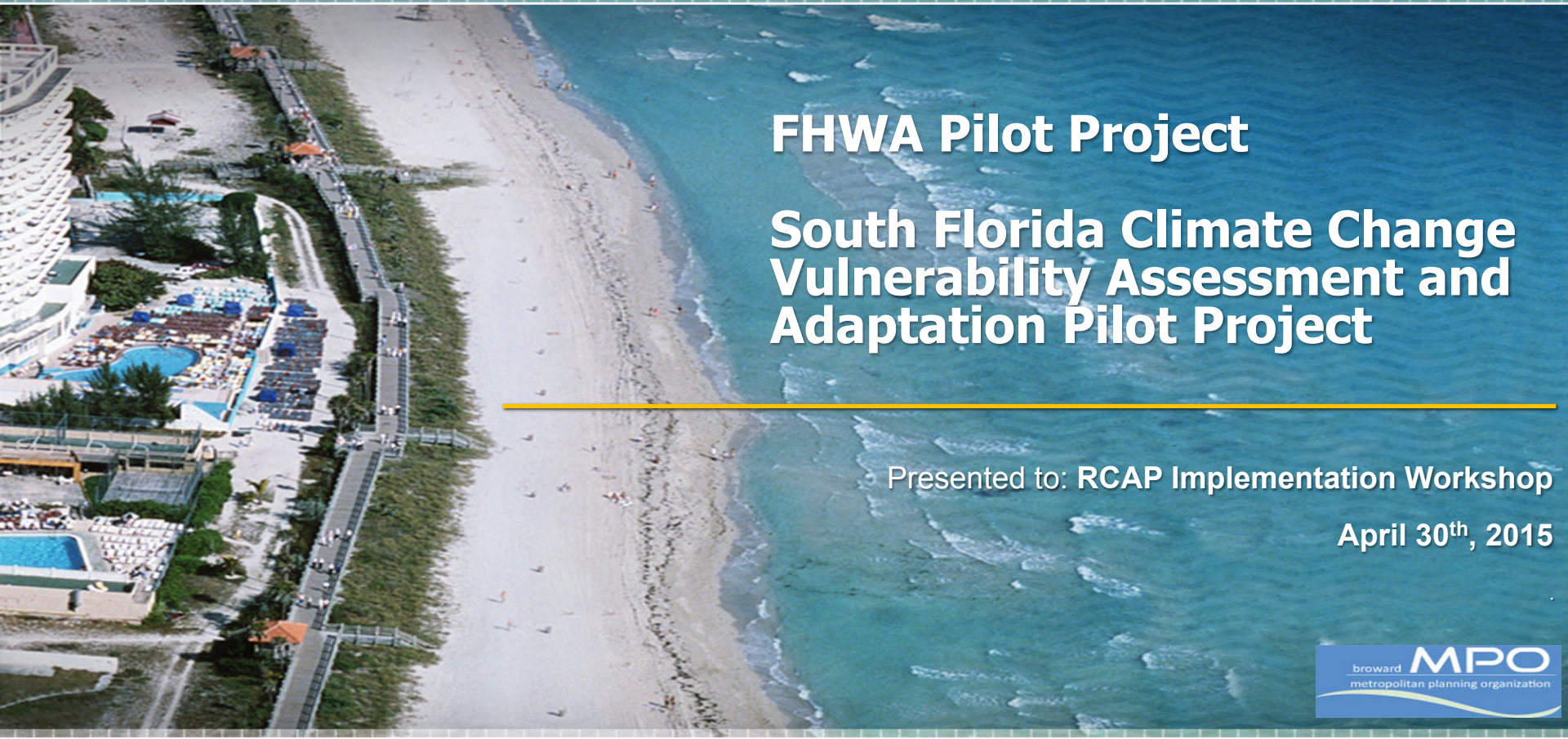


FHWA Pilot Project

South Florida Climate Change Vulnerability Assessment and Adaptation Pilot Project

Presented to: **RCAP Implementation Workshop**

April 30th, 2015

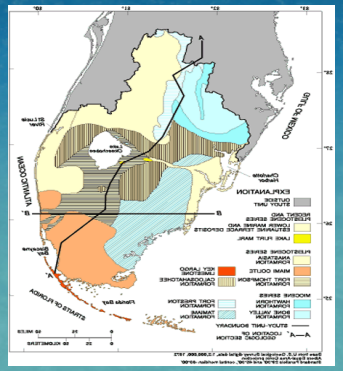
broward MPO
metropolitan planning organization

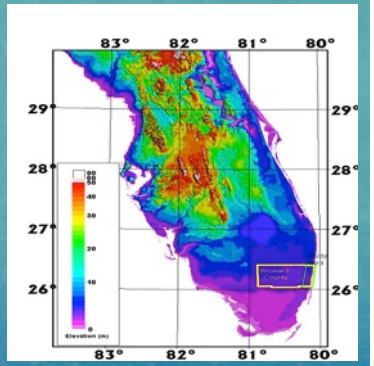
Agenda

- Discussion of transportation impacts in your community
- Project background and technical methodology
- Group Activity
- Project Findings
- How to Apply the Findings
- Q&A

Florida – The Sunshine State

- What Makes it Great
  - Caribbean Climate
  - Plenty of Water Front Property
  - Fascinating Limestone Geology
  - Great for Morning Exercise





Discussion

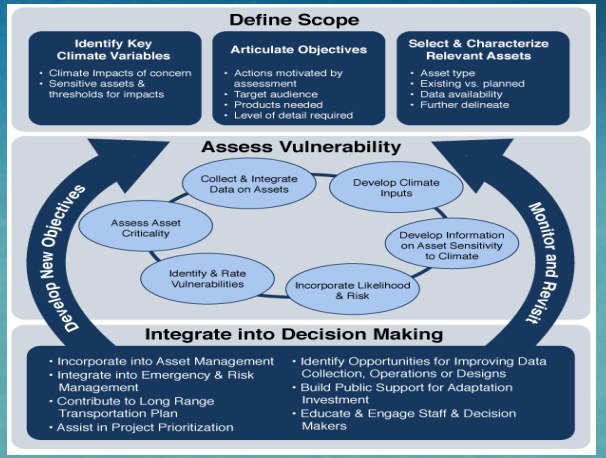
Transportation Impacts in Your Community

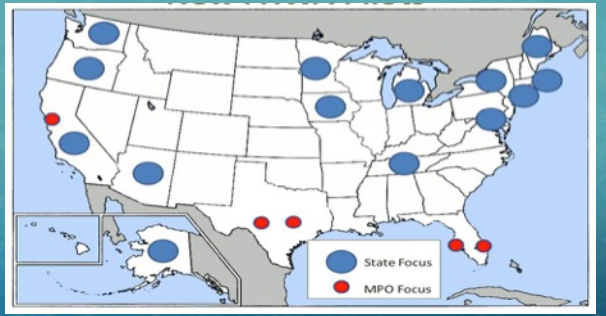
- What are the issues you have seen in your community thus far?
- What do you see as the greatest threat to your community?
  - Long term SLR, Surge, Precipitation Induced Flooding
- How is your community planning for existing or future events?
- What factors guide future responses to vulnerabilities?
  - Level of Impact, usage, access to business centers, detours, etc.

Project Background

Project Intent

- Part of a broader national effort to define methods to determine vulnerability
- Led by Broward MPO for four county southeast Florida area
- Identify existing and future vulnerabilities of the transportation system
- Provide feedback to FHWA on approaches to refine methods





U.S. Department of Transportation
Federal Highway Administration

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Project Scope

- Assess current and future impacts to regionally significant roads, railroads, and bridges
- Unit of analysis
  - Roads: Segmented at intersections of other regionally significant routes
  - Railroads: Segmented between stations
- Analysis involves measuring exposure to:
  - Current and future temporary flood inundation (storm surge & precip.)
  - Permanent sea level rise (SLR) inundation

Technical Methodology

Overall Vulnerability Approach

Identify Assets of Interest

Regional road network

Tri Rail network

Calculate the Vulnerability Scores for Each Asset

Sensitivity

- Bridge condition index
  - Scour rating (roads)
  - Substructure condition rating (roads)

Exposure

- % of segment permanently inundated by SLR (1, 2, & 3 Ft.)
- Current flood exposure index
- Future potential flood exposure index

Adaptive Capacity

- Average annual daily traffic (roads)
- Heavy commercial average daily traffic (roads)
- Tri-Rail ridership on segment (rail)
- Detour length (roads)

Rank Flood Vulnerabilities

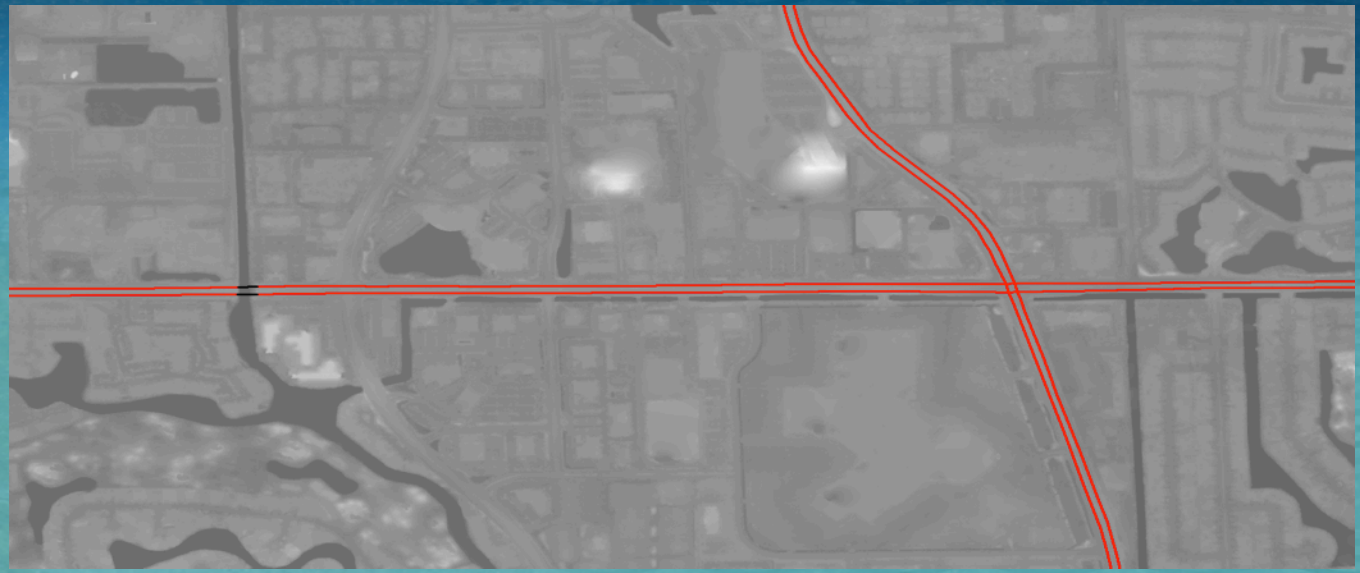
Methodology – Spatial Refinement of Risk

Thank You FDOT GeoPlan and Other Local Partners!

1. Selecting/Developing Baseline Data

Developing the Baseline Data for Analysis

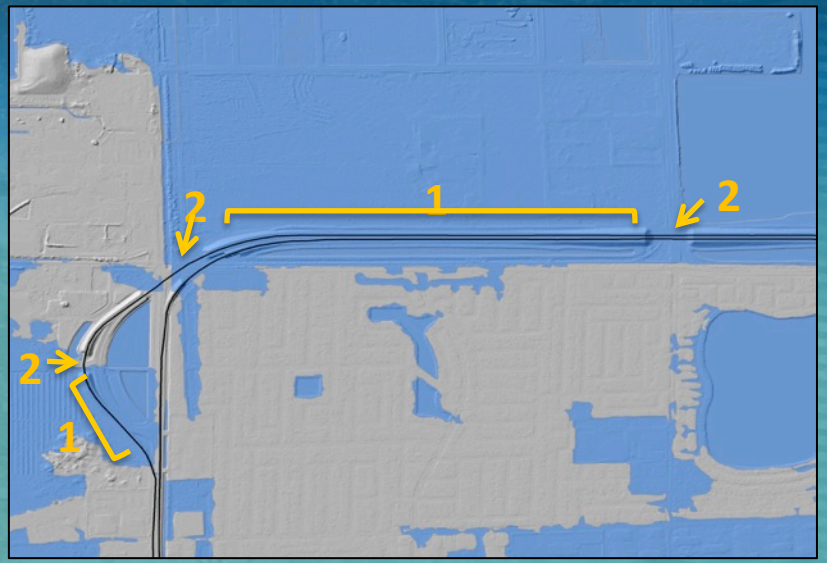
- Obtain LIDAR topographic mapping for region
- Obtain horizontally accurate roadway layer
- Determine bridge deck elevations from raw LIDAR files
- Identify network segments to apply in vulnerability analysis



2. Understand Current Flood Exposure

Developing the Baseline Data for Current Vulnerability Analysis

- Obtain FEMA mapping for each regional jurisdiction
- Combine FEMA mapping into one regional geo-database
- Rectify FEMA layer with more accurate LIDAR topographic data
- Utilize cleaned FEMA layers



2. Understand Current Flood Exposure

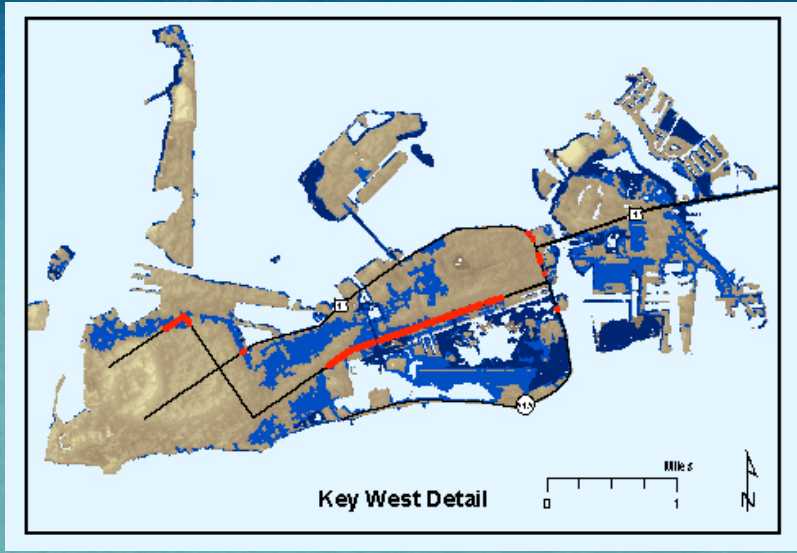
Developing the Baseline Data for Current Vulnerability Analysis

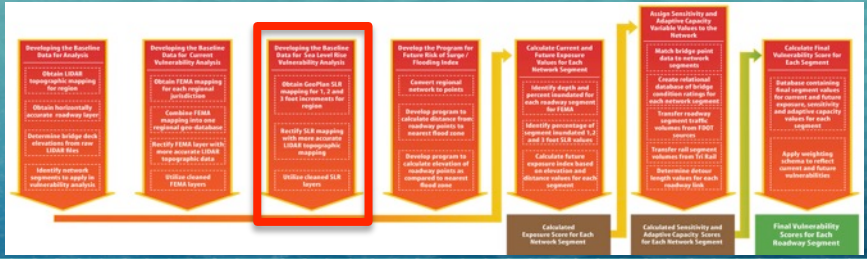
- Obtain FEMA mapping for each regional jurisdiction
- Combine FEMA mapping into one regional geo-database
- Rectify FEMA layer with more accurate LIDAR topographic data
- Utilize cleaned FEMA layers

3. Understand Future Exposure – Permanent Inundation

Developing the Baseline Data for Sea Level Rise Vulnerability Analysis

- Obtain GeoPlan SLR mapping for 1, 2 and 3 foot increments for region
- Rectify SLR mapping with more accurate LIDAR topographic mapping
- Utilize cleaned SLR layers



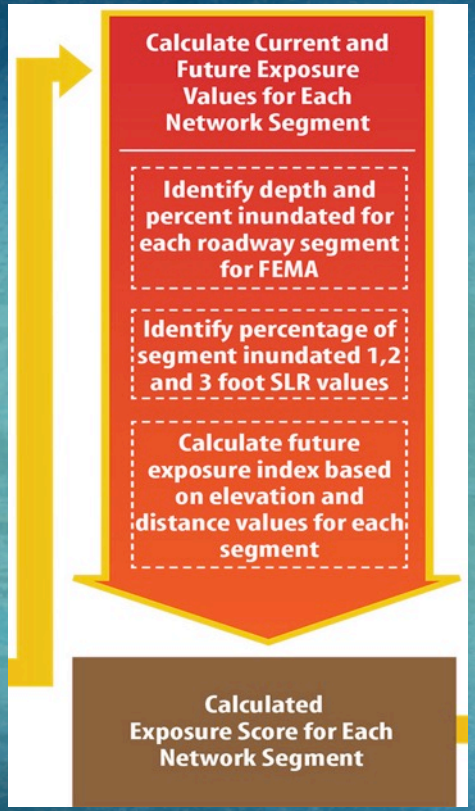


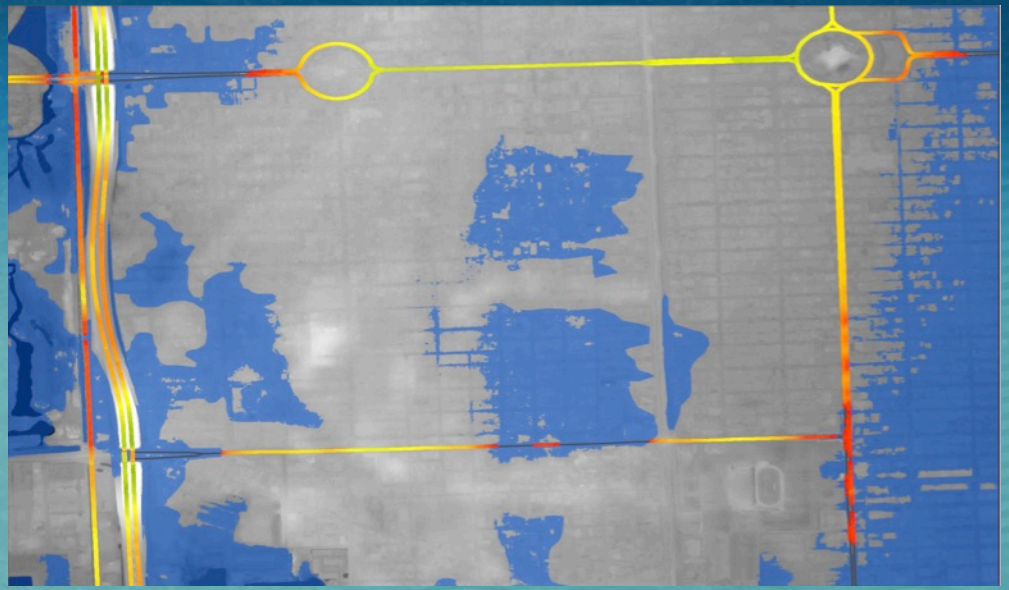
4. Understand Future Exposure – Temporary Inundation

Develop the Program for Future Risk of Surge / Flooding Index

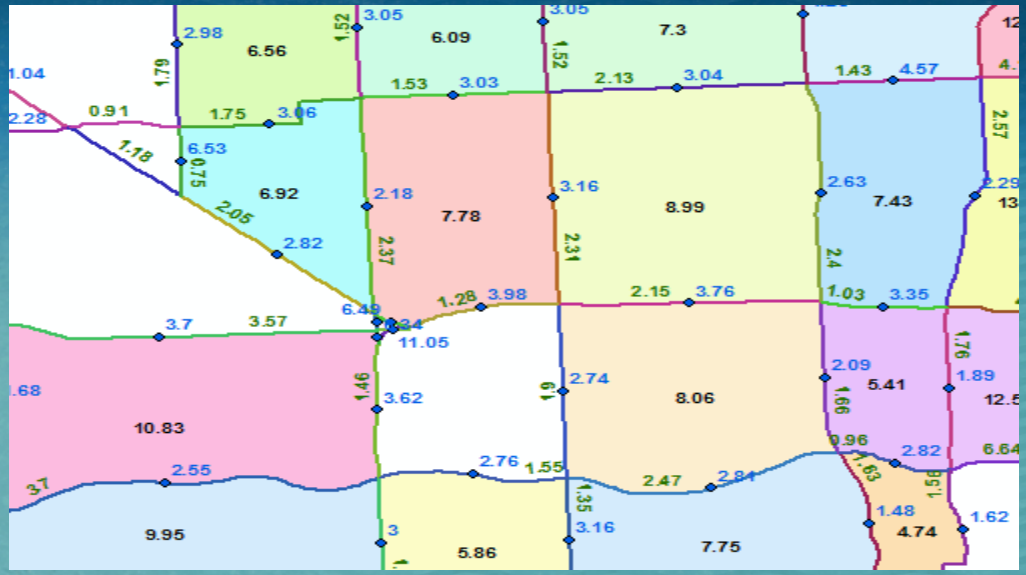
- Convert regional network to points
- Develop program to calculate distance from roadway points to nearest flood zone
- Develop program to calculate elevation of roadway points as compared to nearest flood zone

5. Summarize Exposure



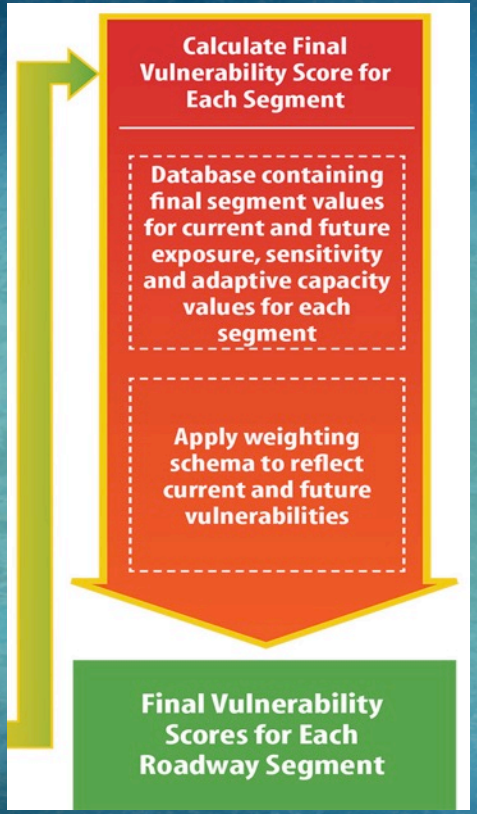


6. Understand Sensitivity & Adaptive Capacity



Group Activity

7. Calculate Vulnerability Scores



Variable Weighting Schema - South Florida Climate Vulnerability Assessment

Roads

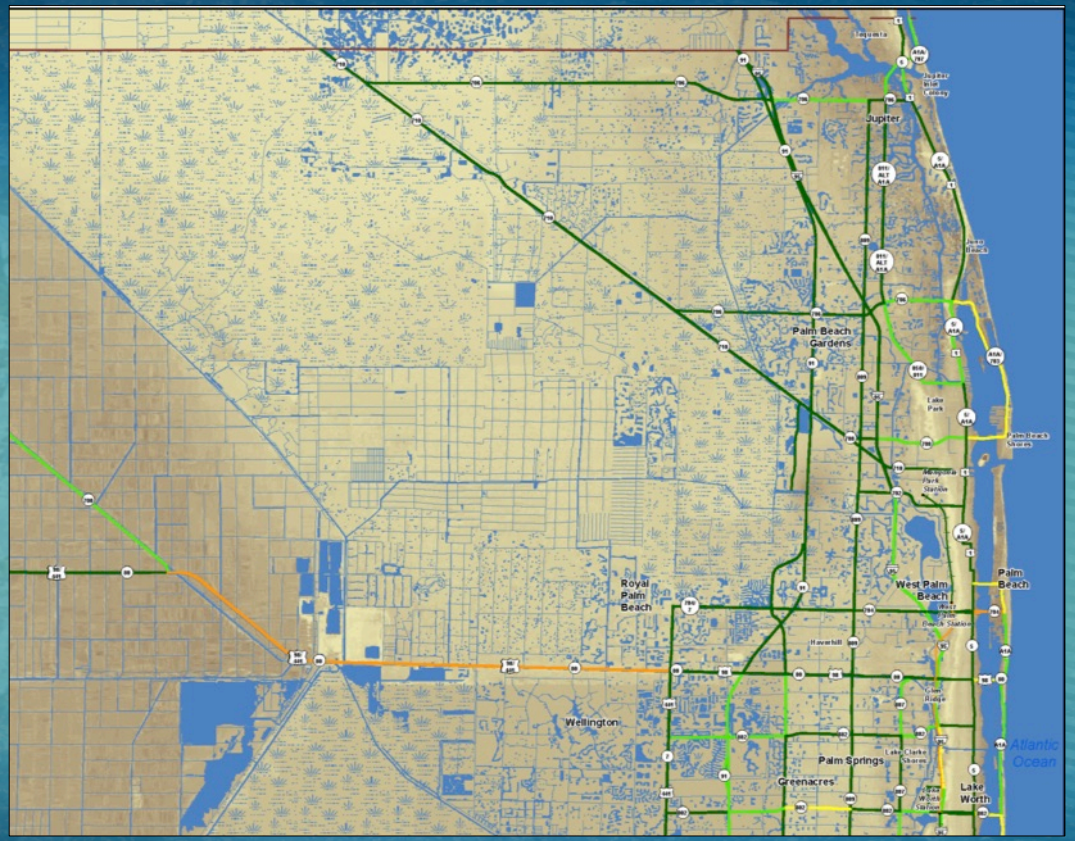
Category	Variable	Variable Weighting	Category Weighting
Sensitivity		*100*	20
	Bridge condition index (scour, substructure condition, # of bridges)	100	
Exposure		*100*	70
	% of segment permanently inundated by 1 ft. of SLR	25	
	% of segment permanently inundated by 2 ft. of SLR	20	
	% of segment permanently inundated by 3 ft. of SLR	15	
	Current flood exposure index (storm surge & precipitation)	30	
	Future potential flood exposure index (storm surge & precipitation)	10	
Adaptive Capacity		*100*	10
	Average annual daily traffic (AADT)	50	
	Detour length	50	

Rail

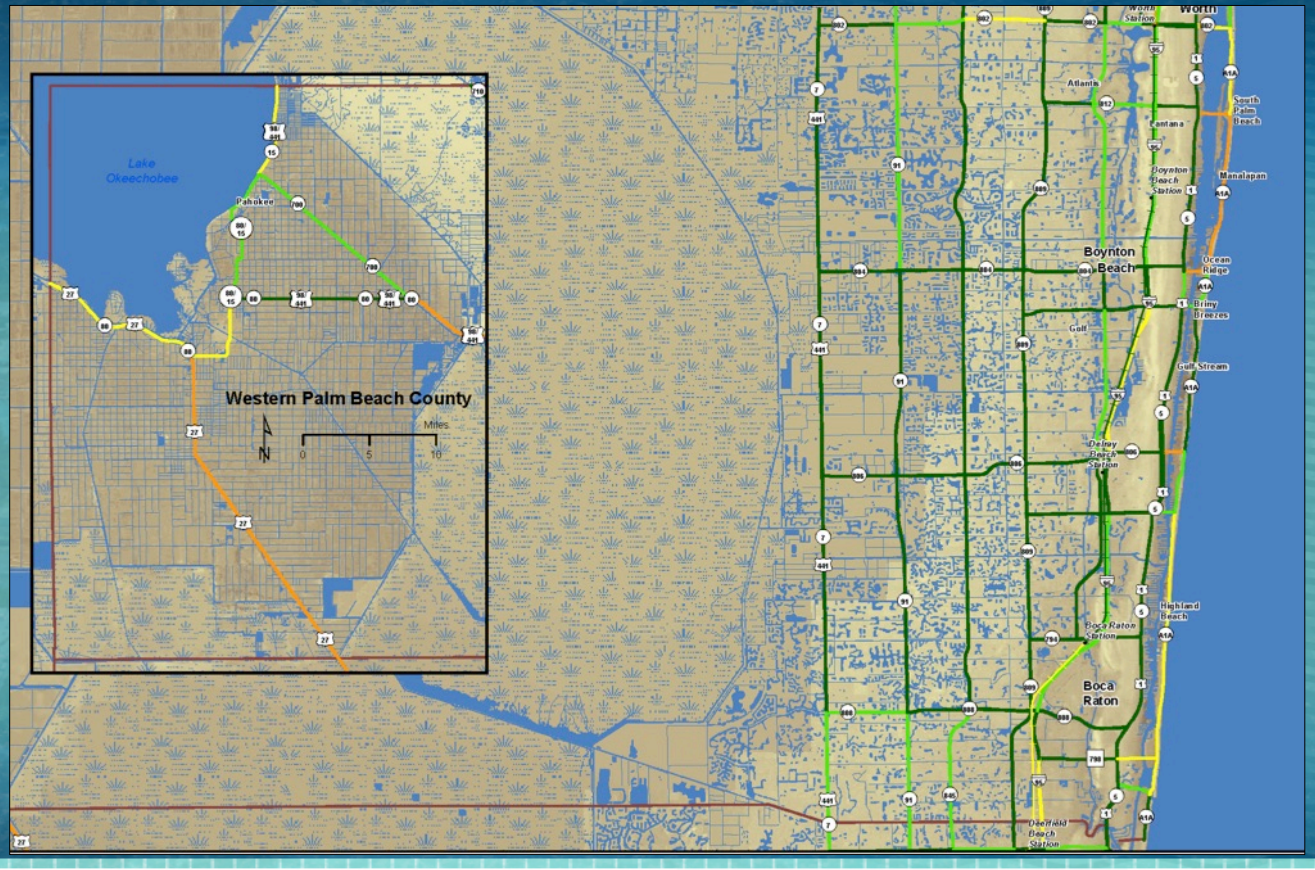
Category	Variable	Variable Weighting	Category Weighting
Sensitivity		*0*	0
Exposure		*100*	95
	% of segment permanently inundated by 1 ft. of SLR	25	
	% of segment permanently inundated by 2 ft. of SLR	20	
	% of segment permanently inundated by 3 ft. of SLR	15	
	Current flood exposure index (storm surge & precipitation)	30	
	Future potential flood exposure index (storm surge & precipitation)	10	
Adaptive Capacity		*100*	5
	Ridership	100	

Findings

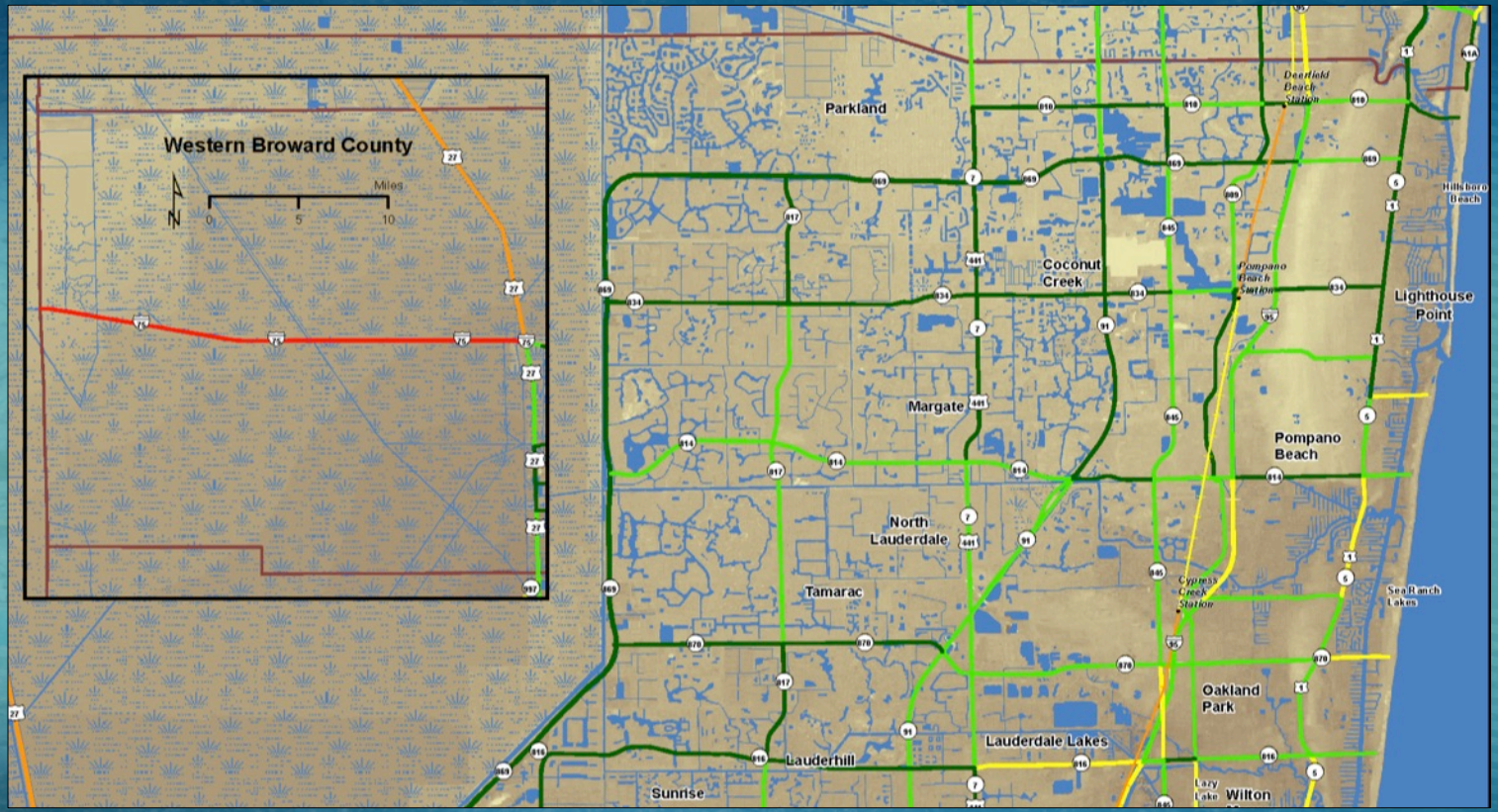
Findings – Palm Beach County (North)



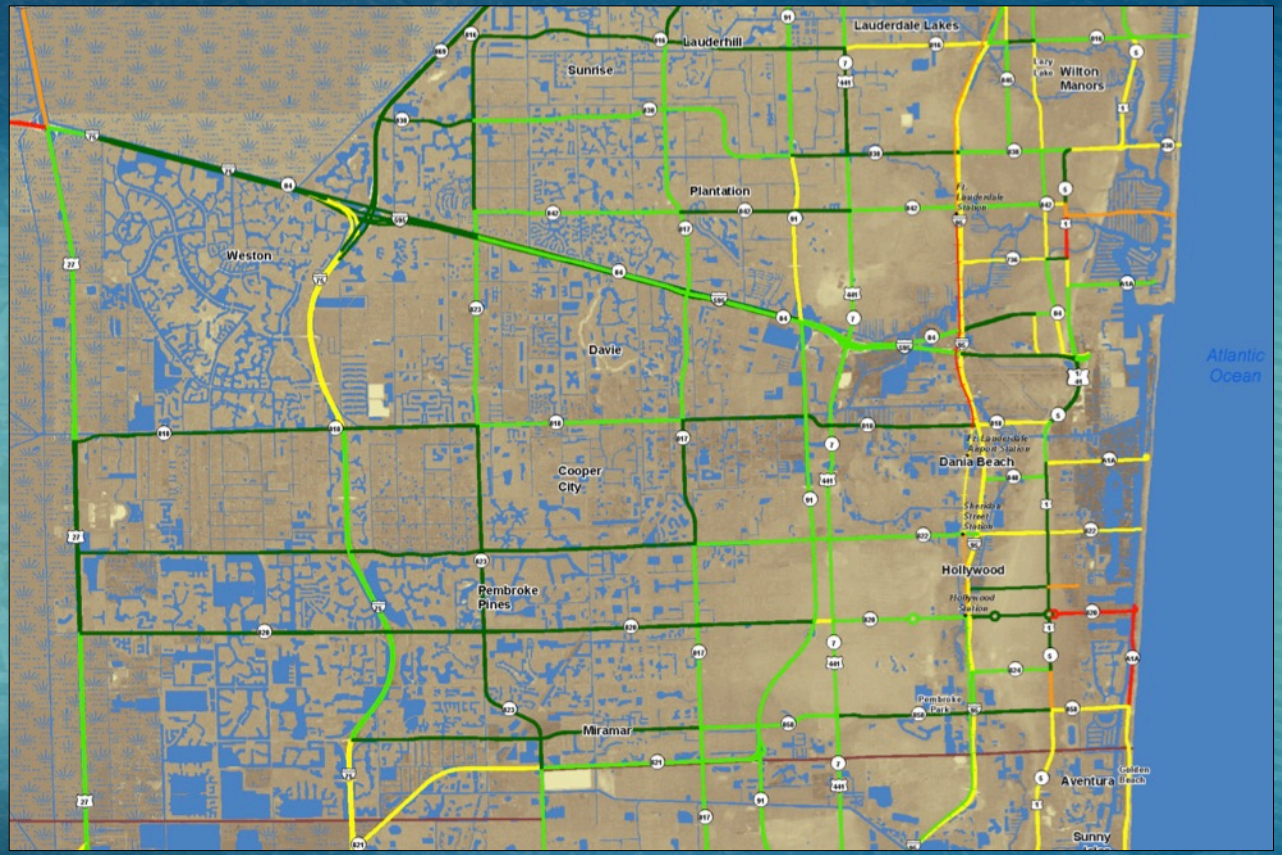
Findings – Palm Beach County (South & West)



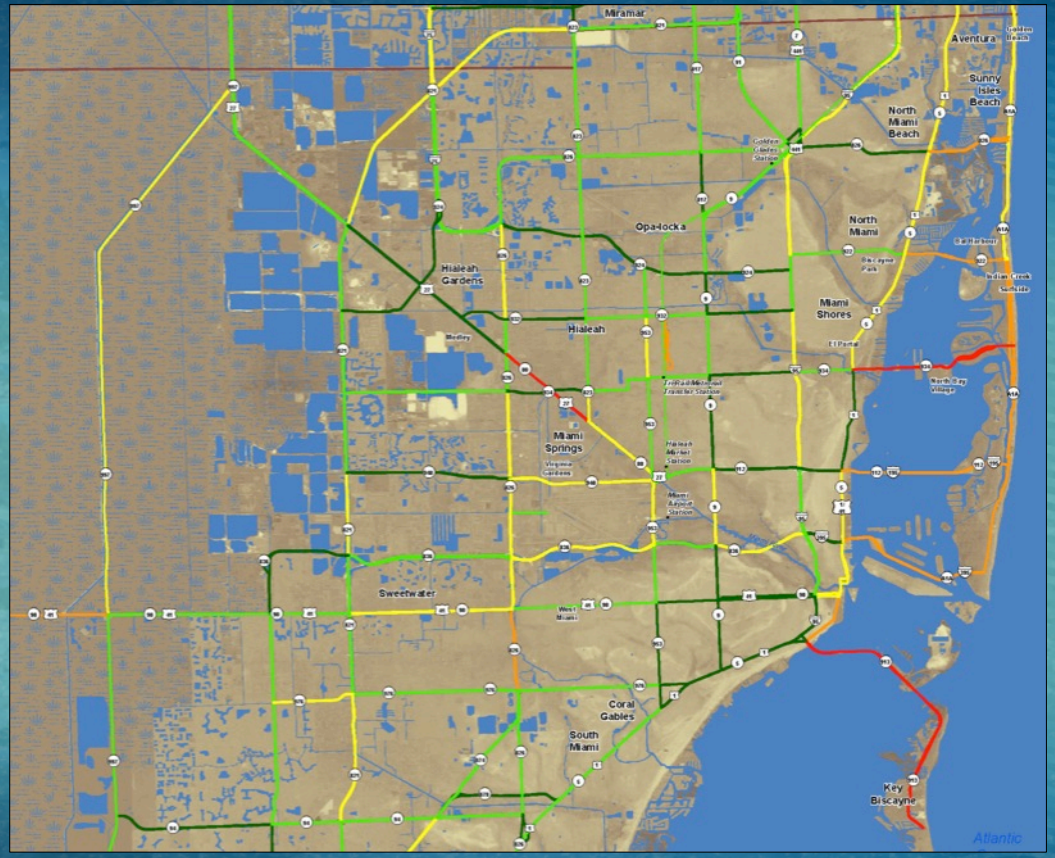
Findings – Broward County (North & West)



Findings – Broward County (South)



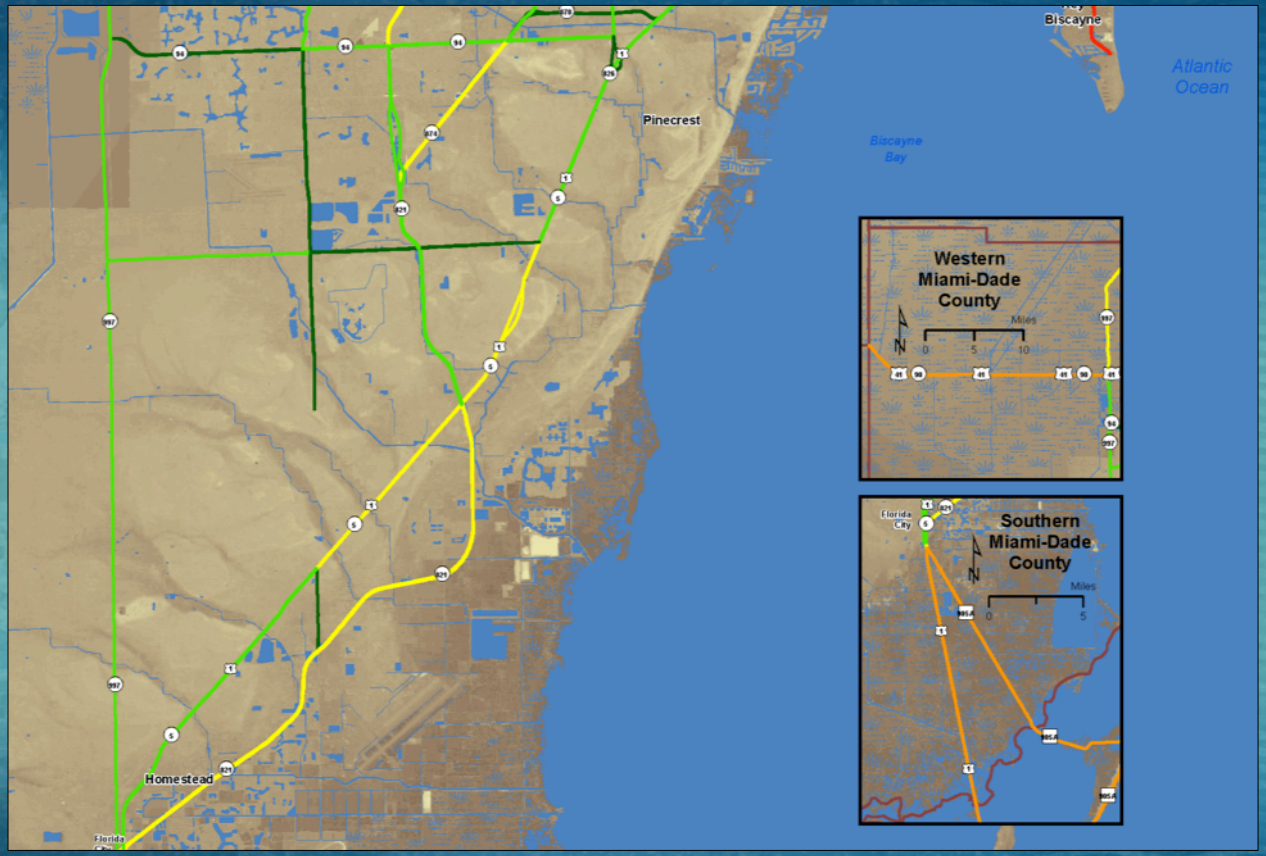
Findings – Miami-Dade County (North)



VULNERABILITY

- Tier 1 – Highest vulnerability
- Tier 2 – High vulnerability
- Tier 3 – Moderate vulnerability
- Tier 4 – Low vulnerability
- Tier 5 – Lowest vulnerability
- Road
- Railroad
- Railroad Station

Findings – Miami-Dade County (South & West)

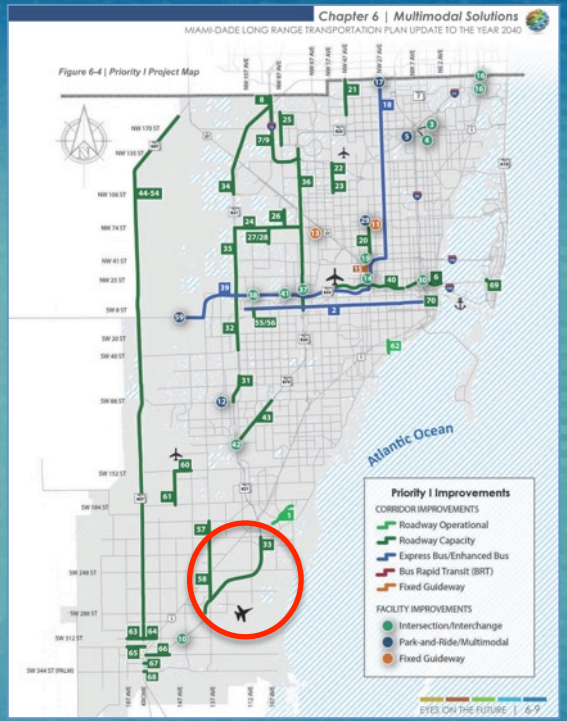


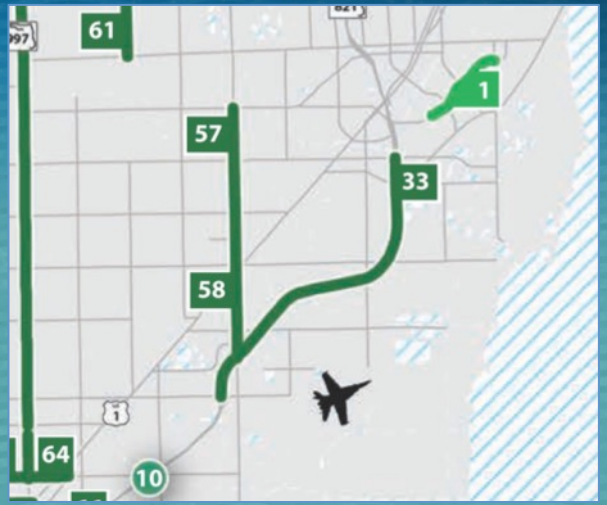
Findings – Monroe County

How to Apply The Findings

Review Long Range Transportation Plans

Theoretical Example



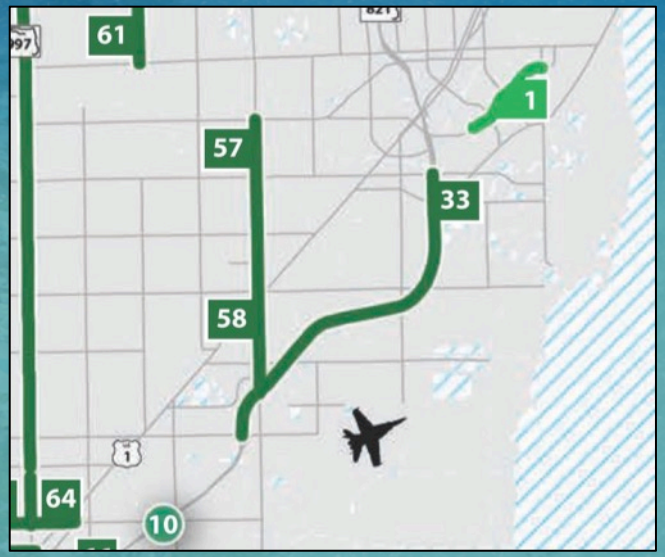


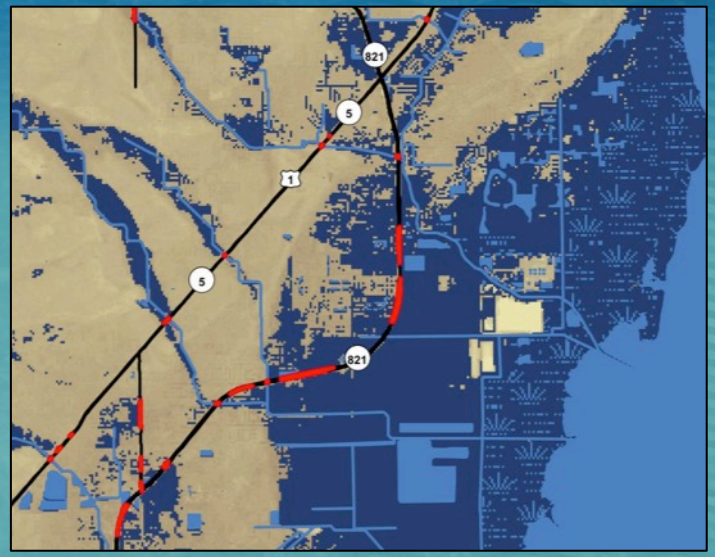
33	SR-821 (HEFT)	SW 288 St

Add lanes and reconstruct

Review Long Range Transportation Plan

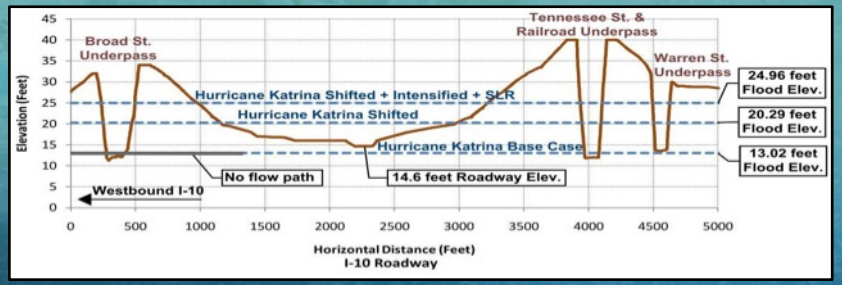
Theoretical Example

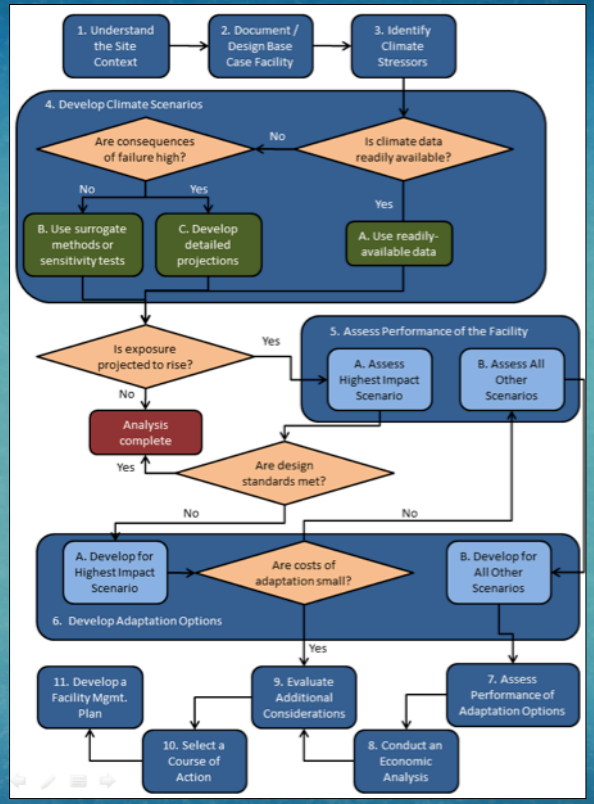




Consider Longer Term Impacts of Current Capital Program Expenditures

Incorporate Into Project Decision-making





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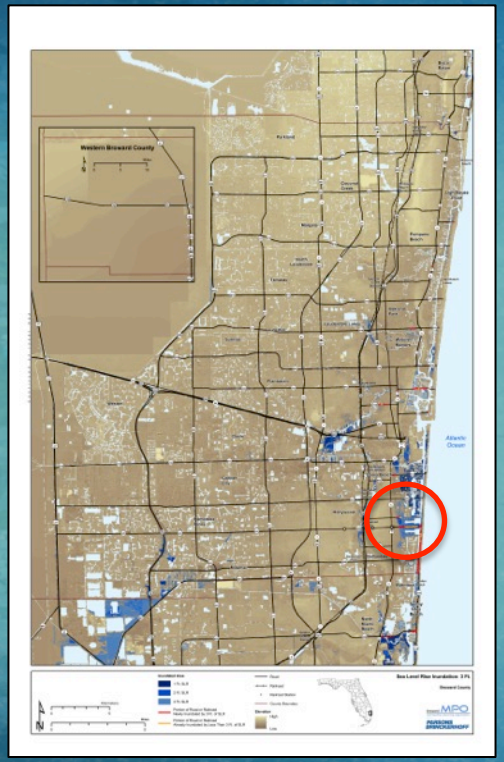
Assess Projects for Inclusion in Capital Program

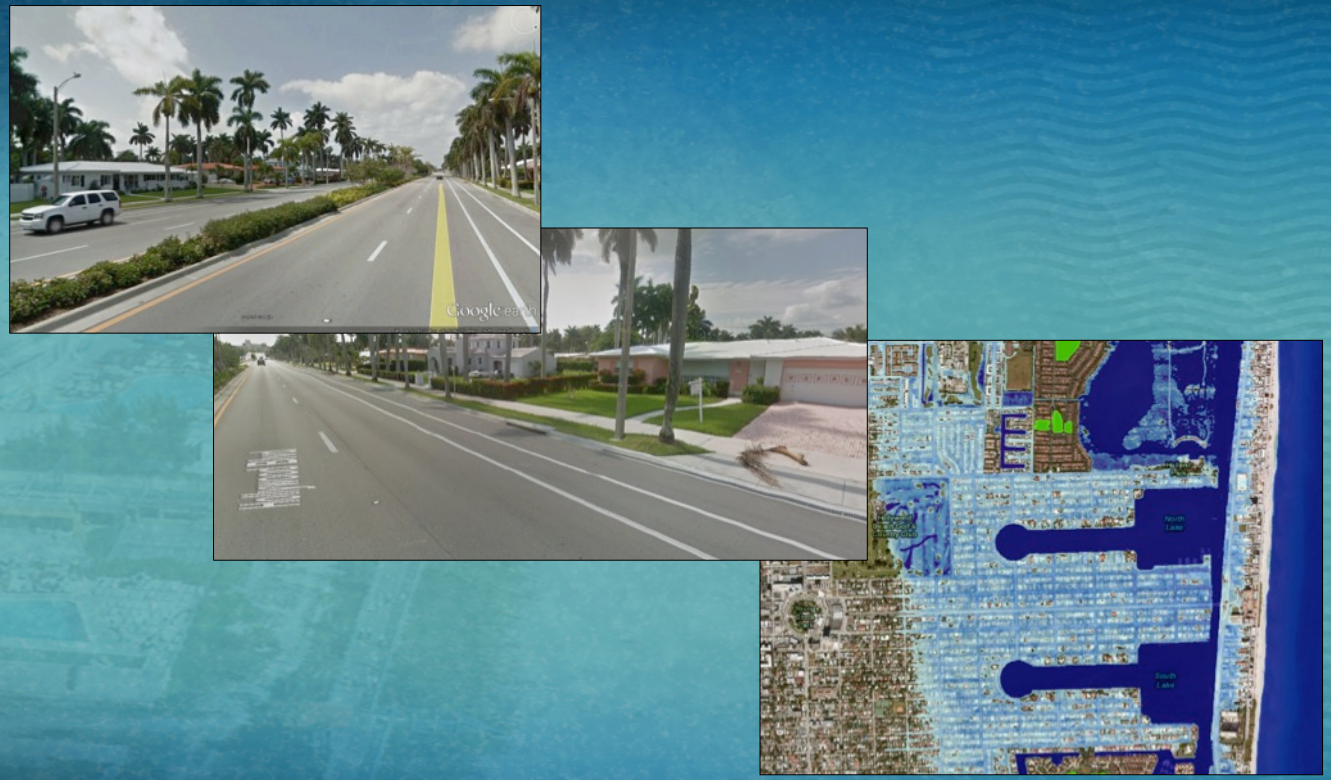
Theoretical Example – Hollywood Boulevard



Consider Adding Projects to LRTP

Assess Long Term Costs and BCA of Response Options

Assess Projects for Inclusion in Capital Program



NOAA – Sea Level Rise Viewer

Consider Transportation and Other Infrastructure Costs as Part of a Basis for a Broader Coastal Protection Strategy

Thank You!

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Chris Dorney, dorney@pbworld.com