TRB First International Conference on Surface Transportation Resilience

September 18, 2015

Applying the Sea-Level Scenario Sketch Planning Tool to Enhance the Resilience of Long-Range Transportation Plans: *Lessons Learned from Two Florida MPOs*

- Josh DeFlorio, Cambridge Systematics
- Allison Yeh, Hillsborough County MPO
- James Cromar, Broward MPO
- *With contributions from* Crystal Goodison, UFL GeoPlan Center & Maria Cahill, Florida DOT

THE PLANNING COMMISSION Plan Hillsborough

broward MPO metropolitan planning organization

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Introduction

- Florida is on the front lines of sea level rise and coastal inundation exposure
  - Nation's second-most extensive coastline
  - Many highly developed coastal areas
  - Low-lying—already subject to recurring tidal flooding
- UFL GeoPlan Center developed the Sea Level Scenario Sketch Planning Tool
- Hillsborough County MPO and Broward MPO both applied the tool in conducting FHWA Climate Resilience Pilots

Sea Level Scenario Sketch Planning Tool

– **Planning level geographic information systems (GIS) tool to assess Florida transportation infrastructure potentially at-risk to projected sea level rise.**
  - **Developed by the University of Florida GeoPlan Center for the Florida Department of Transportation**
  - **Follows U.S. Army Corps of Engineers (USACE) SLR methods**
  - **Uses NOAA tide gauge data (sea level trends and tidal datums)**
  - **Maps SLR inundation regionally and statewide in Florida from 2040 – 2100; at USACE High, Intermediate, and Low projections; using multiple tidal datums; accounts for hydrologic connectivity.**

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Sea Level Scenario Sketch Planning Tool: Components

Map Viewer

- Visualize areas of inundation and affected infrastructure
- *Low technical expertise needed, no GIS software needed*

GIS Data Layers

- SLR Inundation Surfaces & Affected Infrastructure layers
- *GIS Software and intermediate GIS expertise needed*

SLR Inundation Surface Calculator

- Create custom inundation layers
- *Intermediate/ Advanced technical/ GIS expertise needed*

All components available on project website:
http://sls.geoplan.ufl.edu

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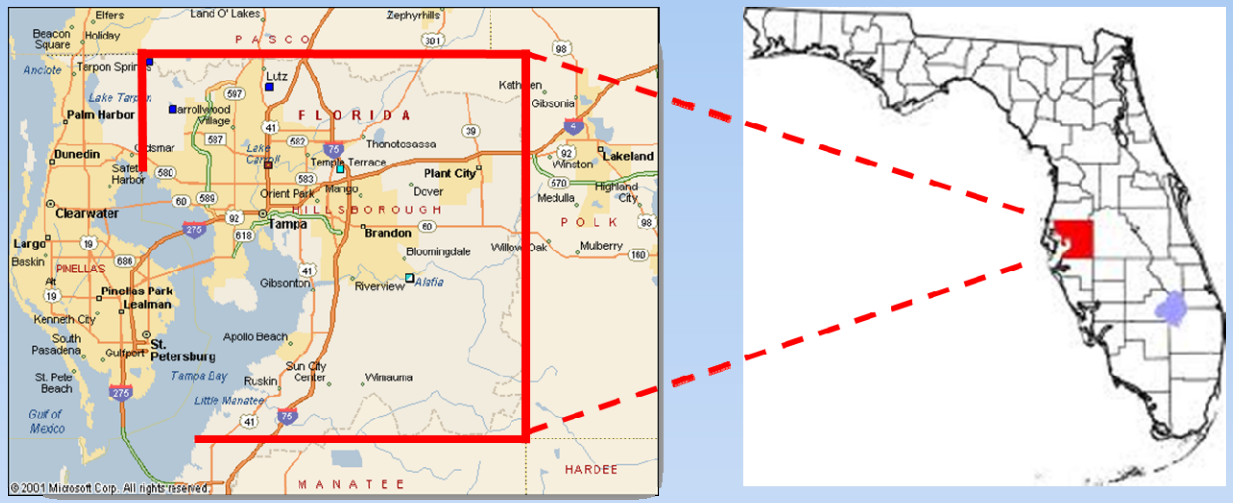
Hillsborough County MPO: Vulnerability Assessment & Adaptation Pilot Project

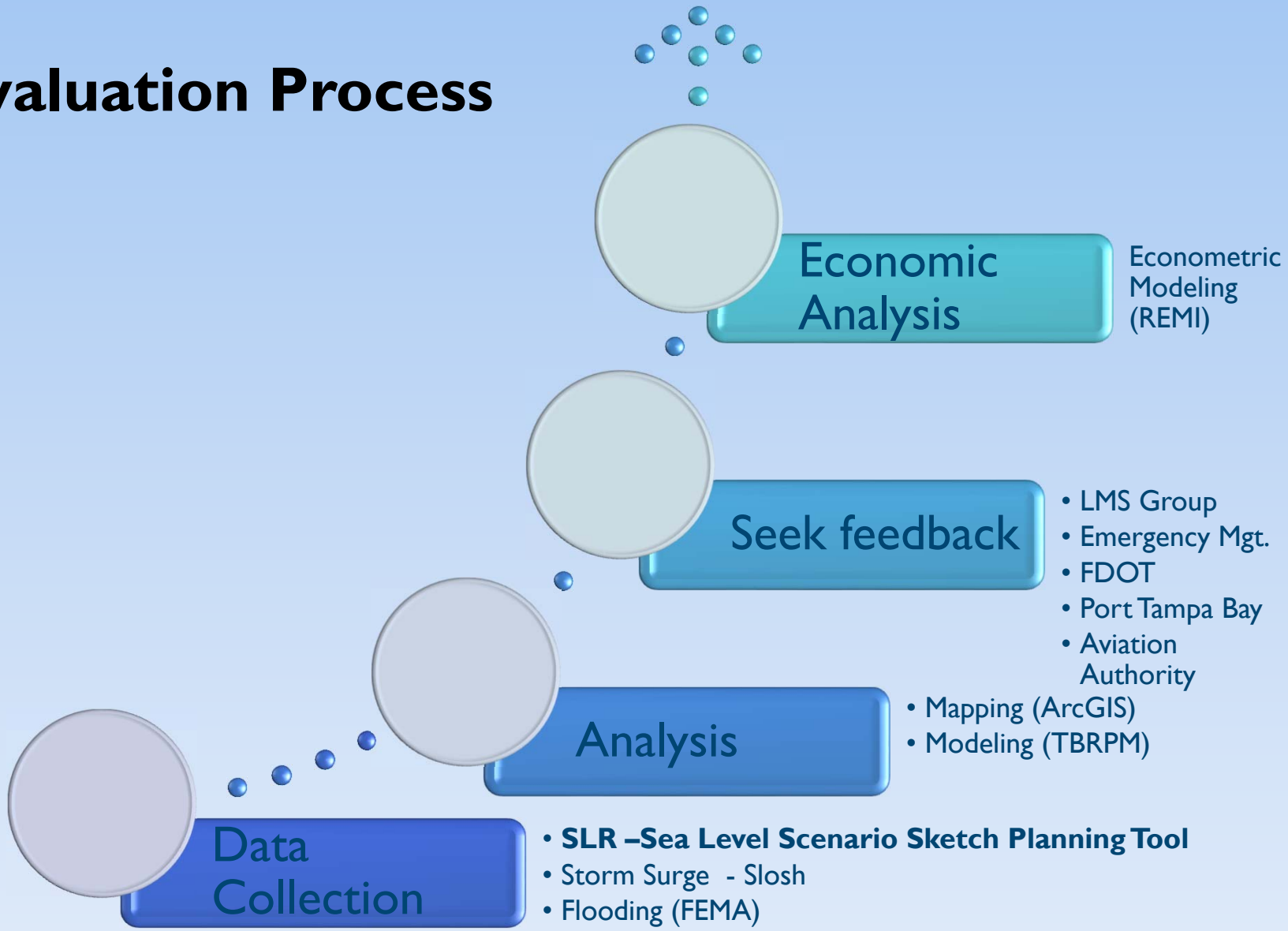
Allison G. Yeh, AICP, LEED GA
Hillsborough County MPO

Hillsborough County, Florida



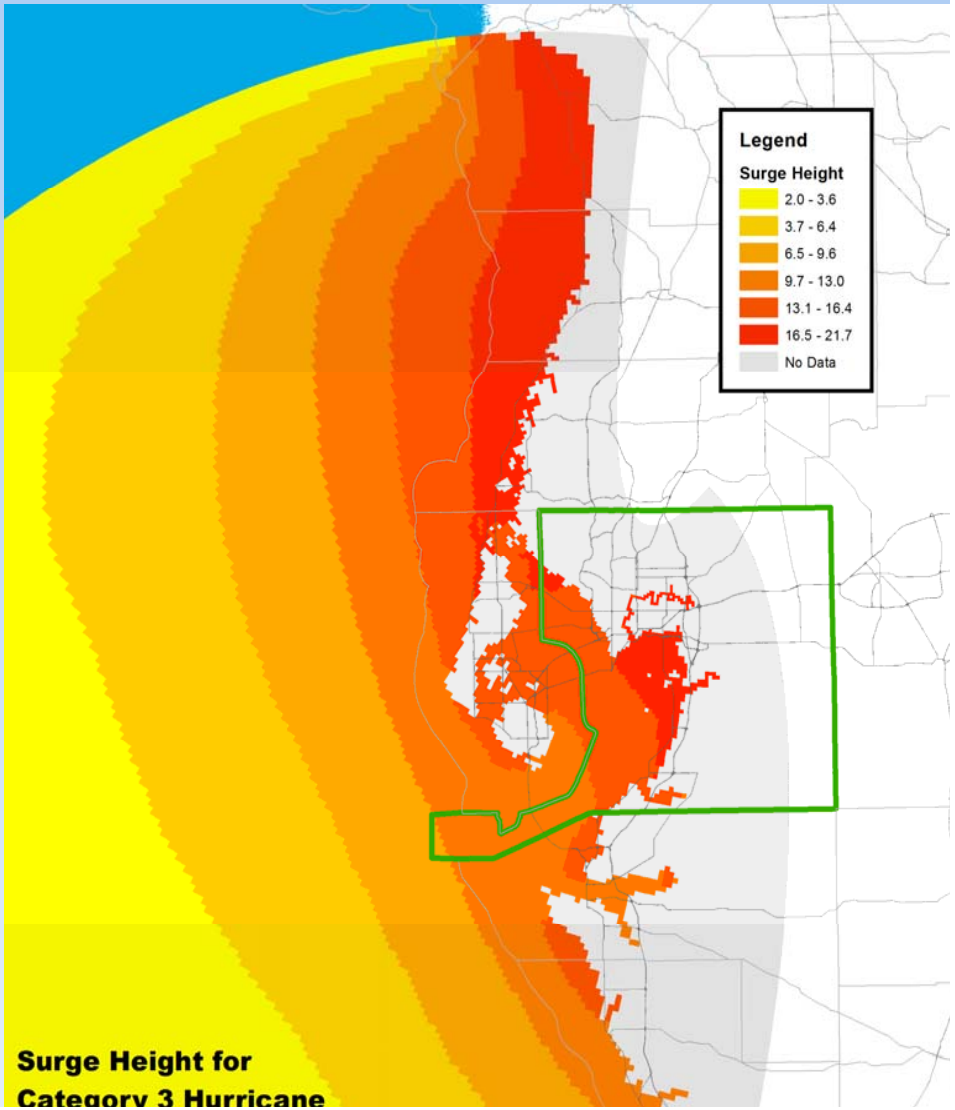
- 158 miles of coastline
- 3rd Largest Population in Florida (1.2 Million)
- 22% of the population lives in a flood prone area
- Economic Hub of Tampa Bay Metropolitan Region
- Largest seaport in Florida
- Home to US Central Command & Special Operations Command Center
- Tampa General – Regional Burn Center

Evaluation Process



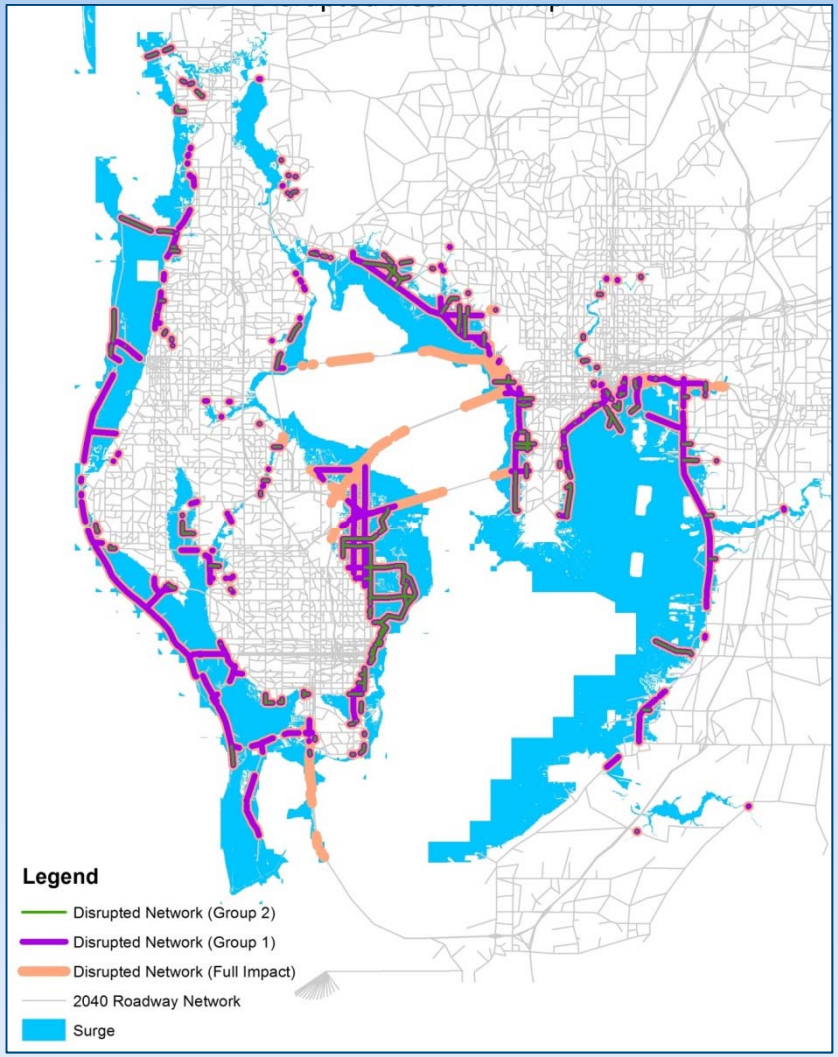
Risk Scenario

- **Simulated Category 3 storm surge**
  - Same category, trajectory as 1921 Tarpon Springs
  - High tide
  - Addition of sea level rise from Sketch Planning Tool (2040)



Assess Potential Network Disruption Impacts

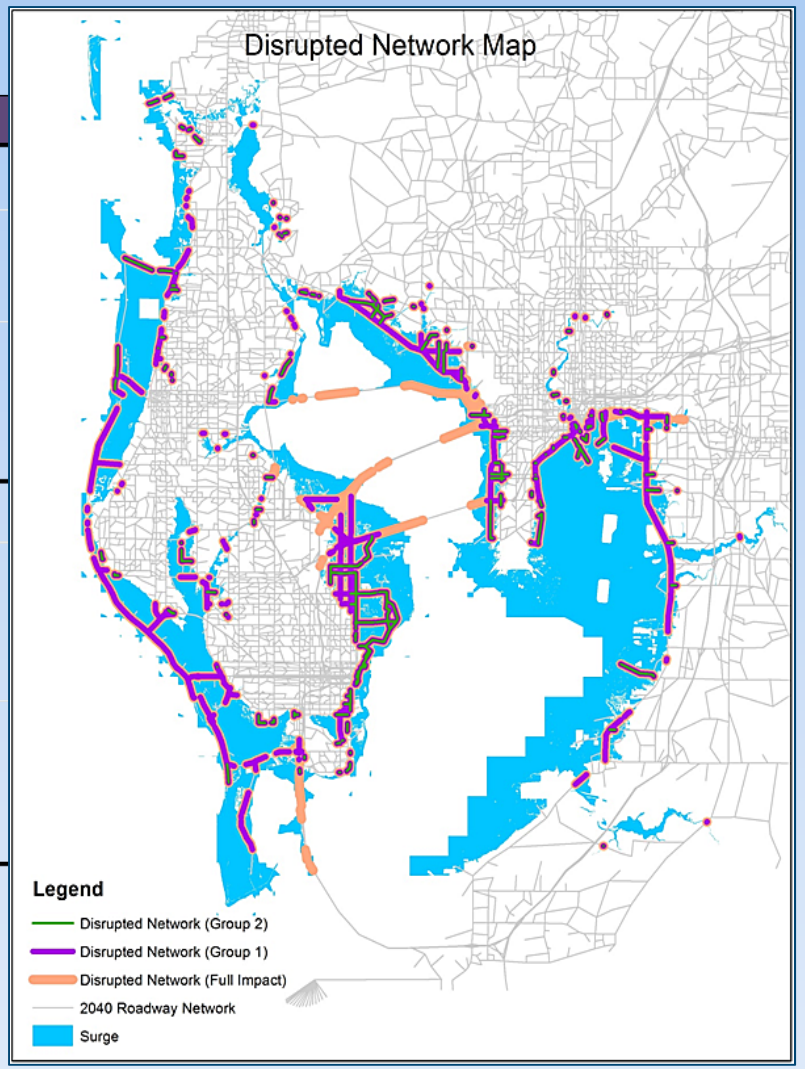
- **Simulation of phased recovery (post-storm surge)**
- **Simulate travel disruption using TBRPM**
  - One "typical day"
- **Derive daily change in**
  - Hours of delay
  - Miles travelled
  - Trips (lost)
- **Estimate range of potential disruption for each scenario**



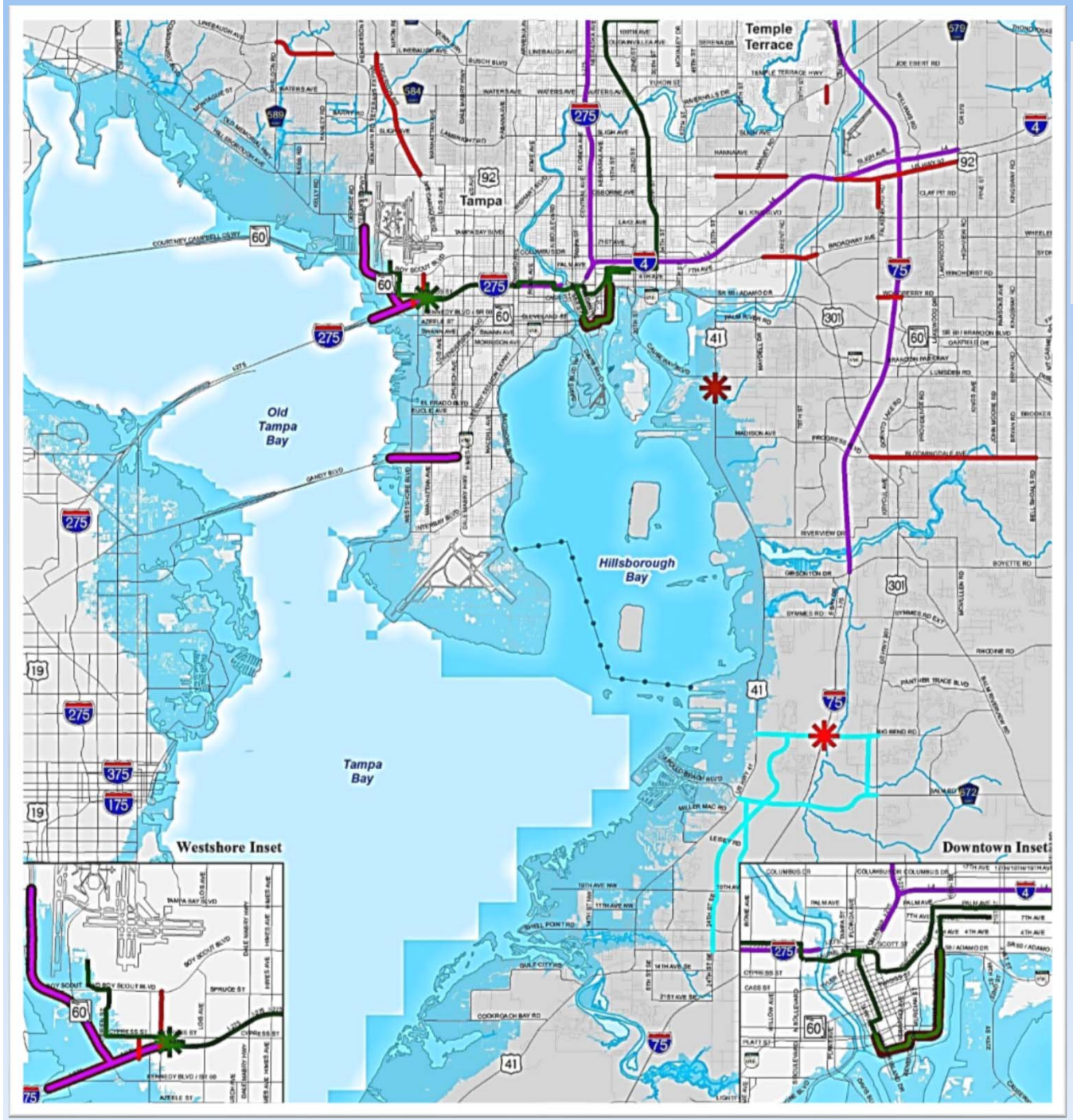
Vulnerability Reduction Investment Assumed in 2040 Plan

Investment Level	Benefits and Costs
	$31 Million per year
Scenario 1 **Current**	Continue today's stormwater drainage improvement programs
	Category 3 storm impacts: - 8 weeks major roads may be unusable - $266 million economic loss
	$39 Million per year
Scenario 8b **Adopted**	Continue today's stormwater drainage, plus: raise road profiles, enhance base, protect shorelines from wave damage
	Category 3 storm impacts: - 3 weeks major roads may be unusable - $119 million economic loss (cut in half!)

Economic losses cut in half



2040 Plan Capacity Projects & simulated CAT 3 storm surge



Storm Surge Area

Projects within Storm Surge Area

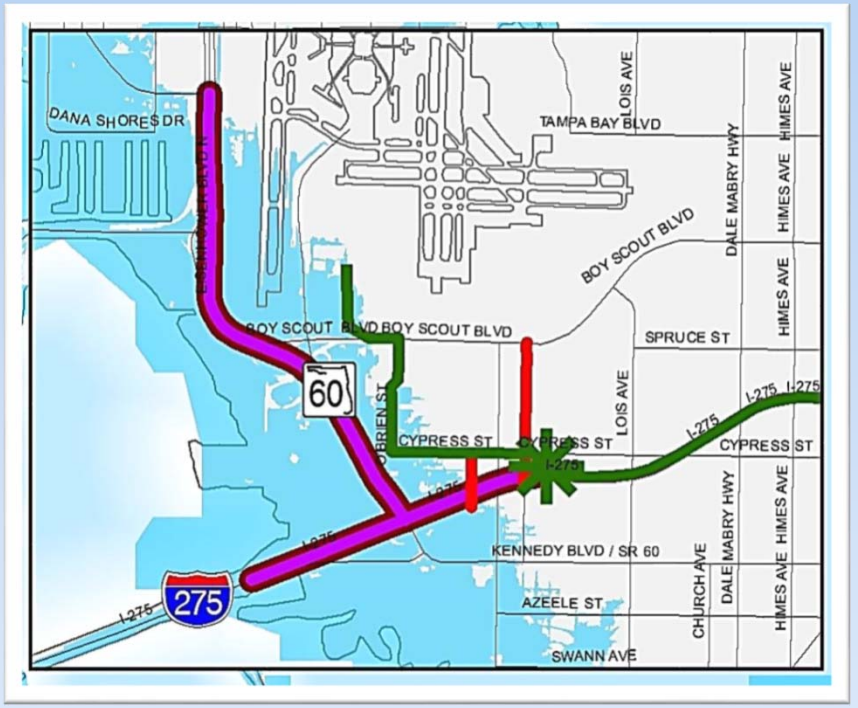
Interchanges within Storm Surge Area

- ❑ Memorial Hwy
- ❑ Gandy Connector
- ❑ US 41 Overpass/ Interchange at CSX/ Causeway
- ❑ Streetcar Modernization & Extension

Memorial Highway Project

- Cost Feasibility based on FDOT Strategic Intermodal System (SIS) 2040 Plan:
  - Part of SR 60/I-275 interchange reconstruction
  - $193 M cost (in YOE)
- Vulnerable area: 0.6 – 1.1 mi. based on Cat 1-Cat 3 storm surge
- Replacement cost: $100 M +
- Protection cost: $ 4.2 M
- ***Potential to incorporate into SIS project***

Inundation with Cat 3 Surge



Memorial Highway – 158,000 ADT

Climate Adaptation Stakeholder Meeting

THE FLORIDA AQUARIUM

January 29, 2015

8A | Tuesday, May 26, 2015 | Tampa Bay Times ★★★★

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OPINION

Times editorials

Rising sea levels require unified effort

For a state surrounded by water, Florida should be leading the nation in preparing to adapt to climate change. Yet with Gov. Rick Scott a self-proclaimed skeptic of man-made warming, the state is offering virtually no direction to local communities despite the impact already being felt from Miami to St. Augustine. State and local governments should increase their efforts before rising sea levels pose even greater dangers to public safety, property and the drinking water supply.

An Associated Press review of thousands of documents and emails shows the state has yet to offer a clear plan or coordination on addressing rising sea levels, despite chronic flooding along Florida's coastline from storm surges and higher tides. It has yet to address the increasing problem of saltwater intrusion into drinking water wells, which has cities and counties scrambling to find new sources of fresh drinking water. And the AP review blamed this not merely on indifference but on the mindset and culture change that took root after Scott took office. The governor downsized and cut the budgets of the regional water management agencies, and he put sea level rise and planning on the back burner.

This is in keeping with a governor who has shown no appreciation for Florida's fragile ecosystem. It comes years after a state inter-agency report found that sea levels are rising and "likely to rise faster as each decade passes," requiring much of the infrastructure of coastal Florida to be replaced. In Miami, high tides push floodwaters onto Biscayne Boulevard and Ocean Drive. In St. Augustine, as the AP reports, the city's old town floods nearly once a month on average, putting historic landmarks and the tourism industry at risk.

"If I were governor, I'd be out there talking about it (sea rise) every day," Eric Buermann, a former general counsel to the state Republican Party who also chaired the South Florida Water Management District, told the AP. "He's really got to grab a hold of this, set a vision (and) rally the people behind it."

Miami and other communities are doing what they can. For the first time, Hillsborough County's planning commission is looking to consider climate change in its review of long-term growth. In a nod to the politically charged dispute over climate change, the commission is referring instead to "climate adaptation." This is a silly word game; rather than indulge climate-skeptics, commissioners should start thinking seriously about how to better protect a county where 40,000 properties already are covered by flood insurance.

Local governments have a role. But they should not be forced to act in a vacuum. These efforts need to be coordinated through a statewide strategy. That's why it's imperative that the governor quit denying reality and widely accepted science. He needs to give the state effort greater urgency. Local communities cannot afford to storm-proof many of these major public works projects by themselves, and the state and local governments need a cost-sharing plan. They also need to agree on a more responsible and unified approach for managing growth. As most Floridians live within 60 miles of the Atlantic Ocean or the Gulf of Mexico, sea level rise is hardly a hypothetical problem, and not one this governor should slough off to his successor.

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POLITICS

Hillsborough governments building sea-level rise into development plans

BY CHRISTOPHER O'DONNELL
Tribune staff
Published: March 26, 2015

'Climate adaptation' on planners' radar

By Steve Contorno
scontorno@tampabay.com

For the first time, the Hillsborough County Planning Commission might ask local governments to consider the effects of climate change when strategizing for future growth and development.

The shift in approach would not be seismic. It's just one proposed line in the massive comprehensive land-use plans for Hillsborough, Tampa, Temple Terrace and Plant City that are up for review this year.

And it wouldn't reference "climate change," but rather the less politically charged phrase "climate adaptation."

Here's what the Planing Commission's draft language for the section on coastal management in local comprehensive plans says: "Develop strategies to identify and address issues related to climate adaptation in cooperation with the (Environmental Protection Commission), the Planning Commission and other agencies."

However vague and open-ended, it still would be a notable step for the county, which faces rising sea levels. Scientists attribute that rise to increasing global temperatures from greenhouse gases. By comparison, Pinellas County has included several direct instructions for addressing climate change and its effects in the county's comprehensive plan since 2008.

The decision whether to acknowledge "climate adaptation" is part of the Planning Commission's periodic review of the comprehensive plans, which guide development countywide. The Planning Commission is an independent body created by the Legislature to oversee growth in Hillsborough with appointees representing all four local jurisdictions. Its recommendations are weighed but are not binding.

The commission on Monday listened to a presentation from Charles Paxton of the National Weather Service on the potential affects of climate change on the region. While sea levels rise and fall constantly, the peaks are higher and levels are more frequently above where they were even 50 years ago.

As a result, "systems engineered in the '70s may not accommodate events in the 2000s," Paxton told commissioners.

TBT 05-13-2015

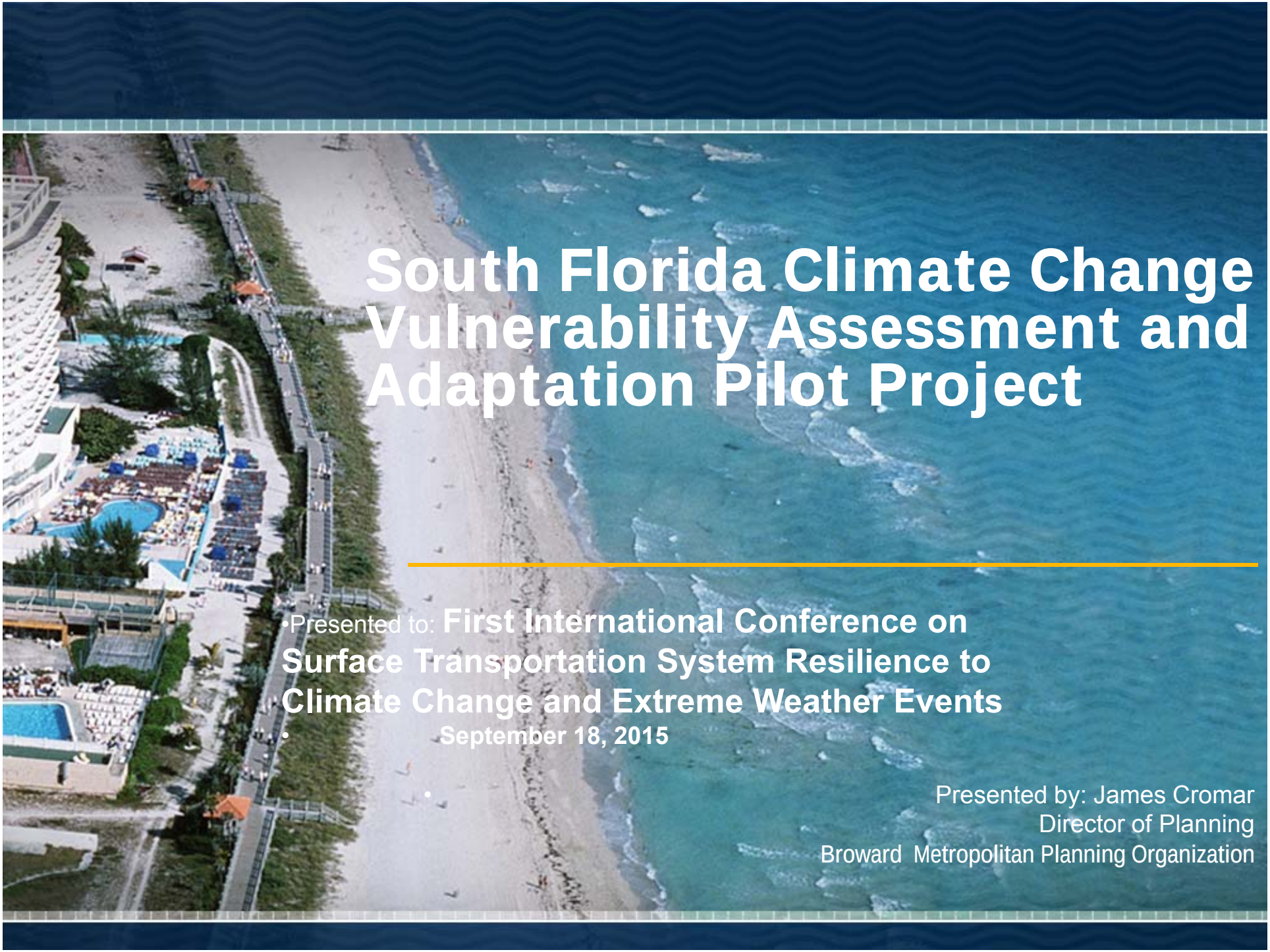
Addressing Climate Issues Regionally

Tampa Bay Climate Science Advisory Panel (CSAP)

Unified Projection of Sea-Level Rise in Tampa Bay Region

TBRPC ONE BAY Resilient Communities

- Pinellas County Climate Team
  - **City of Clearwater DOE Pilot Project**
- Hillsborough County EPC Workgroup
- Manatee County Green Team
- Pasco County



South Florida Climate Change Vulnerability Assessment and Adaptation Pilot Project

•Presented to: **First International Conference on Surface Transportation System Resilience to Climate Change and Extreme Weather Events**

• **September 18, 2015**

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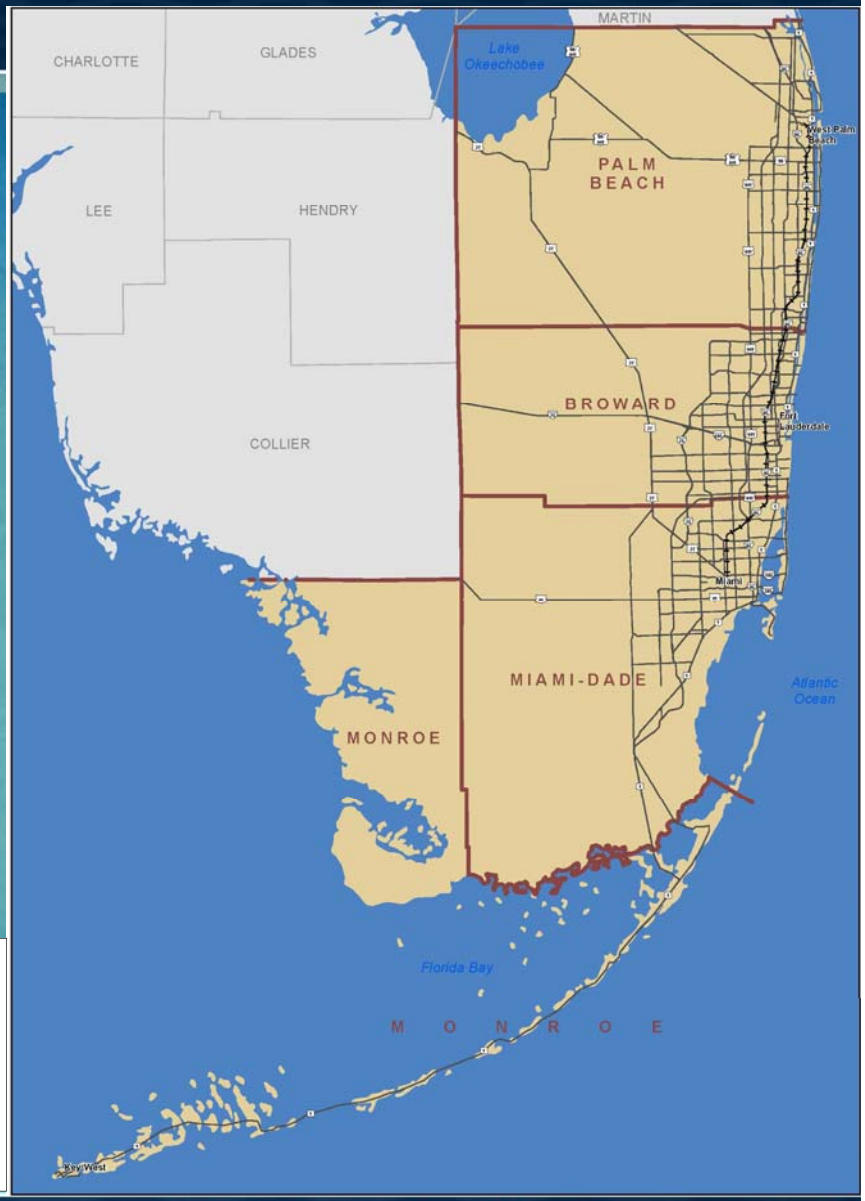
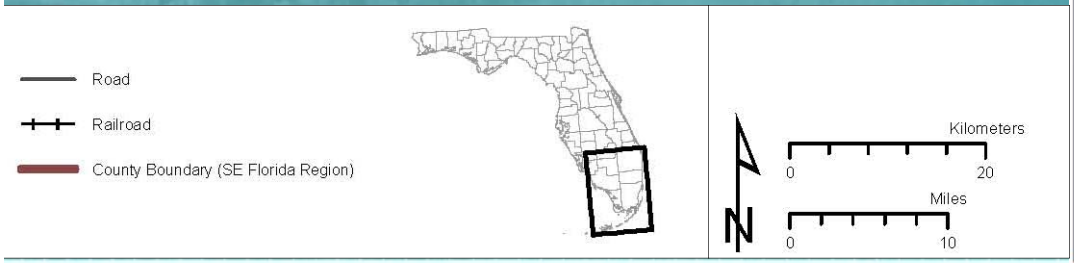
Presented by: James Cromar
Director of Planning
Broward Metropolitan Planning Organization

Regional Transportation Network

- Palm Beach County
- Broward County
- Miami-Dade County
- Monroe County

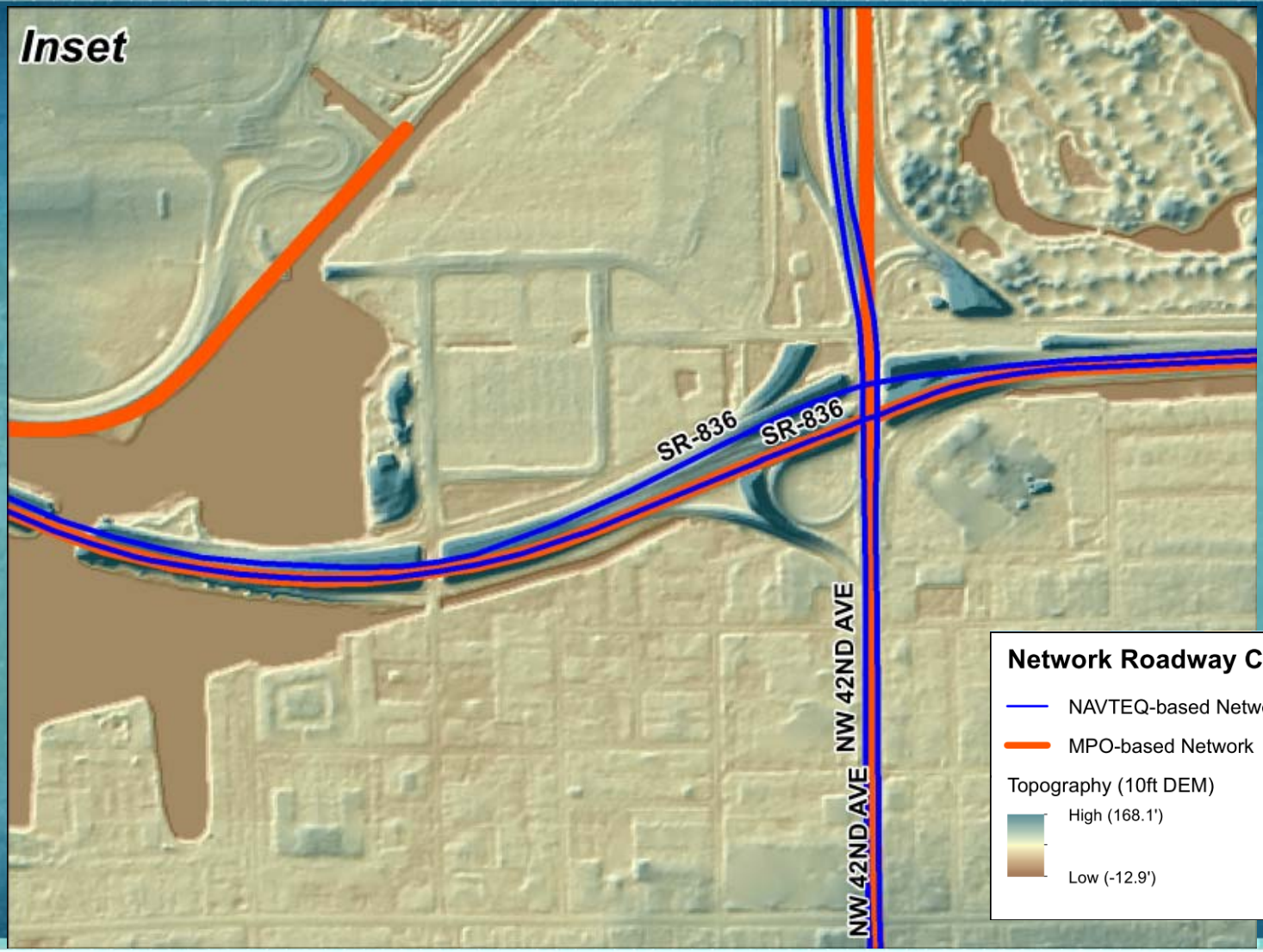




Data Collection

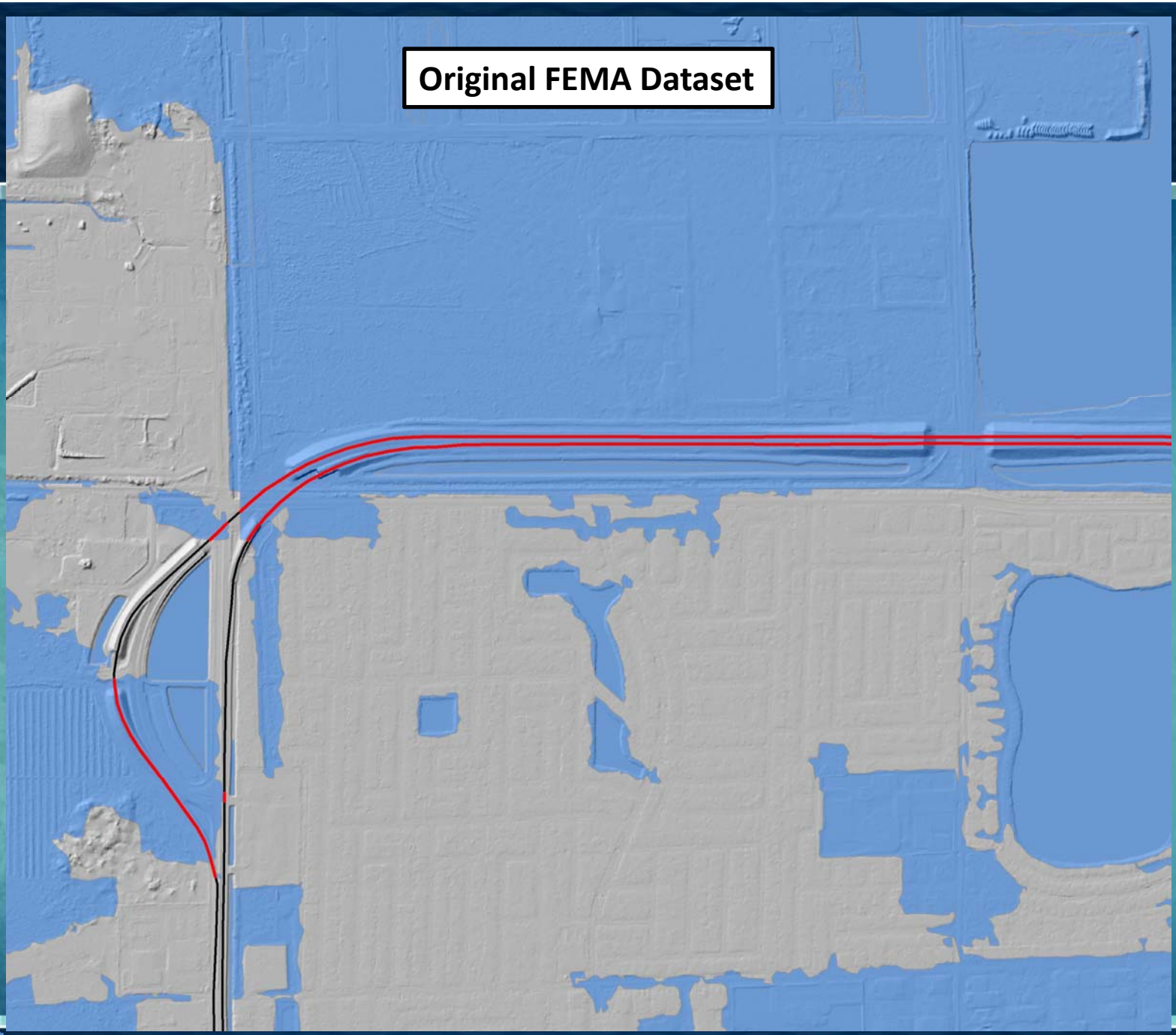
Name/Type	Data Collected	Accuracy	Source
LiDAR Derived Elevation Contours and DEM	DEM-FLiDAR Mosaic	5-meter mosaic for the entire Florida state	FGDL
FDOT-UFL-GeoPlan Tool	Inundation Surfaces		UFL-GeoPlan Website
	Affected Infrastructure		UFL-GeoPlan Website
Transportation Network	Transportation Data		FDOT-GIS
SLR Scenarios based on NOAA Tidal Surface information	1ft, 2ft, 3ft SLR for Miami Dade, Broward, Monroe County's		Broward County GIS

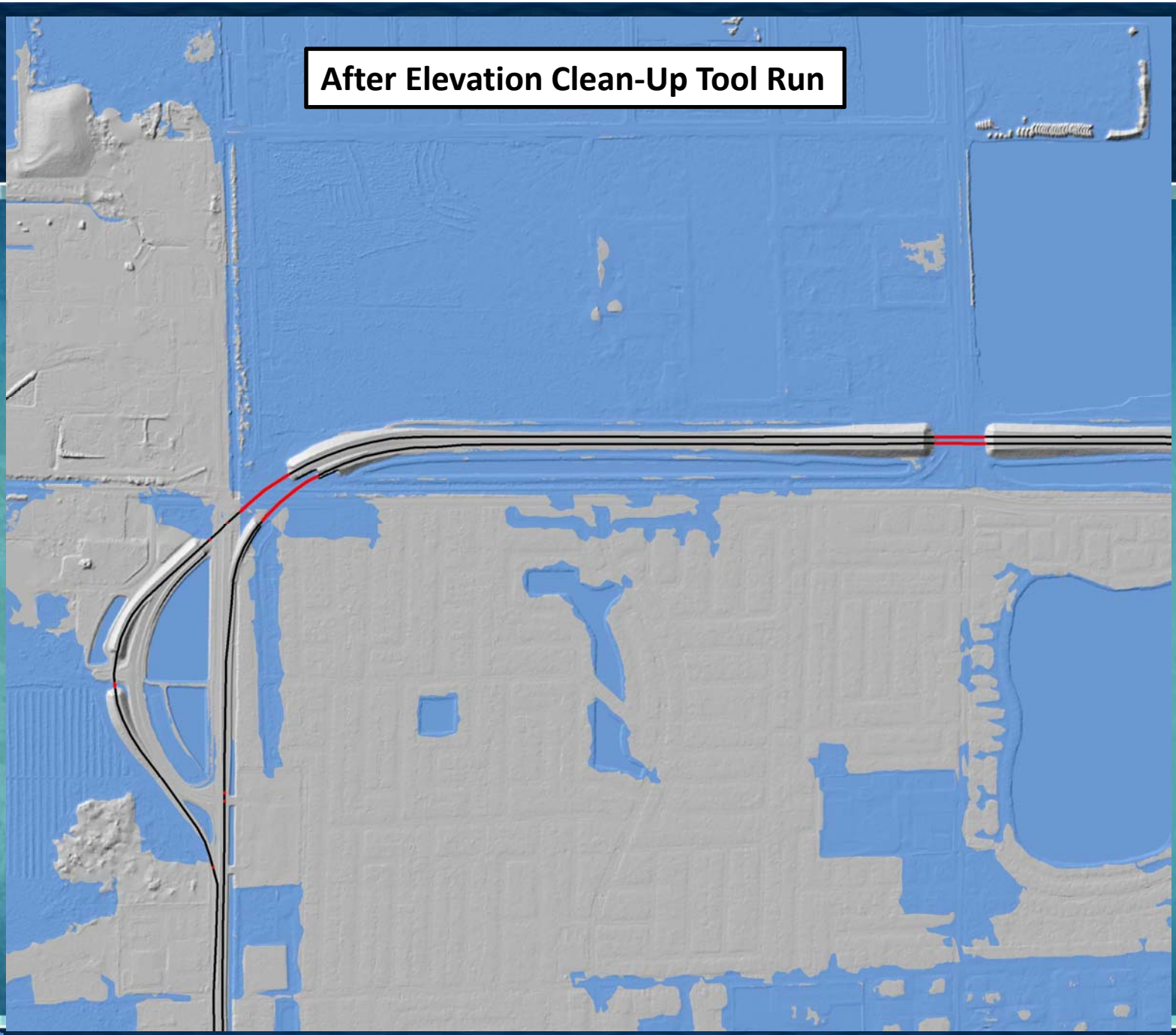
Network Irregularities



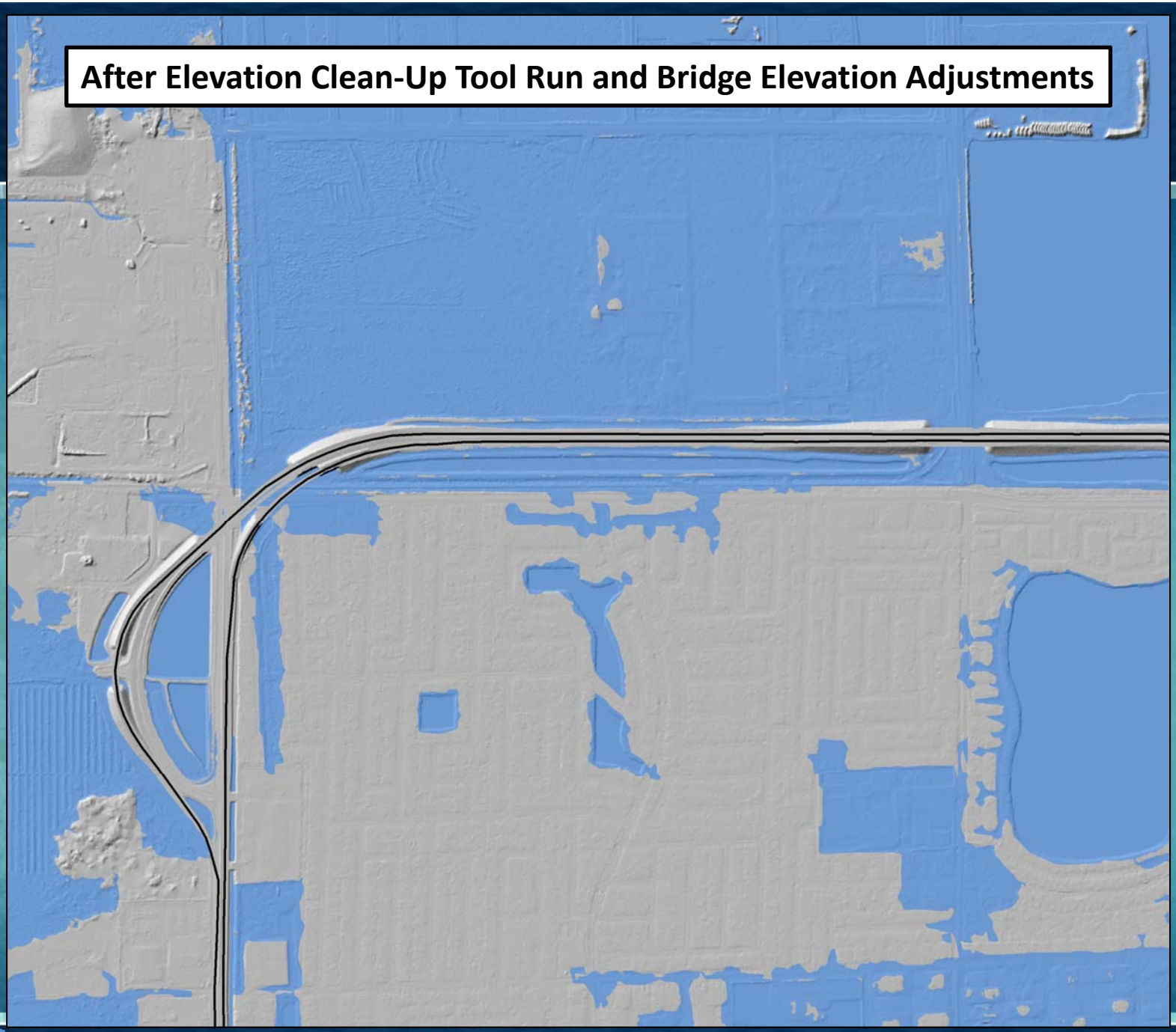
FEMA Data Example

False inundation examples
(road on embankment)


Original FEMA Dataset

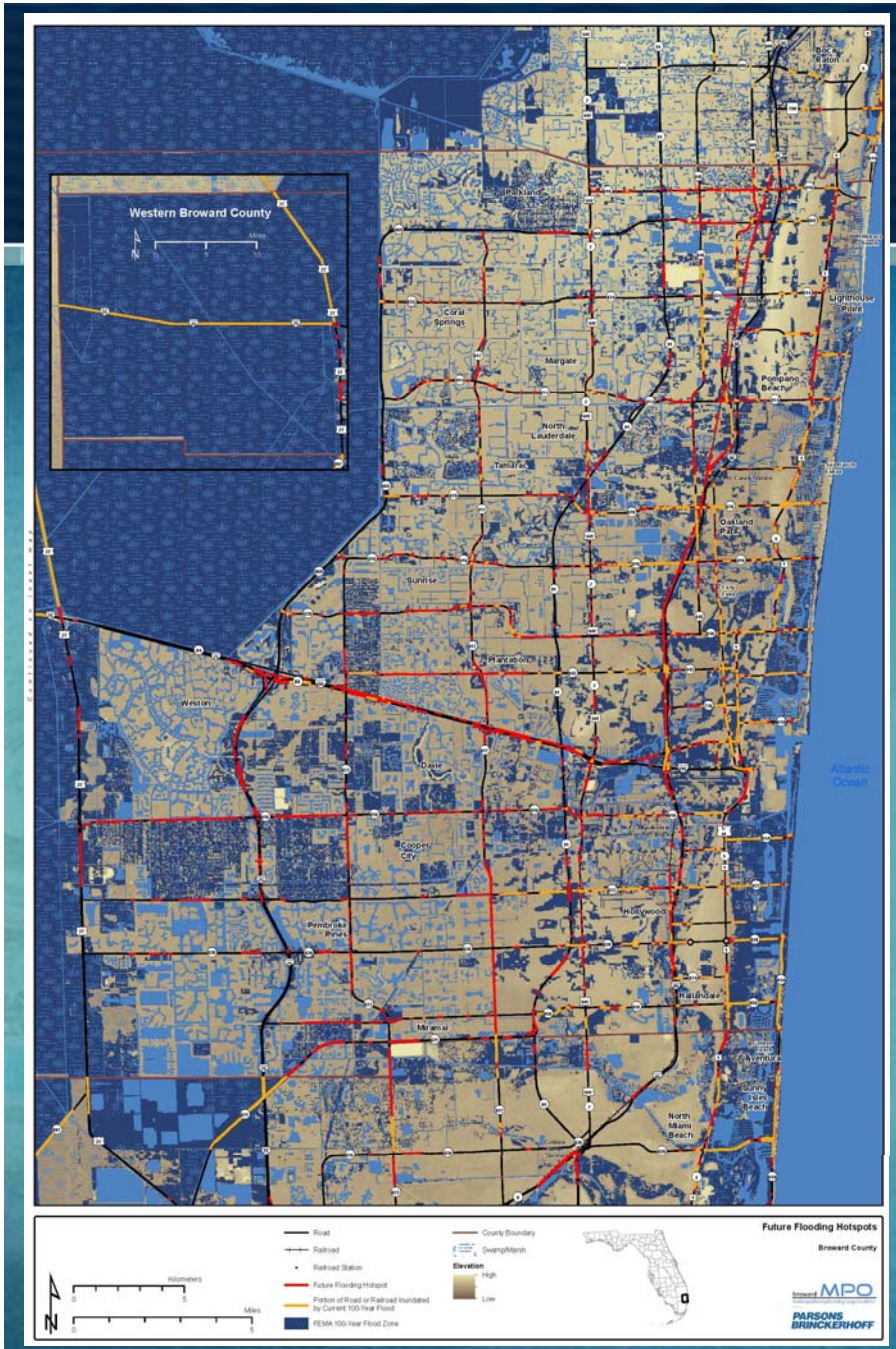

After Elevation Clean-Up Tool Run

After Elevation Clean-Up Tool Run and Bridge Elevation Adjustments



Climate Stressors

- Sea level rise (SLR)
- Storm surge and related inundation
- Heavy precipitation and related flooding
  (including impacts from SLR – groundwater interactions)



Integrating Data into Decision Making

- Transportation Planning and Prioritization
- Rehabilitation or Reconstruction of Existing Facility in High Risk Areas
- New Facility on New ROW in High Risk Areas
- Operations
- Maintenance

http://www.browardmpo.org/planning/adapting-to-climate-change

Lessons Learned / Conclusions

- Don't delay decisions by trying to develop "perfect data"
- Data needs to be "good enough" to inform decisions

- Taking action in Broward
  - Determine potential roadway impacts in vulnerable areas
  - Propose actions to reduce vulnerability
  - Prioritize the funding
  - Implement projects

Thank You!

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Links

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Hillsborough County MPO Pilot

www.planhillsborough.org/hillsborough-transportation-vulnerability-assessment-pilot-project

Broward MPO Pilot

www.browardmpo.org/planning/adapting-to-climate-change

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