



# **Resiliency Framework Study**

## **Technical Working Group Kick-Off Meeting**

December 15, 2020

# Agenda

## 1. Welcome and Introductions

*Please introduce yourself & organization and provide a brief description of how you are involved with combating climate change within your organization.*

## 2. Purpose & Need of this study

## 3. History of MPO efforts

## 4. Who is at the table and why

## 5. Who may we want to reach out to for additional feedback

## 6. Review of the Draft Scope & Schedule

## 7. Next steps

# Purpose and Need

Develop a framework for climate change preparedness into project planning, design, and construction.

Enhance and further incorporate transportation resiliency into the MPO's 2050 Metropolitan Transportation Plan (MTP) and the future efforts of our partners.

# What is this study?

## Study will ...

- Develop a programmatic framework to address vulnerabilities in the transportation network
- Create a repeatable process that takes a larger and more holistic approach to resiliency
- Establish a general purpose and need statement for future studies

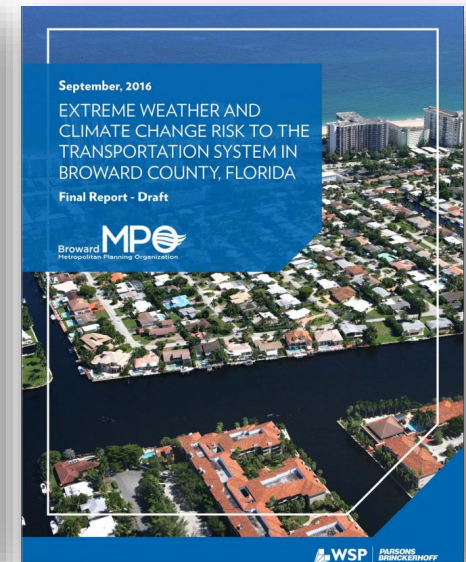
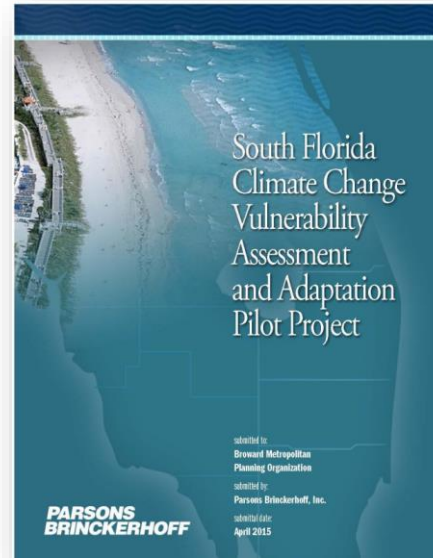
## Study will NOT ...

- Solve the climate crisis

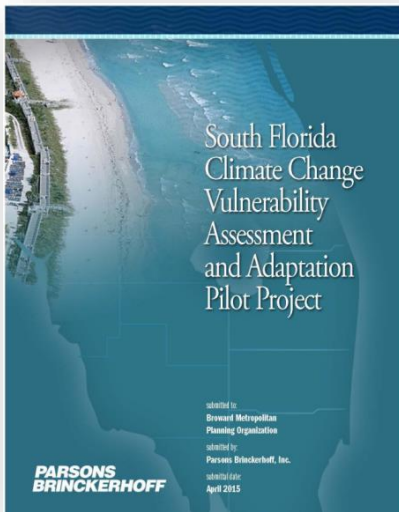


# MPO Foundational Resiliency Work

- South Florida Climate Change Vulnerability and Adaptation Pilot Project (2015)
- Extreme Weather and Climate Change Risk to the Transportation System in Broward County, Florida (2016)
- Ongoing Coordination with Department of Homeland Security
- FTA All Hazards Recovery Training



# South Florida Climate Change Vulnerability and Adaptation Pilot Project



## Identify Assets of Interest



Regional road network



Tri Rail network

## Calculate the Vulnerability Scores for Each Asset

### Sensitivity

- Pavement condition rating (weighted average by segment) (roads)
- Bridge condition index
  - Number of bridges per segment
  - Scour rating (roads)
  - Substructure condition rating (roads)

### Exposure

- % of segment inundated by SLR (1, 2, & 3 Ft.)
- % of segment inundated by 100-yr surge (current, +1, +2, & +3 Ft. SLR)
- Inland flooding index (current, +1, +2, & +3 Ft. SLR)
  - Groundwater table depth
  - SLR impact distance-decay factor
  - Elevation & distance relative to FEMA 100-yr precip floodplain
- Location in VE zone
- Previous flooding issues

### Adaptive Capacity

- Average annual daily traffic (roads)
- Heavy commercial average daily traffic (roads)
- Bus ridership on segment (roads)
- Tri-Rail ridership on segment (rail)
- Detour length (roads)
- Maximum volume / capacity ratio on detour route (roads)

Rank Flood Vulnerabilities by County



# Phase II

## Extreme Weather and Climate Change Risk to the Transportation System in Broward County, Florida (2016)

- Expanded focus to Broward County Arterials and Collectors
- Emphasis on resiliency of connectors to activity centers and economic generators
- Typologies of stressors on facility type and potential mitigation/actions

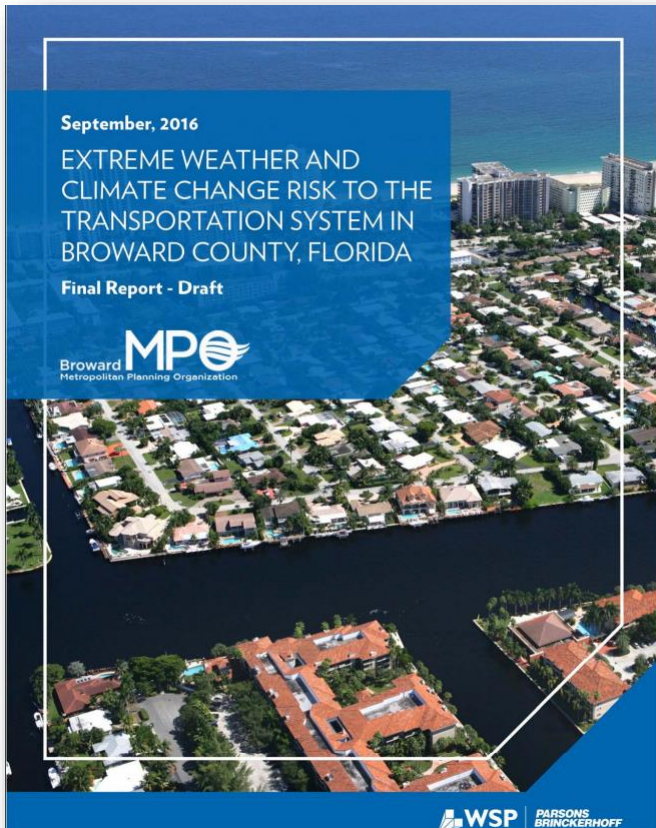


Table 1 - Temperature Effects on Transportation Infrastructure

Potential Impact from Temperature	Areas of Potential Exposure	Mitigation	Associated Issues
Heat Kinks/Rail Buckling	Along turns, ballasted track, track using wooden rail ties, areas of lower rail strength	Carefully consider rail neutral temperature by location and do not default to averages, directly or indirectly measure rail temperature to monitor for stress, monitor areas more prone to kinks/buckling, use concrete crossties as opposed to wooden ones, maintain ballast to improve stability	Misalignment/derailment delays, slow orders, halts in service, heavy maintenance
Overheated Electrical Equipment	Above ground cables, bare conductors, power control cubicles, signal rooms, etc.	Design systems for temperature increases/hotter weather	Connection loss, wire expansion, decreased transmission efficiency
Blackouts	Electrical equipment, facilities including stations, stoplights at control points	Build redundancy into system and prepare emergency power generation (FTA, 2011), prioritize energy efficiency, develop strong emergency response	Operations disruption
Material Expansion and Contraction	Pavements, cements, bridge joints	Choose materials carefully for the climate, choose joints carefully for locations, temperatures, expansion limits, and service life, place joints downhill of drains to limit water contact, design decks with few joints, maintain joints and drains annually consider creating jointless bridge decks by using link slabs	Rutting, asphalt movement, slab buckling, frequent maintenance, joint failure

throughout Florida in Fall, 2016. Such effects would become more impactful in the future as seas rise and a larger volume of water moves inland.

Table 2 - Expected Effects of Sea Level Rise on Transportation Infrastructure in Broward County

Asset	Issue	Concern	Potential Action
Roadways and Rail	Inundated Roadways	Roadways that may be inundated from sea level rise at all times, or intermittently - impacting travelers during times of peak tidal events	Raise Profile
Roadways and Rail	Higher Water Table	Reduced Drainage Capacity - Increased Effects During Precipitation Events	Raise Profile, Install Drainage Pumps
Roadways	Higher Water Table	Inundation of Pavement during tidal/storm events or at all times	Raise Profile
Roadways and Rail	Higher Water Table	Inundation of Pavement subgrades during tidal events or at all times - erosion of material and increasing need for maintenance	Increase Maintenance to Maintain
Bridges	Tidal Effects	Tidal effects in areas which previously had no tidal effects and not considered in design	Add Erosion Control Measures
Bridges	Tidal Effects	Undermining of foundations (scour)	Add Scour Protection Measures
Bridges	Tidal Effects	Reduced bridge clearance	Re-Build Bridge at Replacement for Higher Clearances
Bridges	Tidal Effects	Bridge girder corrosion from salt water in areas not considered	Add Corrosion Protection Treatment
Bridges	Tidal Effects	Uplift of roadway approaches from inundation	Anchor approaches
Bridges	Tidal Effects	Additional buoyancy on bridge superstructure (timber bridges)	Add buoyancy control measures
Bridges	Tidal Effects	Mechanical system flooding	Protect/move mechanical features
Bridges	Tidal Effects	Inundation of utility connections required to operate mechanical bridges	Seal electrical systems from flooding

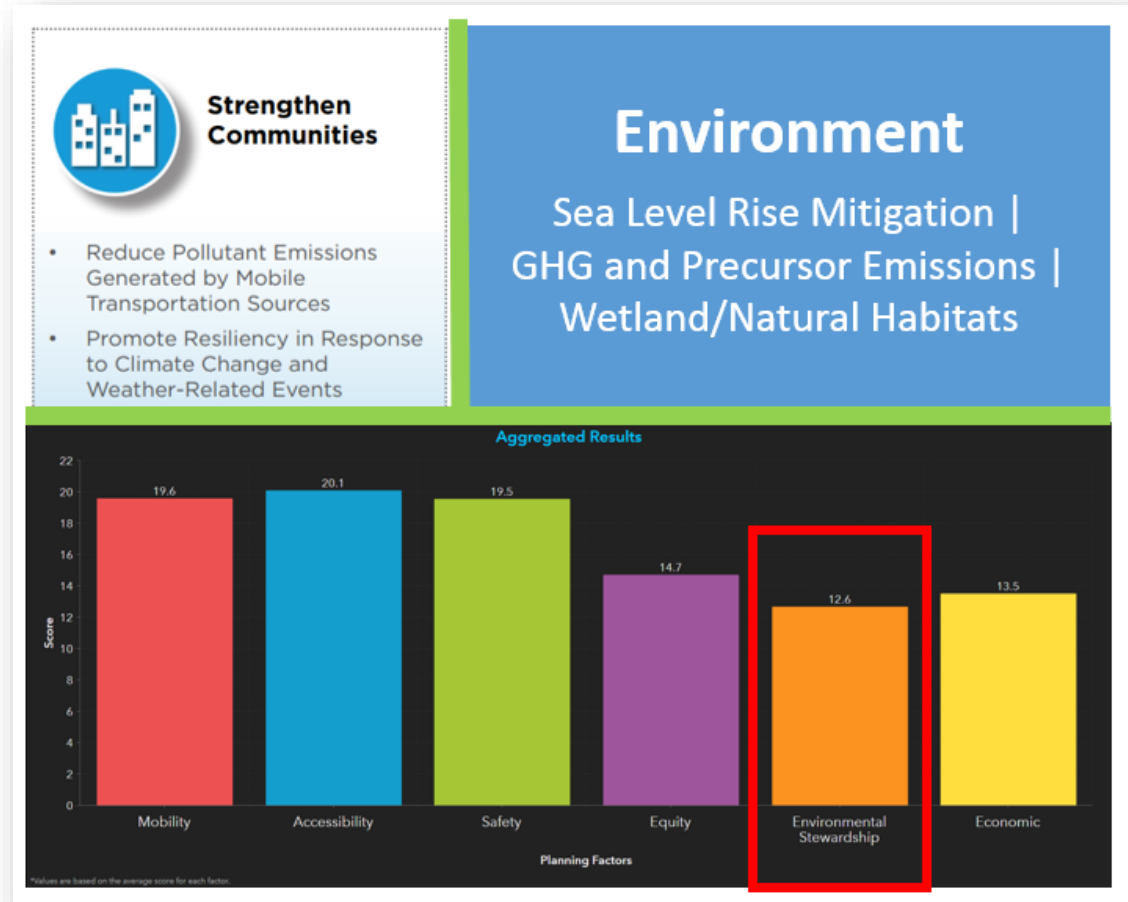
Sea level has already been occurring in the region, and projected increases range from 30 and 80 inches by the end of the century depending on the amount of greenhouse gases emitted into the atmosphere and the level of Earth's response to increased temperatures. A range of estimates of future conditions exist to various out years, with estimates maintained by the U.S. Army Corps of Engineers, NOAA and also local academic agencies. The intent of these estimates is to define a reasonable basis for forecasting future sea levels based on the various factors that affect the overall total.

As noted earlier, Broward County is a part of a regional compact, the Southeast Florida Climate Compact (SFCC), which acts as a single source of information to help guide policy decisions. The



# Resiliency in the 2045 Metropolitan Transportation Plan (MTP)

- Goals and Objectives
- Project Prioritization
- Cost Feasible Plan
- Resiliency Technical Report



# Climate Change Planning in South Florida

## Southeast Florida Regional Climate Change Compact

4 Counties

2 RPCs

2 FDOT Districts

Southeast Florida Transportation Council & South Florida Regional Transportation Authority

Monroe County

South Florida Regional Planning Council

Treasure Coast Regional Planning Council

District IV

District VI

Palm Beach County

Broward County

Miami-Dade County

Palm Beach MPO

Broward MPO

Miami-Dade MPO

# Who is at the table?

- Who do we need to reach out to?



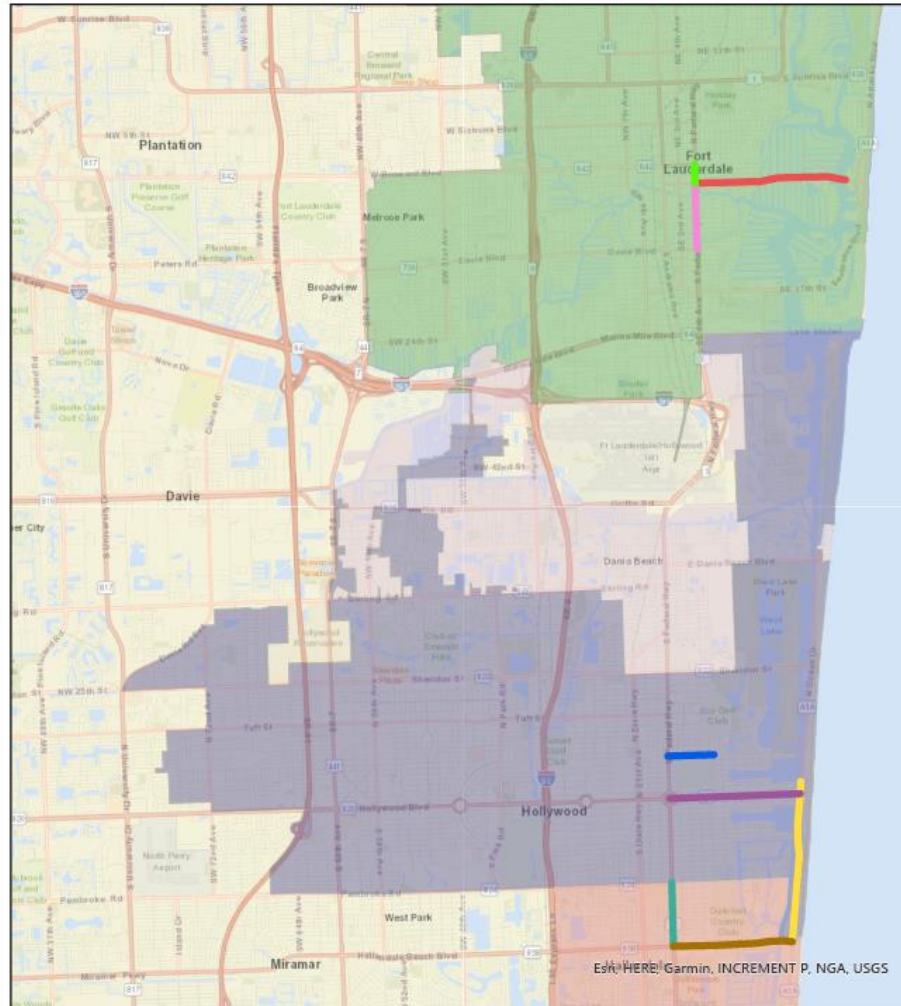
# Identified Resiliency Corridors

- Identified eight (8) resiliency studies on highly vulnerable corridors from the Pilot Project
- Programmed in the 2026-2030 funding timeframe

**Table 5-4: 2045 Roadway Plan (2025–2045)  
(Funded and Unfunded Projects) (cont'd)**

Ref. ID	Project Sponsor	Jurisdiction	Project Name	Project Limits	Project Description	Total Cost (2019\$)	Timeframe for Implementation			
							2025	2026/30	2031/35	2036/45
17	Broward MPO	State	Hollywood Blvd	US-1 to SR-A1A	Conduct study to determine resiliency improvements.	\$1,500,000		X		
18	Broward MPO	State	SR-A1A	South of Arizona St to Hallandale Beach Blvd	Conduct study to determine resiliency improvements.	\$1,500,000		X		
19	Broward MPO	State	US-1/SR-5	Las Olas Blvd to Davie Blvd	Conduct study to determine resiliency improvements.	\$1,500,000		X		
20	Broward MPO	State	US-1	Broward Blvd to Las Olas Blvd	Conduct study to determine resiliency improvements.	\$750,000		X		
21	Broward MPO	State	Las Olas Blvd.	US-1 to SR-A1A	Conduct study to determine resiliency improvements.	\$1,500,000		X		
22	Broward MPO	State	US-1	Pembroke Rd to Hallandale Beach Blvd	Conduct study to determine resiliency improvements.	\$1,000,000		X		
23	Broward MPO	State	Hallandale Beach Blvd	US-1 to SR-A1A	Conduct study to determine resiliency improvements.	\$1,500,000		X		
37	Broward MPO	Non-State	Johnson St	US-1 to N 14th Ave	Conduct study to determine resiliency improvements	\$750,000		X		

# MPO Resiliency Study Framework



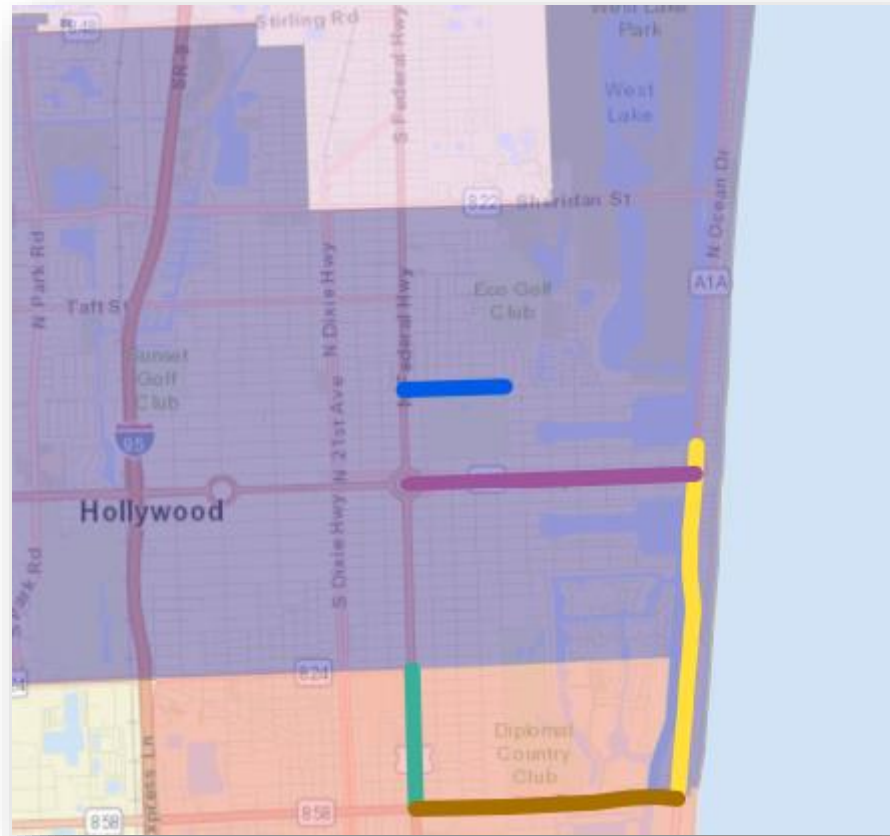
**Legend**

<span style="color: red;">—</span> E Las Olas Blvd from US-1/SR-5 to SR-A1A	<span style="color: green;">—</span> US-1/SR-5 from SR-842/Broward Blvd to E Las Olas Blvd
<span style="color: blue;">—</span> Johnson St from US-1/SR-5 to N 14th Ave	<span style="color: orange;">—</span> SR-858/Hallandale Beach Blvd from US-1/SR-5 to SR-A1A
<span style="color: purple;">—</span> SR-820/Hollywood Blvd from US-1/SR-5 to SR-A1A	<span style="background-color: #e0e0e0; border: 1px solid black; padding: 2px;"> </span> DANIA BEACH
<span style="color: yellow;">—</span> SR-A1A from S of Arizona St to SR-858/Hallandale Beach Blvd	<span style="background-color: #c8e6c9; border: 1px solid black; padding: 2px;"> </span> FORT LAUDERDALE
<span style="color: pink;">—</span> US-1/SR-5 from E Las Olas Blvd to SR-736/Davie Blvd	<span style="background-color: #ffe0b2; border: 1px solid black; padding: 2px;"> </span> HALLANDALE BEACH
<span style="color: teal;">—</span> US-1/SR-5 from SR-824/Pembroke Rd to SR-858/Hallandale Beach Blvd	<span style="background-color: #bbdefb; border: 1px solid black; padding: 2px;"> </span> HOLLYWOOD

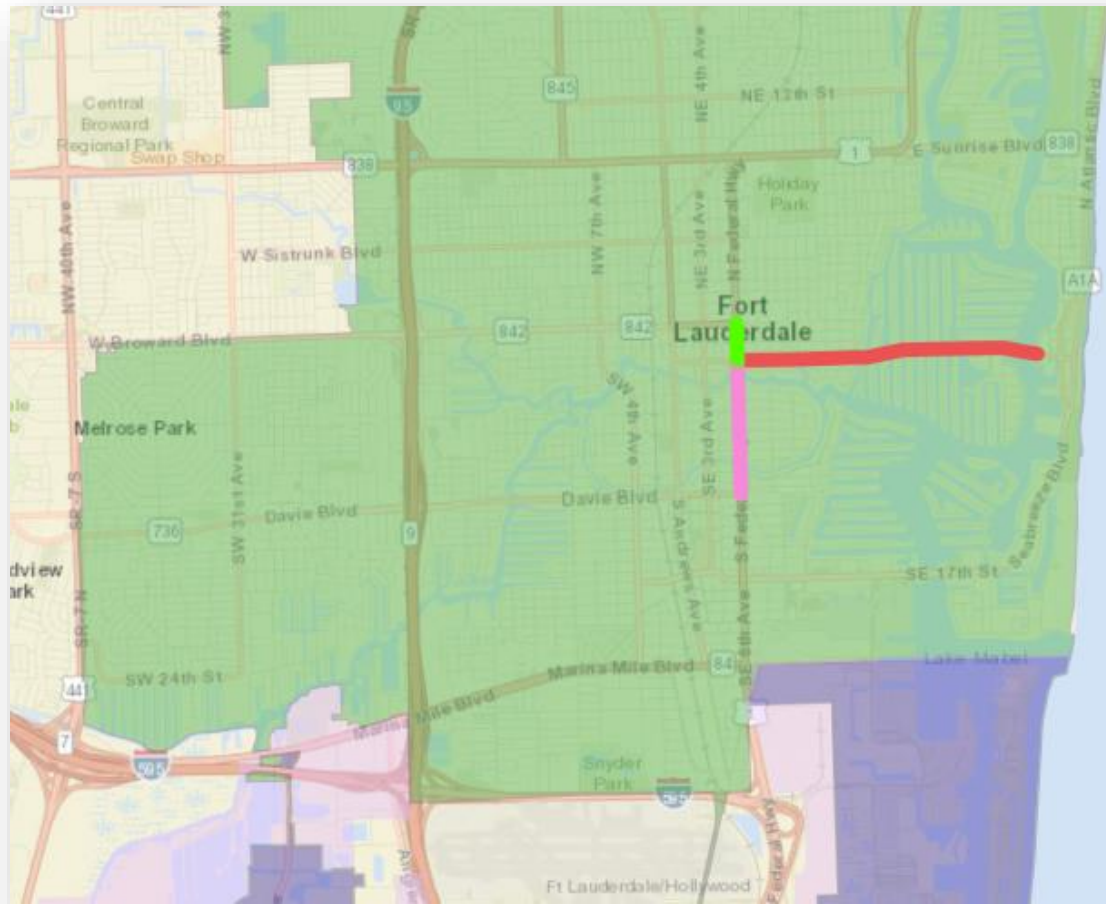
  
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# Hollywood and Hallandale Beach





# Fort Lauderdale



# Draft Scope of Work

- Task 1 – Project Management
- Task 2 – Data Collection Background Review
- Task 3 – Identify and Screen Potential Methods of Analysis in order to develop a Framework
- Task 4 – Stakeholder Outreach
- Task 5 – Cost Assessment and Plans
- Task 6 – Final Report
- Timeframe

# Task 1 –Project Management

## Subtask

- 1.1 Project Schedule
- 1.2 Technical Working Group (TWG)
- 1.3 Project Meetings
- 1.4 Meeting Minutes, Notes, and Progress Report

## Deliverables

# Task 1 – Deliverables

- Technical Working Group with Contact List
- Meeting Notes and Minutes
- Monthly Progress Report

# Task 2 – Data Collection Background Review

- 2.1 Review of Existing MPO Plans, Assessments, and GIS Models
- 2.2 Develop Resiliency Themes
- 2.3 Case Study, Lessons Learned, and Best Practices
- 2.4 Data Review and Existing Conditions
- 2.5 Regulatory, Approvals, and Coordination
- 2.6 Gap Analysis

# Task 2 – Deliverables

Existing Conditions Report with Gap Analysis



# Task 3 – Identify and Screen Potential Methods of Analysis in order to develop a Framework

- 3.1 Analysis Methodology
- 3.2 Develop a Toolbox for Each Facility and Stressor Type
- 3.3 Timeline / Phases for addressing vulnerabilities
- 3.4 Decision Making Framework
- 3.5 Outward Facing Component

# Task 3 – Deliverables

Decision-making Framework Memo with a Repeatable Approach

Report and Methods Guidebook

## Task 4 – Outreach

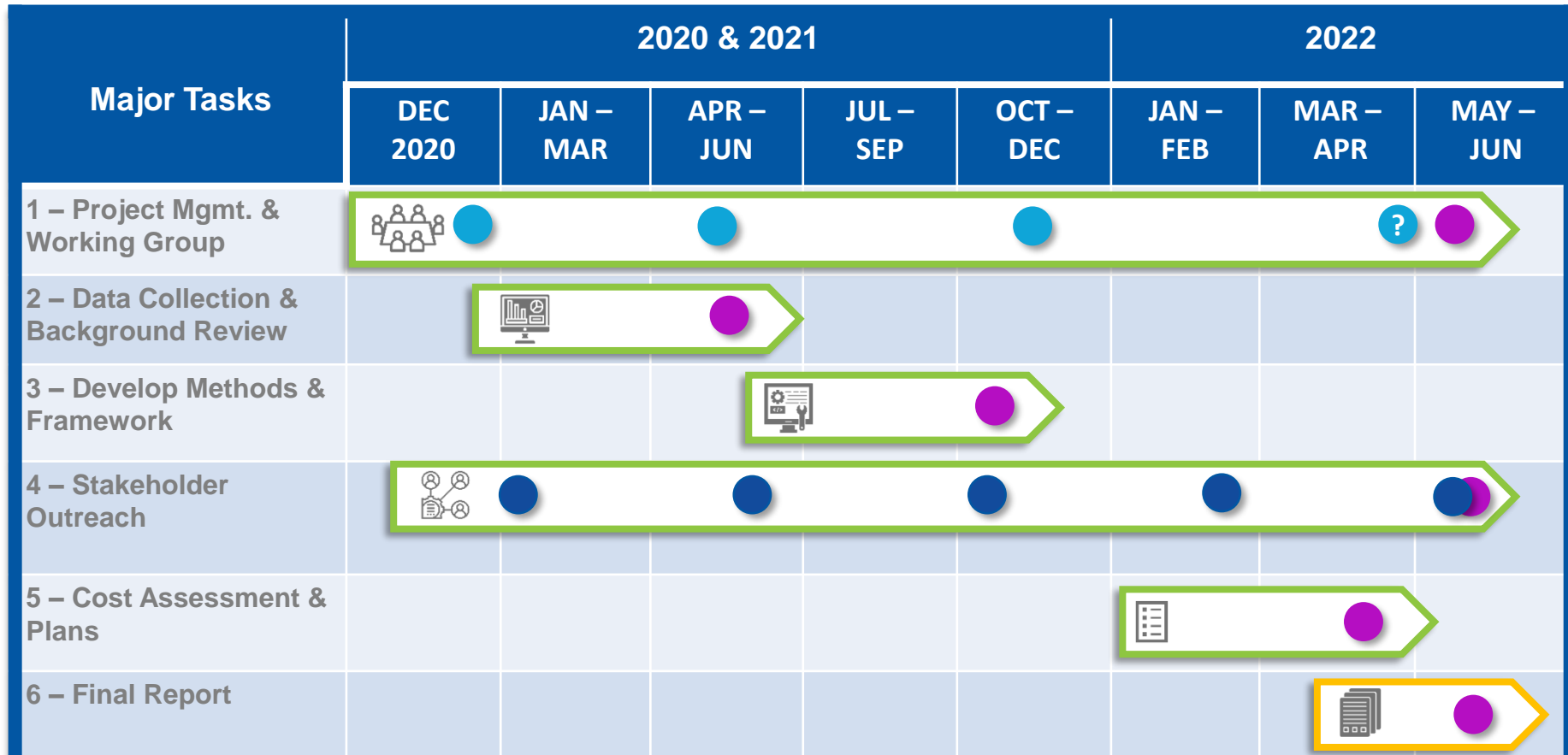
- Public/Stakeholder Outreach Memo

## Task 5 – Cost Assessment and Plans

- 10% plans with cost estimates

## Task 6 – Final Report

# Draft Schedule



- TWG
- Stakeholder
- Deliverable



## Questions?

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