizon scenarios



MIAMI-DADE COUNTY

Stormwater Master Plan Update – Design Rainfall

- Design Rainfall Volume from NOAA Atlas 14
  - 24 and 72-hour storm duration with 0.001, 0.002, 0.01, 0.02, 0.04, 010 and 0.20 occurrence probability (5-, 10-, 25-, 50-, 100, 500- and 1000-yr return period)
  - NOAA Grid Raster Files based on 915 m resolution used to develop rainfall timeseries for each watershed
  - No changes are assumed for the future based on the National Climate Assessment Study from 2018, which lists South Florida with less than 5% Changes in Total Rainfall Volume or Intensity
  - **County Flood Criteria was developed using 10-yr/24-hour events**

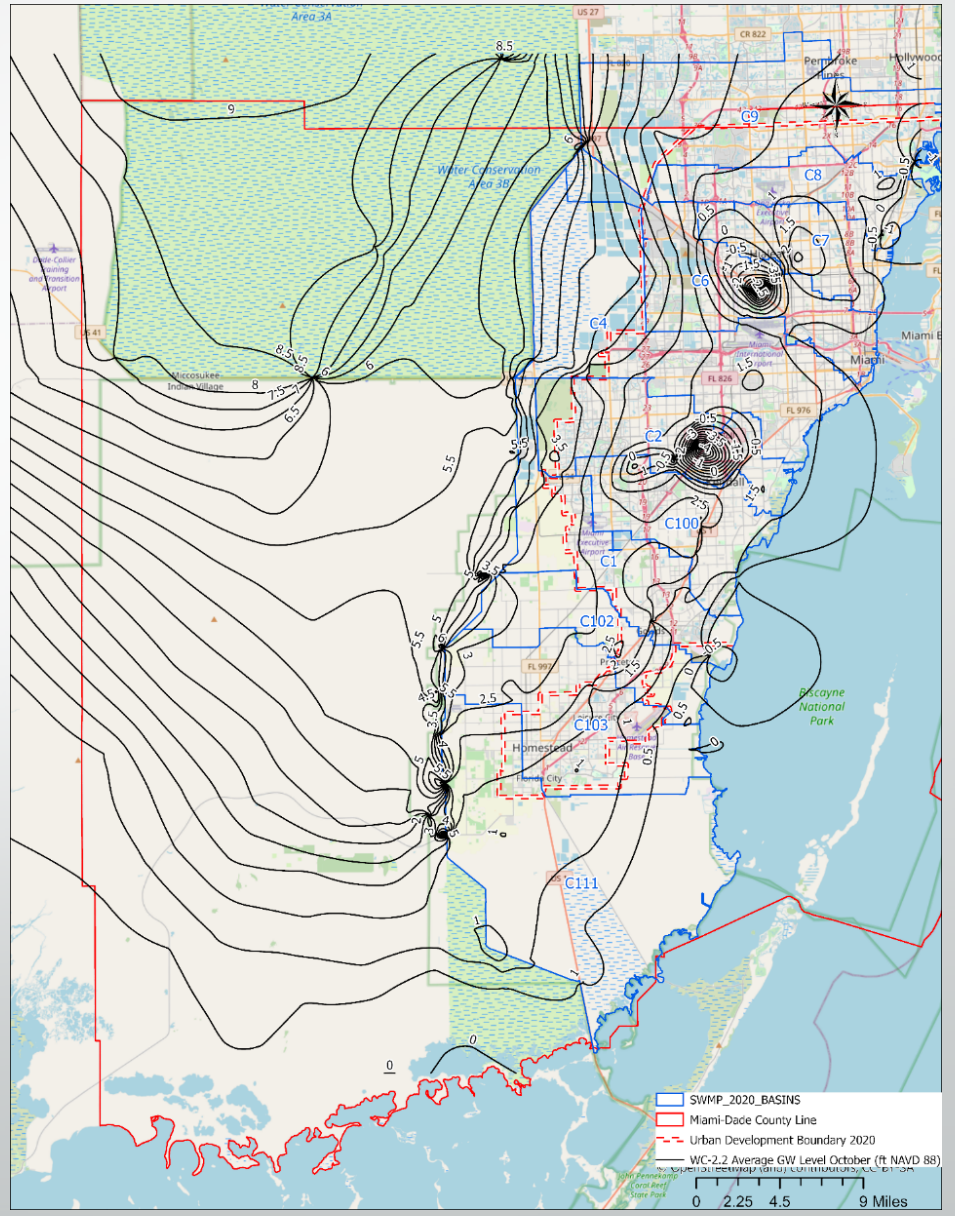


NOAA Atlas 14 Spatial Distribution of 10-yr 24-hr Design Event

MIAMI-DADE COUNTY

Stormwater Master Plan Update – Groundwater

- Groundwater Maps updated with 2010-2020 data
- Future groundwater elevations provided by Miami-Dade Water and Sewer Department for 2040
- Future GW levels applied for the simulation of future conditions



MIAMI-DADE COUNTY

Stormwater Master Plan Update – Future Scenarios

Four future scenarios:

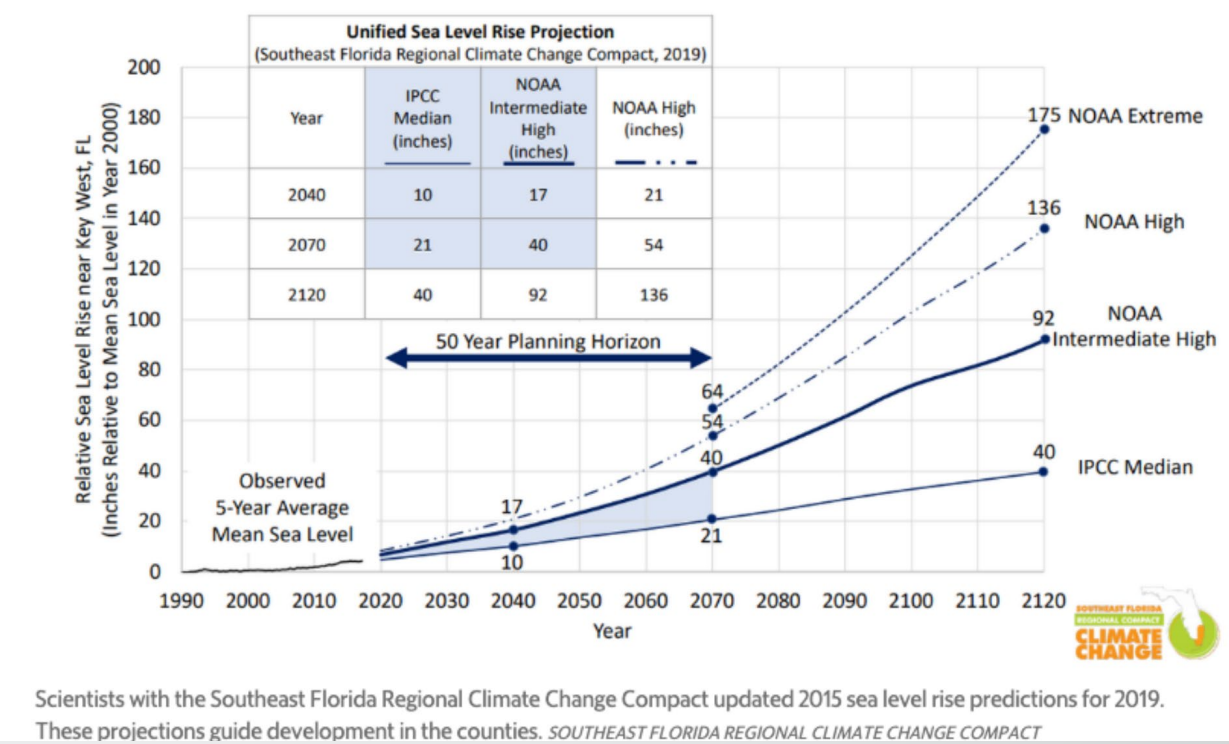
i. **Year 2040** projected SLR in 2040 (tidal conditions for 2020 +0.5 ft of SLR), future land use (2030) and future ground water (2040)

ii. **Year 2060** projected SLR in 2060 (tidal conditions for 2020 +2.0 ft of SLR), future land use (2030) and future ground water (2040)

iii. **Year 2080** projected SLR in 2080 (tidal conditions for 2020 +4.0 ft of SLR), future land use (2030) and future ground water (2040)

iv. **Year 2100** projected SLR in 2100 (tidal conditions for 2020 +6.0 ft of SLR), future land use (2030) and future ground water (2040)

County Flood Criteria Uses Scenario 2060

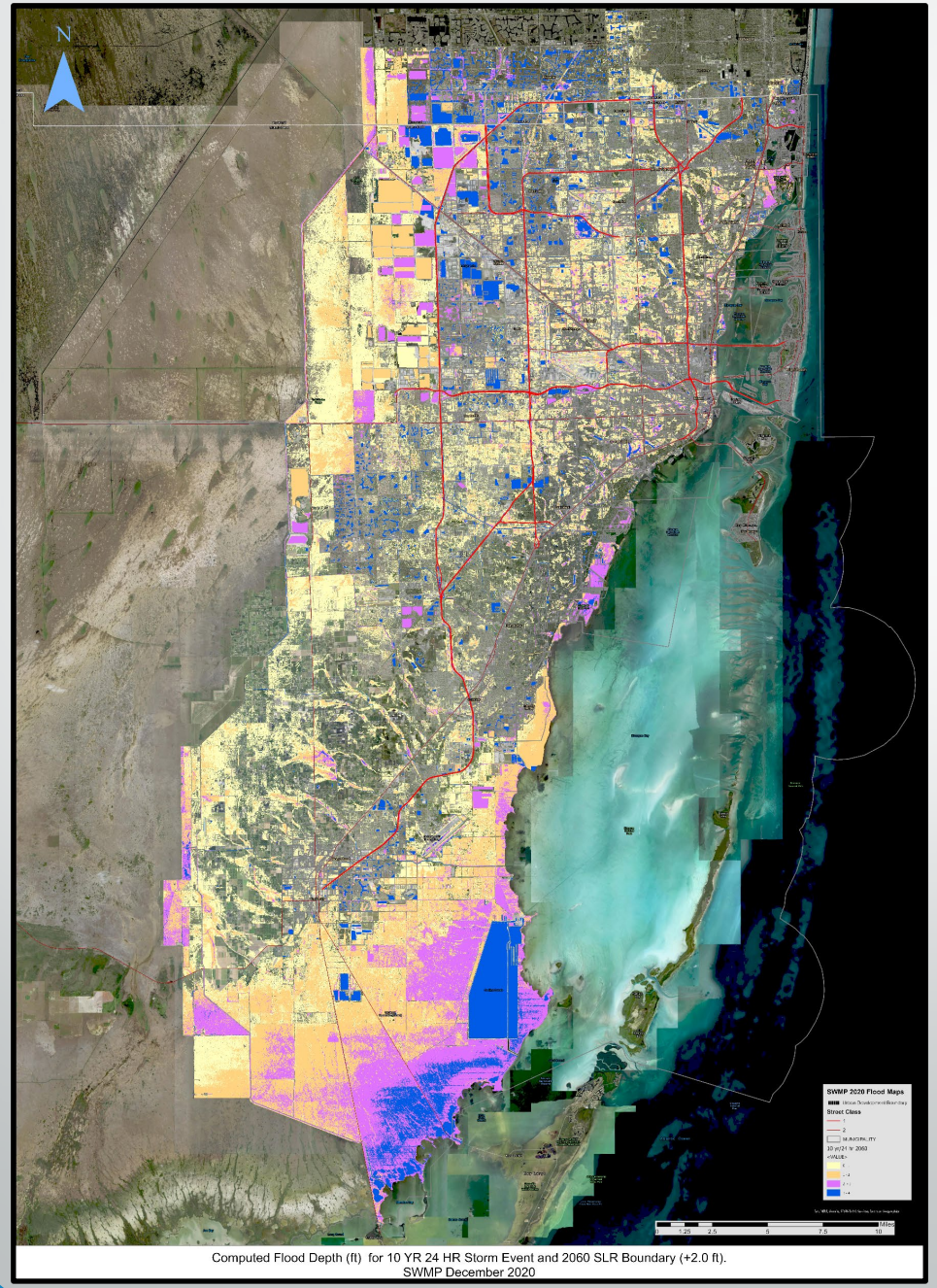


Scientists with the Southeast Florida Regional Climate Change Compact updated 2015 sea level rise predictions for 2019. These projections guide development in the counties. *SOUTHEAST FLORIDA REGIONAL CLIMATE CHANGE COMPACT*

Year	Sea Water Level increase in ft above the 2020 median	Sea Water Level Increase in inches above the 2020 median
2040	+0.5	+6
2060	+2.0	+24
2080	+4.0	+48
2100	+6.0	+72

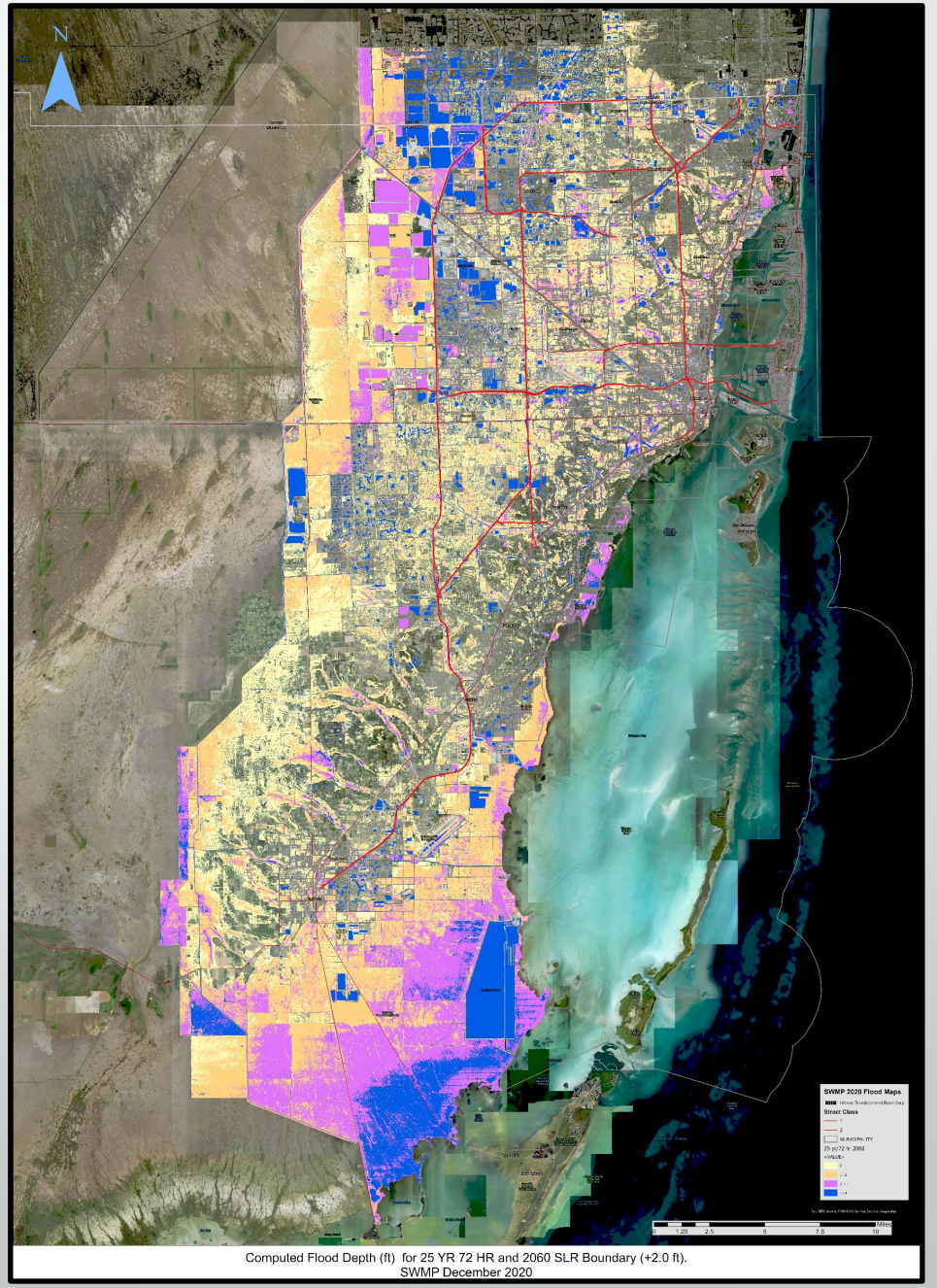
Tidal Boundary Conditions Modeled

Flood Map 10YR 24 HR, 2060 Conditions



Computed Flood Depth (ft) for 10 YR 24 HR Storm Event and 2060 SLR Boundary (+2.0 ft).
SWMP December 2020

Flood Map 25YR 72 HR, 2060 Conditions

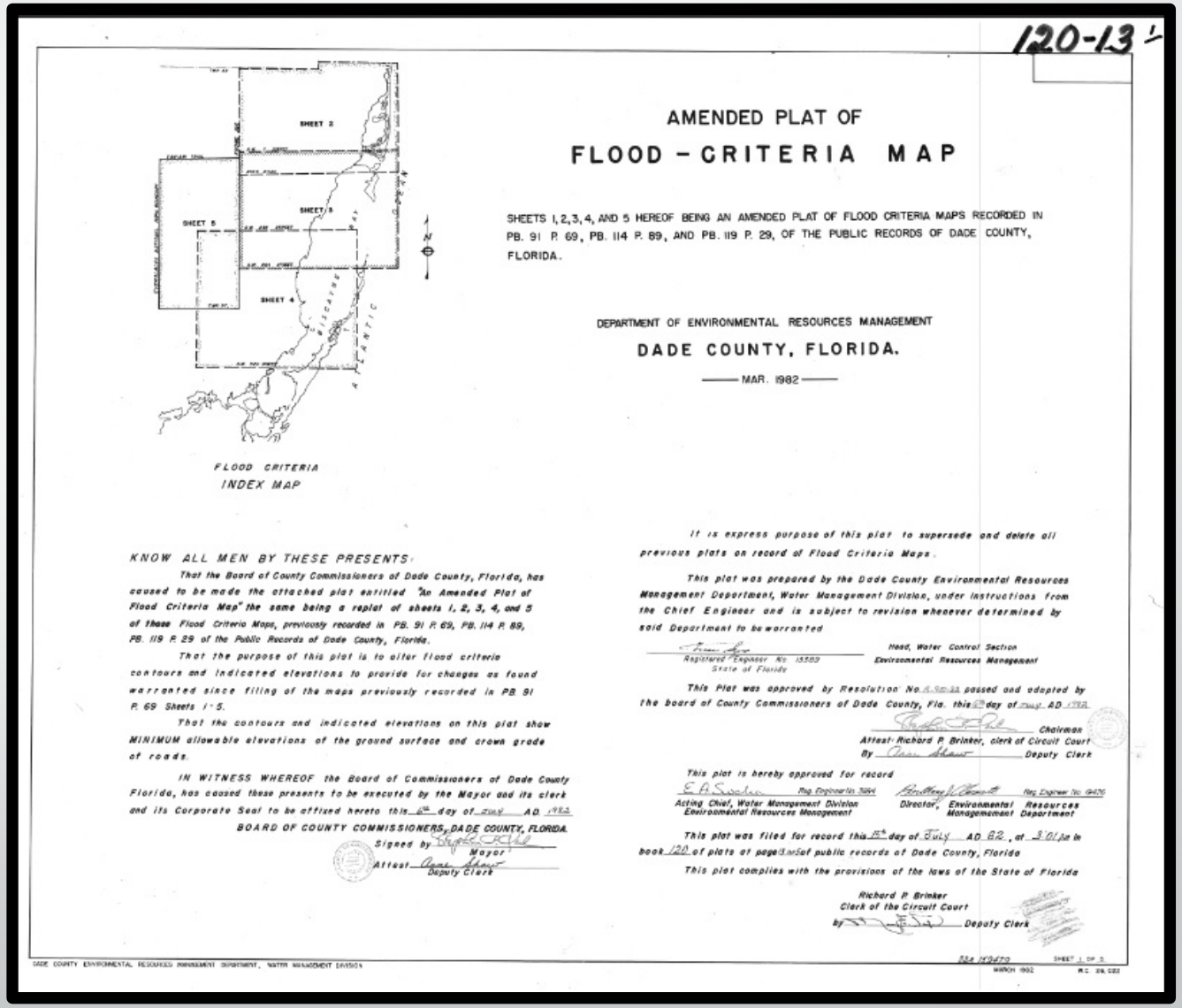


Computed Flood Depth (ft) for 25 YR 72 HR and 2060 SLR Boundary (+2.0 ft).
SWMP December 2020

MIAMI-DADE COUNTY

What is the County Flood Criteria

- Flood criteria elevations first established in October 1959
- Last modified in March 1982
- Based on highest groundwater level expected to occur after a 10YR/24HR rain event
- Map establishes minimum ground elevations, minimum crown of road, top of canal bank elevations, and minimum top of seawall elevation
- Currently, minimum elevation of 5' NGVD29 (3.45' NAVD88)



120-13

AMENDED PLAT OF

FLOOD - CRITERIA MAP

SHEETS 1, 2, 3, 4, AND 5 HEREOF BEING AN AMENDED PLAT OF FLOOD CRITERIA MAPS RECORDED IN PB. 91 P. 69, PB. 114 P. 89, AND PB. 119 P. 29, OF THE PUBLIC RECORDS OF DADE COUNTY, FLORIDA.

DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT

DADE COUNTY, FLORIDA.

MAR. 1982

SHEET 1 SHEET 2 SHEET 3 SHEET 4 SHEET 5

FLOOD CRITERIA INDEX MAP

KNOW ALL MEN BY THESE PRESENTS:

That the Board of County Commissioners of Dade County, Florida, has caused to be made the attached plat entitled "An Amended Plat of Flood Criteria Map" the same being a replat of sheets 1, 2, 3, 4, and 5 of those Flood Criteria Maps, previously recorded in PB. 91 P. 69, PB. 114 P. 89, PB. 119 P. 29 of the Public Records of Dade County, Florida.

That the purpose of this plat is to alter flood criteria contours and indicated elevations to provide for changes as found warranted since filing of the maps previously recorded in PB. 91 P. 69 Sheets 1-5.

That the contours and indicated elevations on this plat show MINIMUM allowable elevations of the ground surface and crown grade of roads.

IN WITNESS WHEREOF the Board of Commissioners of Dade County Florida, has caused these presents to be executed by the Mayor and its clerk and its Corporate Seal to be affixed hereto this 6th day of July A.D. 1982

BOARD OF COUNTY COMMISSIONERS, DADE COUNTY, FLORIDA.

Signed by _____ Mayor

Attest _____ Deputy Clerk

It is express purpose of this plat to supersede and delete all previous plats on record of Flood Criteria Maps.

This plat was prepared by the Dade County Environmental Resources Management Department, Water Management Division, under instructions from the Chief Engineer and is subject to revision whenever determined by said Department to be warranted

_____ Head, Water Control Section
Registered Engineer No. 13589 State of Florida — Environmental Resources Management

This Plat was approved by Resolution No. [illegible] passed and adopted by the board of County Commissioners of Dade County, Fla. this 6th day of July A.D. 1982

_____ Chairman

Attest: Richard P. Brinker, clerk of Circuit Court

By _____ Deputy Clerk

This plat is hereby approved for record

_____ Reg Engineer No 13644 — _____ Reg Engineer No 6476

Acting Chief, Water Management Division Environmental Resources Management — Director, Environmental Resources Management Department

This plat was filed for record this 8th day of July A.D. 82, at 3:01 pm in book 120 of plats at page 13 of public records of Dade County, Florida

This plat complies with the provisions of the laws of the State of Florida

Richard P. Brinker
Clerk of the Circuit Court

by _____ Deputy Clerk

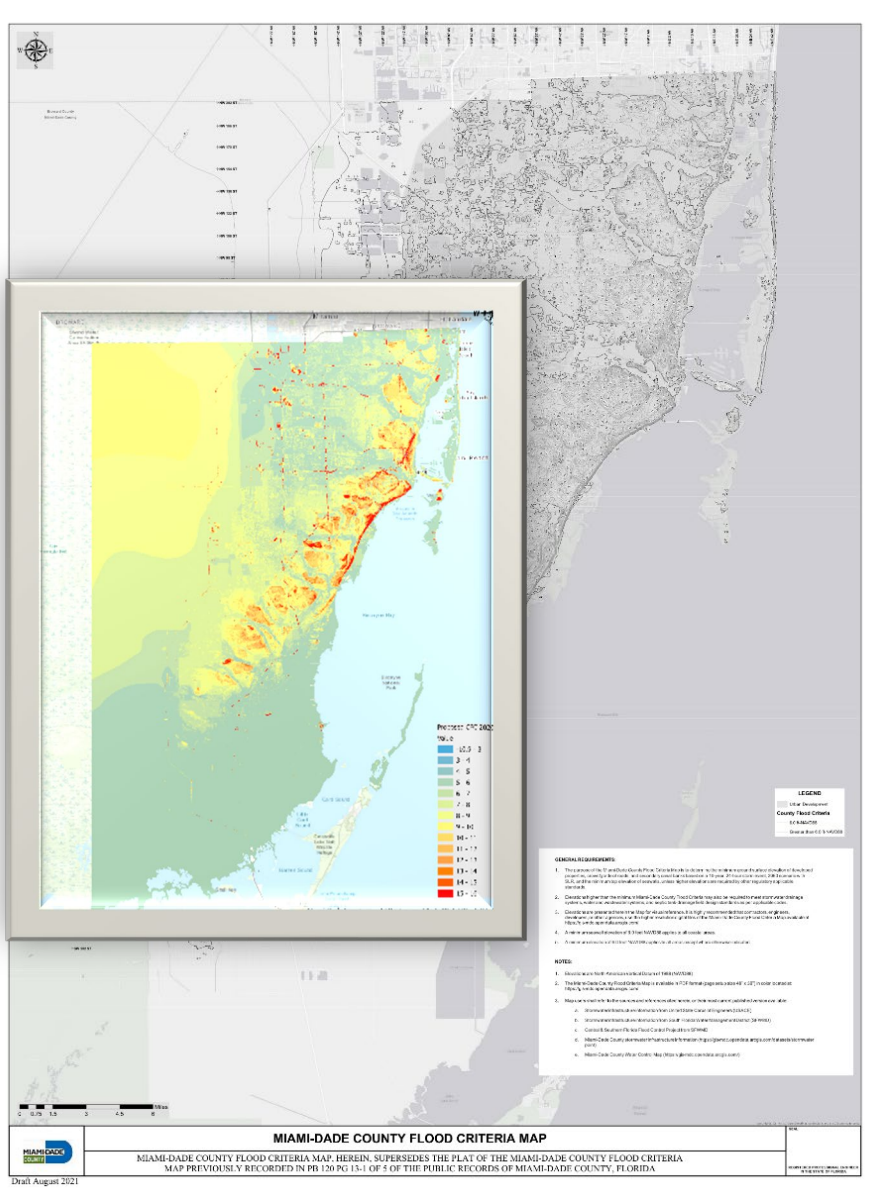
DADE COUNTY ENVIRONMENTAL RESOURCES MANAGEMENT DEPARTMENT, WATER MANAGEMENT DIVISION — SHEET 1 OF 5 — MARCH 1982

MIAMI-DADE COUNTY

The New County Flood Criteria Map

Criteria for the new CFC Map

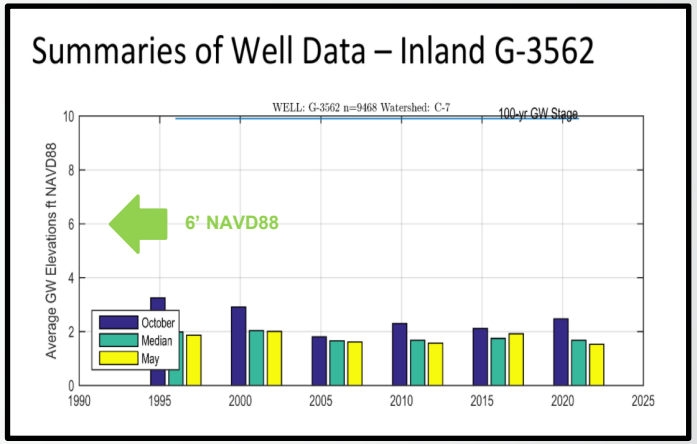
- Update uses the highest of:
    1. Surface water levels from the 10YR/24HR event, with 2060 SLR
    2. Groundwater levels for 10YR/24HR event determined from nearly 30 years (1990 – 2020) of daily groundwater stage observations
    3. Current Miami-Dade CFC based on 10YR/24HR design event
    4. Existing topography (ground surface elevation)
    5. Minimum elevation raised to 6’ NAVD88 from 3.45’ NAVD88 in the old map
- Improves resilience by increasing elevation

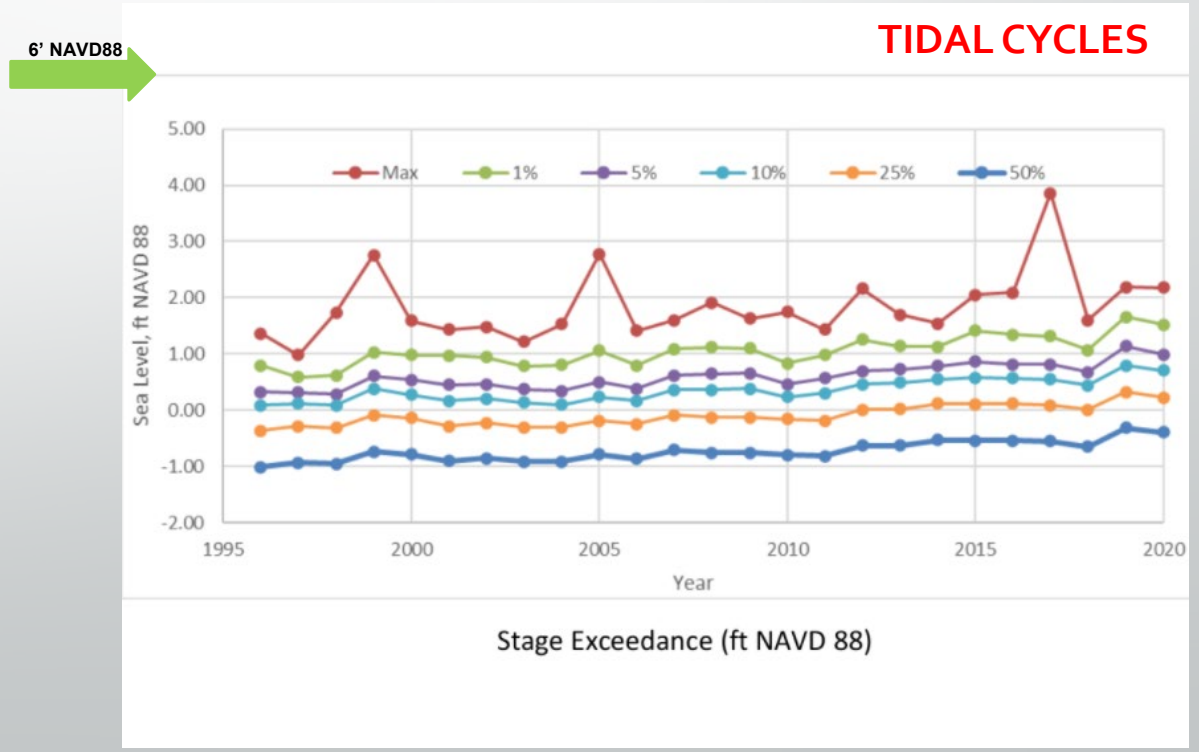


Improved Protection from New CFC

For planning horizon through 2060:

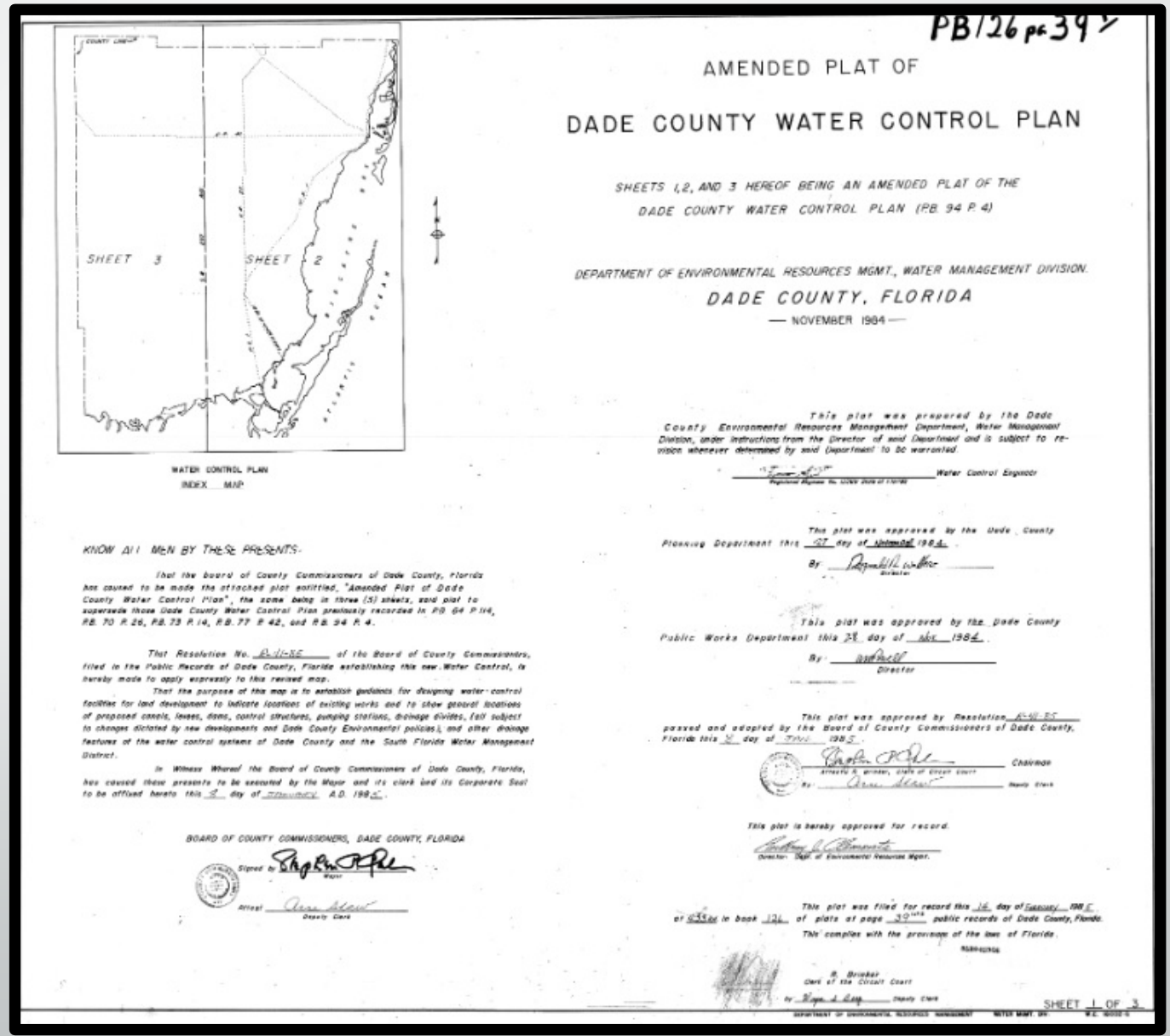
- Protection from groundwater flooding
- Increases the "water table to ground freeboard"
- Protection from maximum tide cycles & storm surge





What is the Water Control Map?

- Last modified in February 1985
- Provides location of existing and proposed canals, levees, dams, control structures, pumping stations, drainage divides, and other drainage features



PB 126 pg 39

AMENDED PLAT OF

DADE COUNTY WATER CONTROL PLAN

SHEETS 1, 2, AND 3 HEREOF BEING AN AMENDED PLAT OF THE DADE COUNTY WATER CONTROL PLAN (PB. 94 P. 4)

DEPARTMENT OF ENVIRONMENTAL RESOURCES MGMT., WATER MANAGEMENT DIVISION.

DADE COUNTY, FLORIDA

— NOVEMBER 1984 —

SHEET 3 SHEET 2

WATER CONTROL PLAN INDEX MAP

KNOW ALL MEN BY THESE PRESENTS:

That the board of County Commissioners of Dade County, Florida has caused to be made the attached plat entitled, "Amended Plat of Dade County Water Control Plan", the same being in three (3) sheets, said plat to supersede those Dade County Water Control Plan previously recorded in PB 64 P 114, PB. 70 P. 26, PB. 73 P. 14, P.B. 77 P. 42, and P.B. 94 P. 4.

That Resolution No. R-1156 of the Board of County Commissioners, filed in the Public Records of Dade County, Florida establishing this new Water Control, is hereby made to apply expressly to this revised map.

That the purpose of this map is to establish guidelines for designing water control facilities for land development to indicate locations of existing works and to show general locations of proposed canals, levees, dams, control structures, pumping stations, drainage divides, (all subject to changes dictated by new developments and Dade County Environmental policies), and other drainage features of the water control systems of Dade County and the South Florida Water Management District.

In Witness Whereof the Board of County Commissioners of Dade County, Florida, has caused these presents to be executed by the Mayor and its clerk and its Corporate Seal to be affixed hereto this 9 day of January A.D. 1985.

BOARD OF COUNTY COMMISSIONERS, DADE COUNTY, FLORIDA

Signed by _____ Mayor

Attest _____ Deputy Clerk

This plat was prepared by the Dade County Environmental Resources Management Department, Water Management Division, under instructions from the Director of said Department and is subject to revision whenever determined by said Department to be warranted.

_____ Water Control Engineer

This plat was approved by the Dade County Planning Department this 27 day of September 1984.

By _____ Director

This plat was approved by the Dade County Public Works Department this 31 day of Oct 1984.

By _____ Director

This plat was approved by Resolution R-141-85 passed and adopted by the Board of County Commissioners of Dade County, Florida this 5 day of Feb 1985.

_____ Chairman

Attest: R. Brinker, Clerk of Circuit Court

By _____ Deputy Clerk

This plat is hereby approved for record.

_____ Director, Dept. of Environmental Resources Mgmt.

This plat was filed for record this 14 day of February 1985 at 4:55 pm in book 126 of plats at page 39 public records of Dade County, Florida.

This complies with the provisions of the laws of Florida.

R. Brinker Clerk of the Circuit Court

by _____ Deputy Clerk

SHEET 1 OF 3

DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT WATER MGMT. DIV.

MIAMI-DADE COUNTY

Criteria for the New Water Control Map

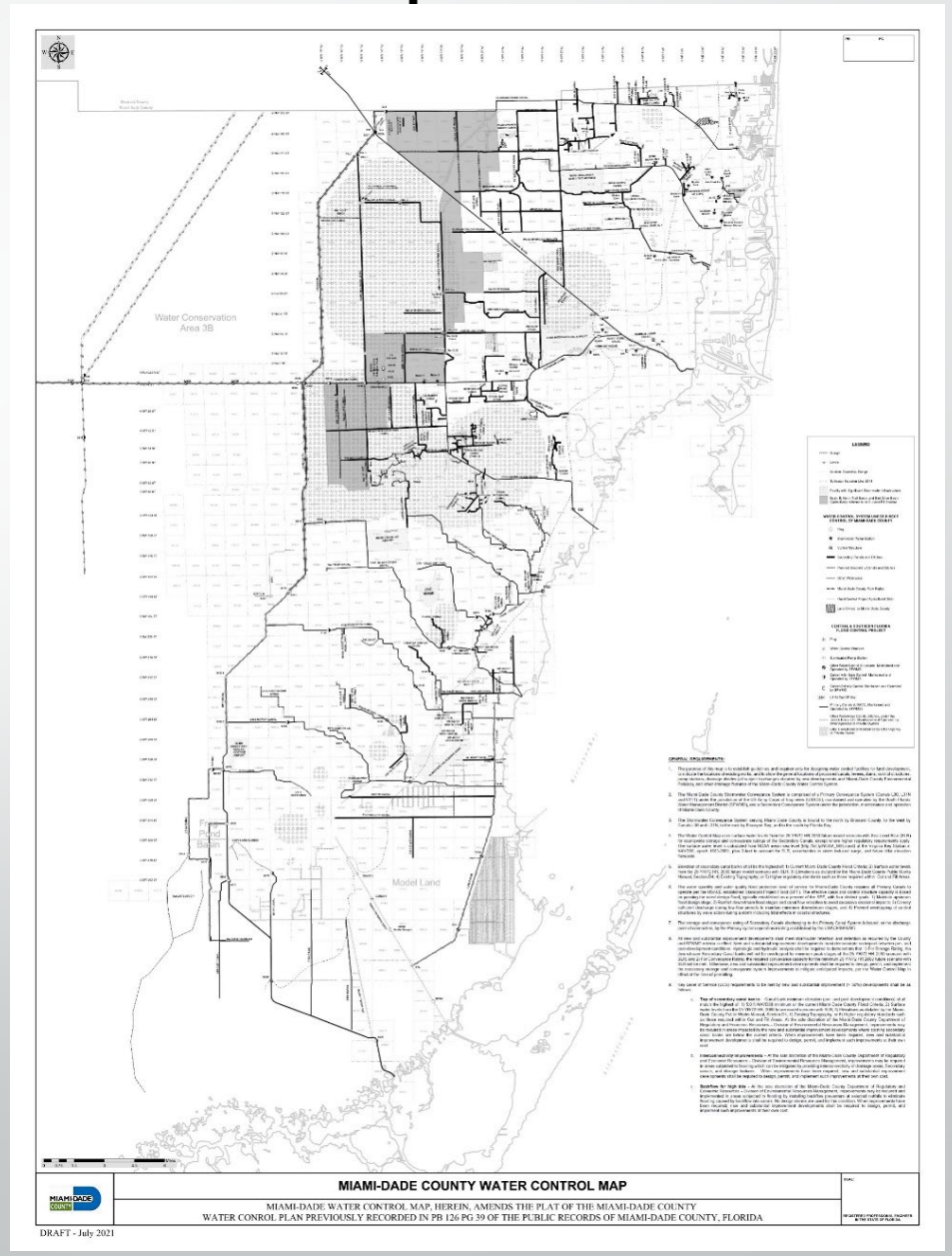
Update uses the most stringent of:

Level of Service

1. Higher regulatory standard based on surface water levels from the 25-YR/72-HR storm event under 2060 conditions (conveyance)
2. Higher regulatory applicable standards such as those required within Cut and Fill basins

Canal Bank Elevation

1. Higher regulatory standard based on surface water levels from the 25-YR/72-HR storm event under 2060 conditions (storage)
2. New CFC based on 10-YR/24-HR design event under 2060 conditions
3. Existing topography
4. Minimum elevation as dictated by the Miami-Dade County Public Works Manual



Conclusions

- Miami-Dade County applied a set of models and analyses to determine proposed changes of parcel elevations, canal banks, seawalls, and bulkheads to adapt to rising sea levels and mitigate inland flooding risk
- These changes will better address the uncertainty of future hydrology, using NOAA's estimates for rainfall and sea level rise
- Prepares a roadmap for the most optimized gradual adaptation to future conditions
- Integral component of ongoing regulatory updates to address Flood Protection Level of Service – one piece of the resiliency puzzle

MIAMI-DADE COUNTY

Questions?

Submit questions to:
Alberto.Pisani@miamidade.gov