2020 Annual Climate Leadership Summit

Monroe County Roadway Vulnerability Analysis and Capital Plan

October 13, 2020

Rhonda Haag
Chief Resilience Officer

MONROE COUNTY
FLORIDA

ERIN L. DEADY, P.A.

HDR wood.

Challenge: Climate Change and Sea Level Rise in the Florida Keys (NOAA 2017 Intermediate-High SLR Projection)

King Tides – Higher and More Frequent

Planning: A Proactive Approach

2013 - 2016 Monroe County sea level rise planning launched: GreenKeys

- Initial vulnerability analysis
- Improve roads elevation data
- Engineering level analysis of transportation impacts countywide
- Two Pilot Road Elevation projects

2017 Mobile Lidar Elevation data completed

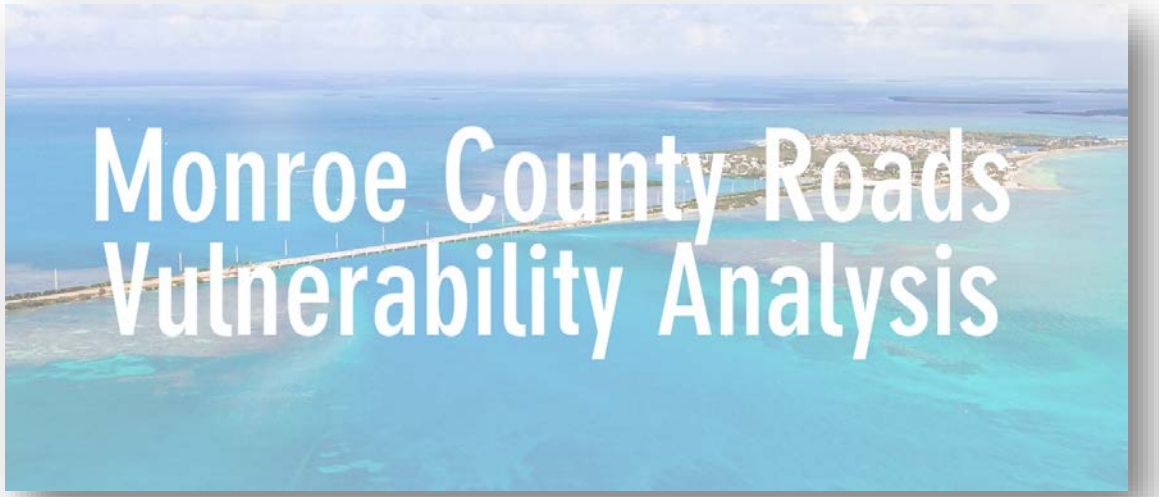
2018 Two Demo Roads Elevation Projects designed

2019 Countywide roads adaptation study is launched

If you fail to plan, you are planning to fail.

– Benjamin Franklin

Roads are County's Most Vulnerable Infrastructure: Roadway Vulnerability Analysis Underway



Task 1:
Data Collection

Task 2:
Engineering Analysis

Task 3:
Concept Development

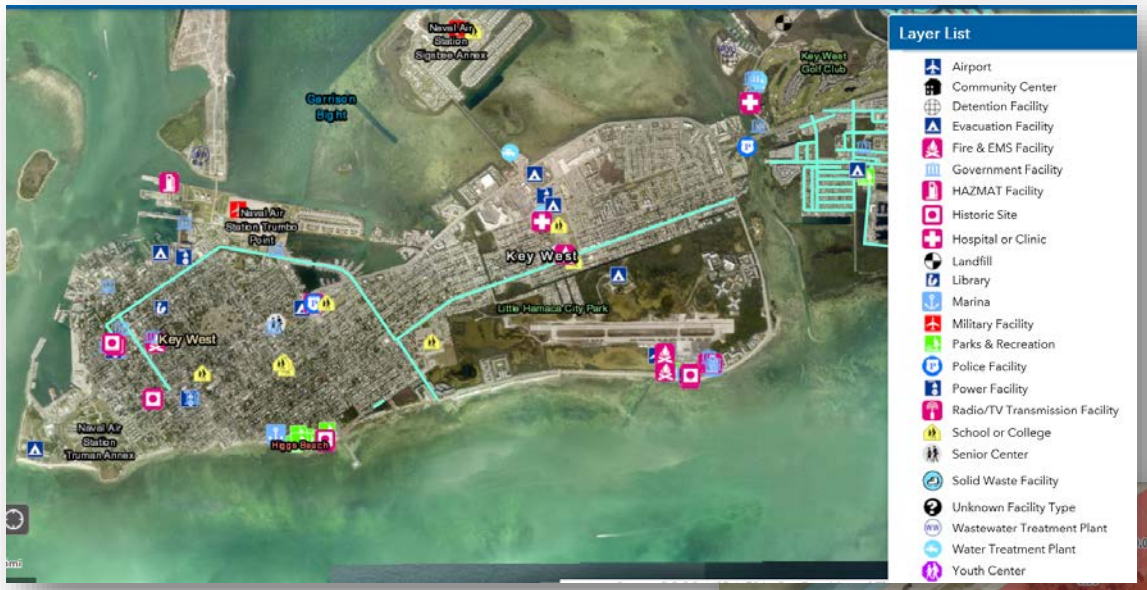
Task 4:
Policy Review & Regulations

Task 5:
Stakeholder & Public Outreach

Task 6:
Implementation Plan

311 Miles of County-Maintained Roads spread out over 1200 locations

Collected A Lot of Data!

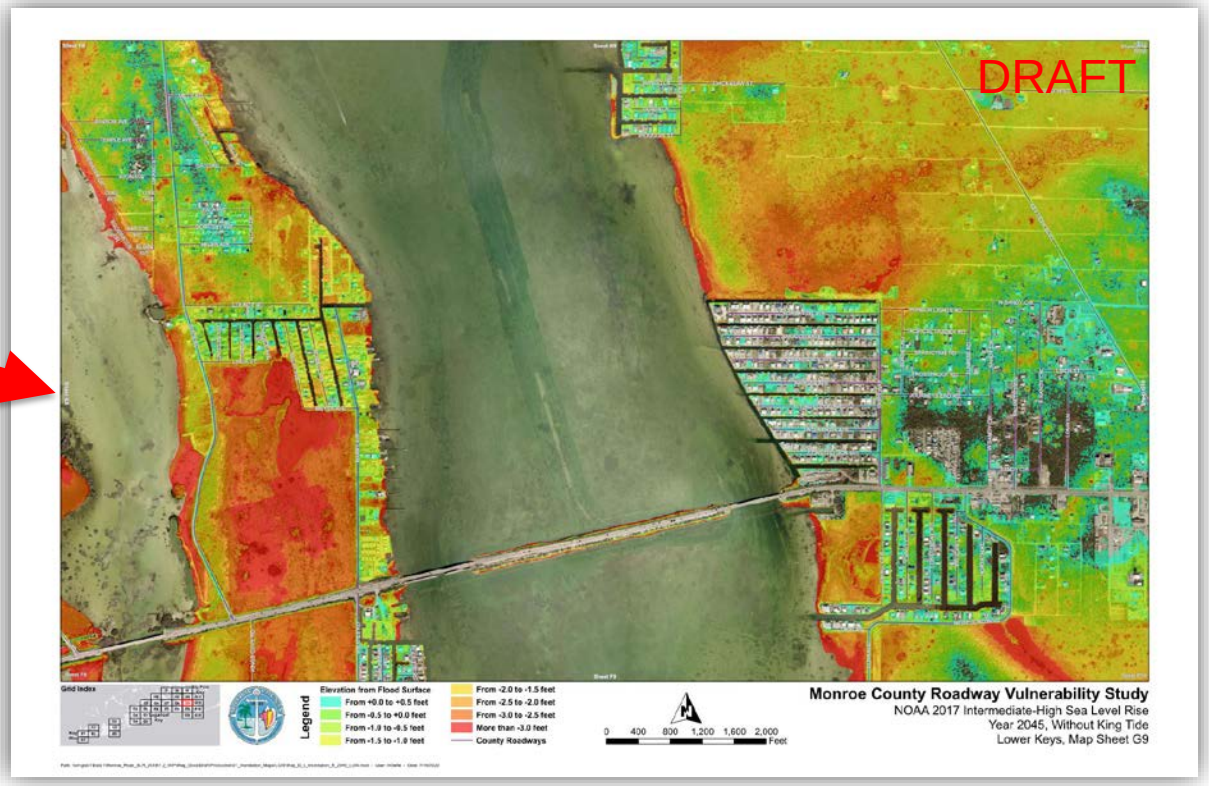


All Critical Facilities throughout the County

LiDAR Survey available along all 311 miles of roadway.

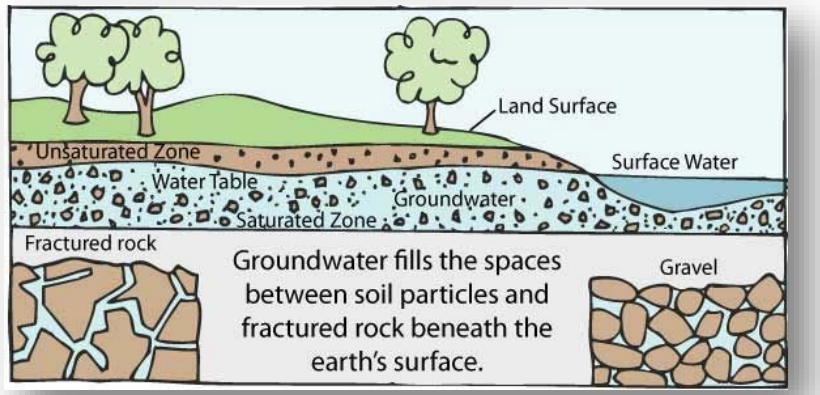
Number of Residential Units along each roadway segment.

Developing Sea Level Rise and King Tide Inundation Maps along County Roadway limits



Digital set up and maps available for 2025, 2030, 2035, 2040, 2045, 2060, and 2100 Study Years.

Vulnerability Assessment



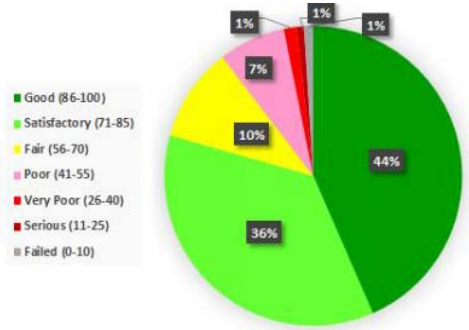
1. Groundwater Clearance

2. Surface Inundation Depth (SLR)

3. Storm Surge

4. Surface Wave Impact Potential

Condition Range	100-86	85-71	70-56	55-41	40-26	25-11	10-0
Color							
Condition Rating	Good	Satisfactory	Fair	Poor	Very Poor	Serious	Failed

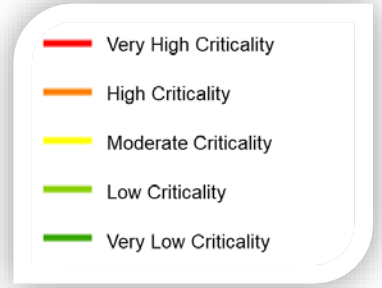


5. Roadway Existing Pavement Condition

45% of Monroe County roads are vulnerable to sea level rise by 2045

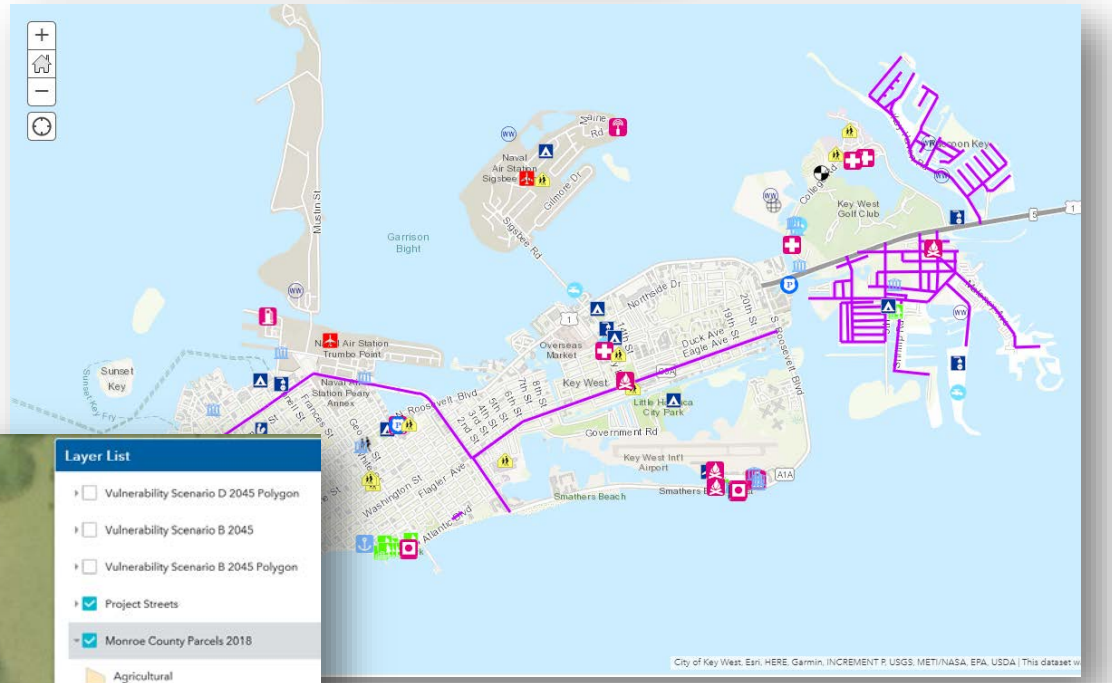
6. Initial Assessment

Criticality Assessment



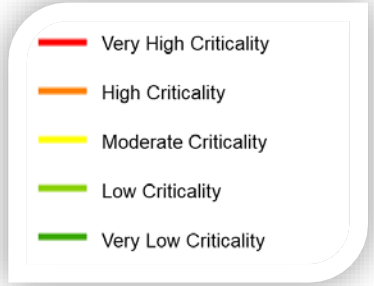
1. Vulnerability Score

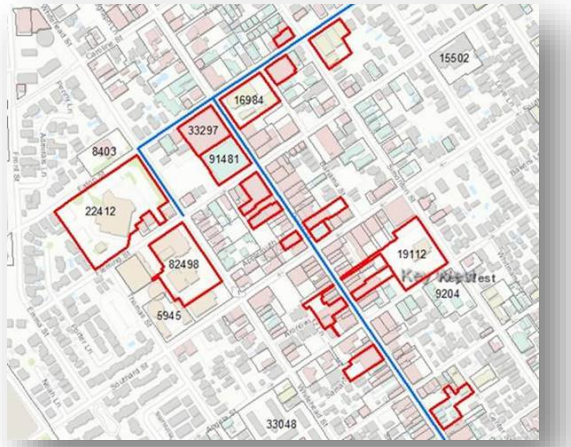
2. Number of Residential Units



3. Roadways Associated with Critical Facilities

Criticality Assessment (Cont.)

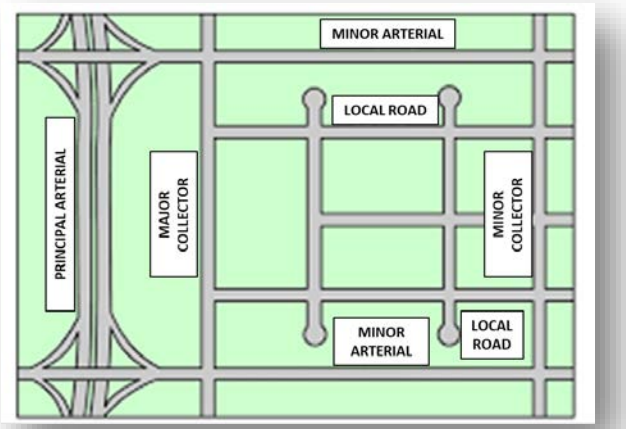




4. Commercial Buildings

5. Threatened and Endangered and Focus Species

6. Wetlands/Natural Habitats



7. Roadway Functional Classification and Evacuation Route

Initial 25% of Road Segments Based on Preliminary Scoring to proceed to Engineering Concept Evaluation

NOAA 2017 Intermediate-High SLR Projection + King Tide Prediction for 2045

Initial 25% of County Maintained Roadways

No. of Keys	Rdwy Segments	Sub-Divisions	Length (Miles)	Residential Units
17	709	240	78.01	8303

Countywide Maintained Roadway Totals

No. of Keys	Rdwy Segments	Sub-Divisions	Length (Miles)	Residential Units
24	2383	260	311.00	17703

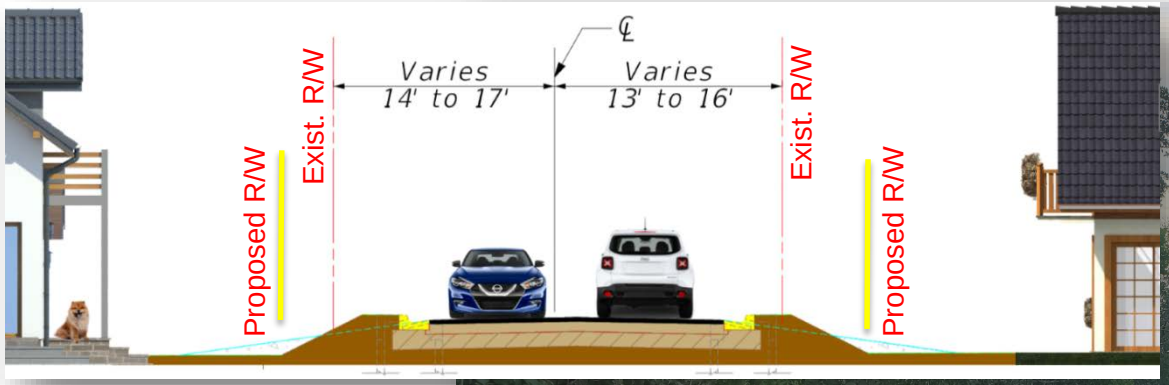
The Initial 25% is Equivalent to….

No. of Keys	Rdwy Segments	Sub-Divisions	Length (Miles)	Residential Units
71%	30%	92%	25%	47%

Engineering Concept Evaluation
Different Solutions for Different Neighborhoods

Existing Private Property and Roadway Low Ground Elevation

Right-of-Way Constraints and Impacts



Existing Right-of-way

Proposed Right-of-way

Cost and Funding

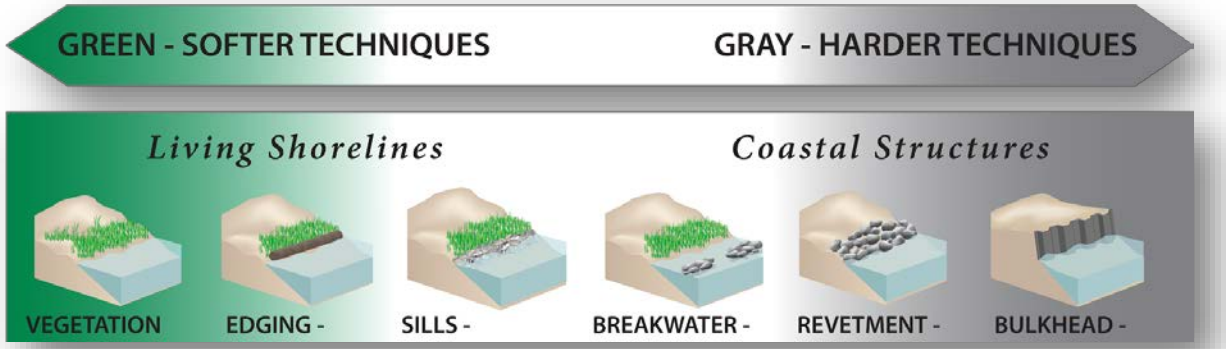
Criteria	Neighborhood Example (Raising the road for 1.75' max with curb & gutter and Pump/Injection Well System) (Approximately 1.8 Miles)
Initial Investment	**$21 Million**
Annual O&M Cost (Pump System)	$ 18,000

Criteria	Countywide Roadways for 2045 (Assumption has similar design approach as example noted above) (Approximately 152 Miles)
Initial Investment	**$1.8 Billion**
Annual O&M Cost	N/A - To be completed as part of Engineering Concept Evaluation

Note: Cost Estimates do not include design, right-of-way acquisition, harmonization/cost to cure, and legal fees. Cost Estimates are preliminary and subject to change.

Policy Components and Regulatory Process

Shoreline Strategies



Parcel-Level Fill and Site Elevation

Regulatory

Preliminary coordination with permitting agencies revealed that permits will be required if a drainage system is included and/or impervious surface of the road increases requiring analysis of:

- Water quality impacts (treatment required)
- Pre-project compared to post-project impacts from precipitation
- Impacts to offsite properties

Partnership with Residents for long term resiliency goals

Projected Sea Level Rise infiltrates through low elevation along vacant lots and property perimeter limits

2025
2035
2045

Temporary Flood Protection

Testing in Key Largo during the current Fall high tides

Example of a temporary dam being used in Detroit

Looking Back…

- FL Keys experiencing widespread effects of Climate Change in King Tide roads flooding
- Monroe County has been resilience planning and data gathering for a decade
- Monroe County preparing for implementation of resilience plans through Countywide Roads Analysis
- Countywide data gathering and modeling must be completed before decisions can be made on schedule of road adaptations, funding, level of service, etc.

Looking Forward….

Countywide Roads Analysis to be completed in 2021