

Agenda Item No. 0-4
Monroe County
Roadway Vulnerability
Analysis and Capital Plan

— June 15, 2022 —



MONROE COUNTY

County Staff:
Rhonda Haag
Chief Resilience Officer
Judith S. Clarke, P.E.
Director of Engineering Services

HDR **wood.**
ERIN L. DEADY, P.A. *e*

Analysis Complete!



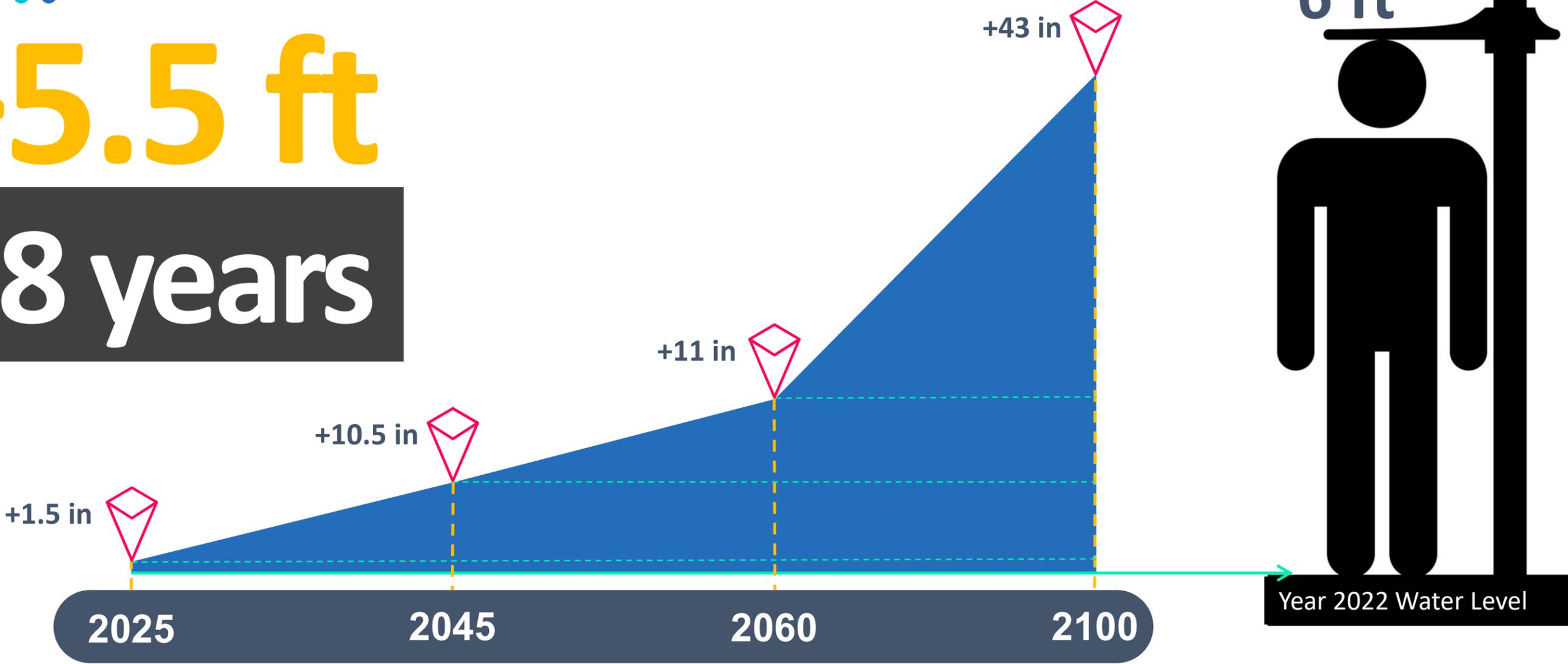
- I. Completion of Conceptual Design (Neighborhood Areas)
- II. Completion of the Cost Estimates
- III. Completion of the Adaptation Plan

Sea Level Rise Projections



+5.5 ft

78 years



SLR Condition: NOAA 2017 Intermediate-High
SE FL Regional Climate Compact Updated Projections 2019

Monroe County Vulnerability



Future Predictions



Current Vulnerability



Avenue G- Big Pine(2020)



Stillwright Point – N Blackwater Lane (2020)

The slide features a light blue background with a central text area. The top and bottom edges are decorated with overlapping, wavy bands of color. The top bands include shades of cyan, teal, and dark blue. The bottom bands include shades of red, orange, and yellow. The text 'Project Update' is centered in a bold, dark blue font.

Project Update

Project Intent



Project Scope

Goals



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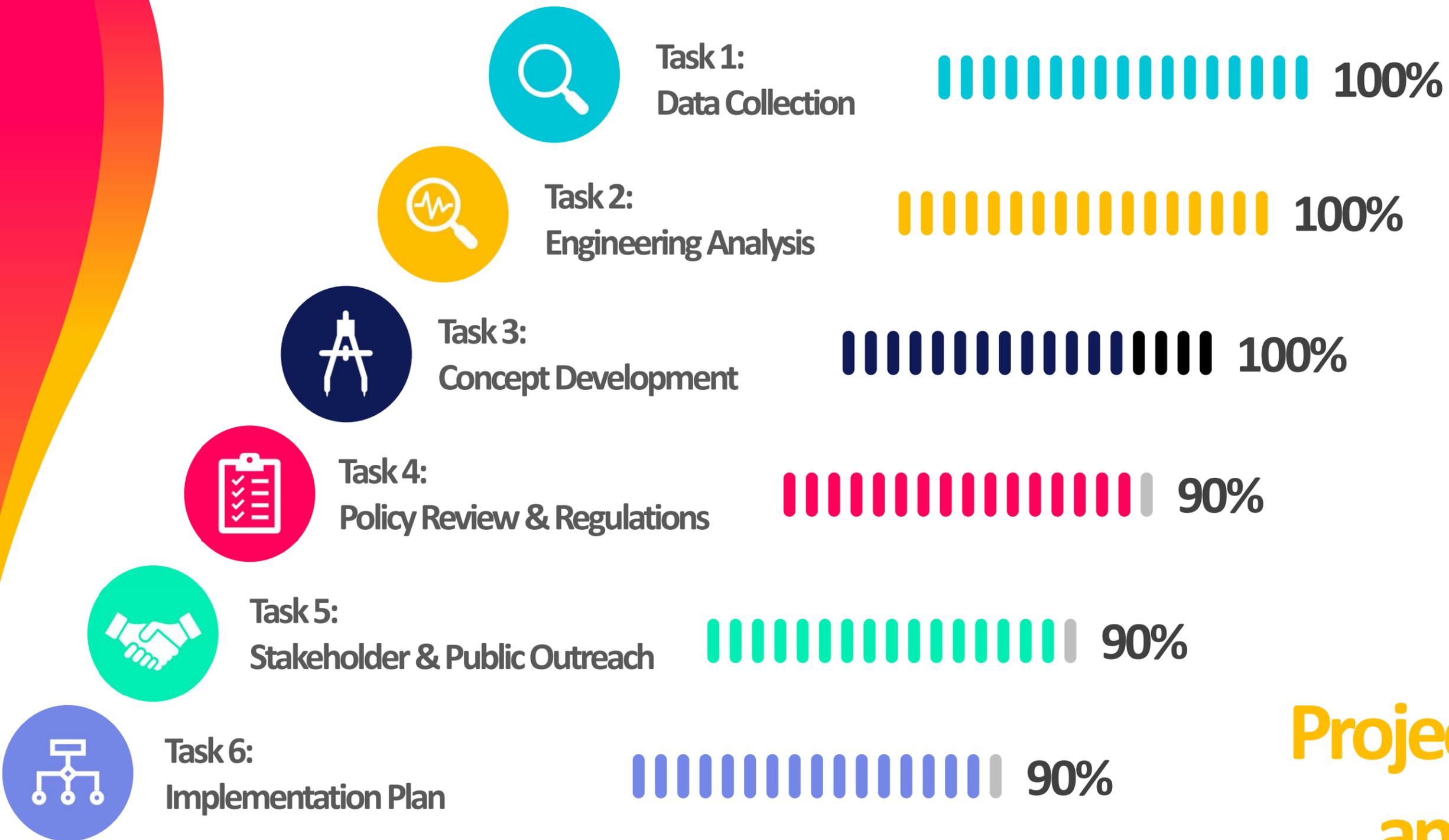
Evaluation of:

- Years 2025, 2030, 2035, 2040, 2045, 2060, and 2100.
- Sea Level Rise and King Tide Predictions
- Roadway LiDAR
- Storm surge
- Wind waves
- Extreme events



Data allows us to:

- Project water surface elevations
- Conduct Vulnerability/Prioritization evaluation
- Identify areas of concern
- When will areas be impacted
- Define improvement projects limits
- Assess environmental impacts/permitting
- Develop preliminary cost estimates



Project Scope and Status

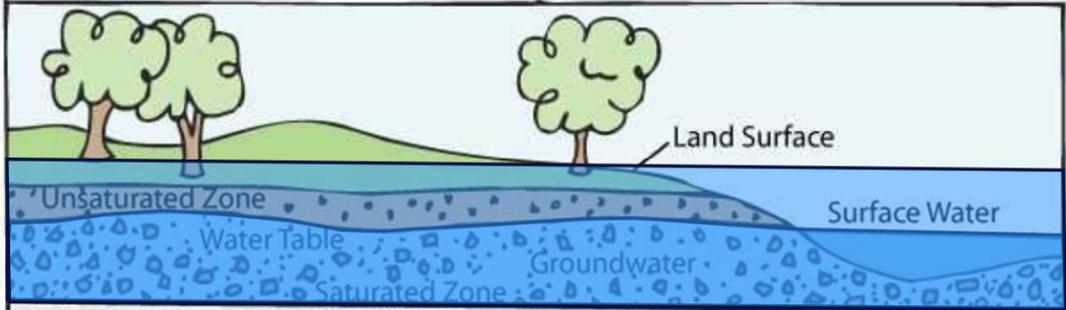
Vulnerability and Criticality Assessment



Vulnerability Evaluation Factors	Weighting Percentages
Roadway Surface Inundation Depth	60%
Roadway Groundwater Clearance	25%
Roadway Inundation Due to Storm Surge	5%
Roadway Surface Wave Impact Potential	5%
Roadway Existing Pavement Condition	5%



Roadway Surface Inundation Depth

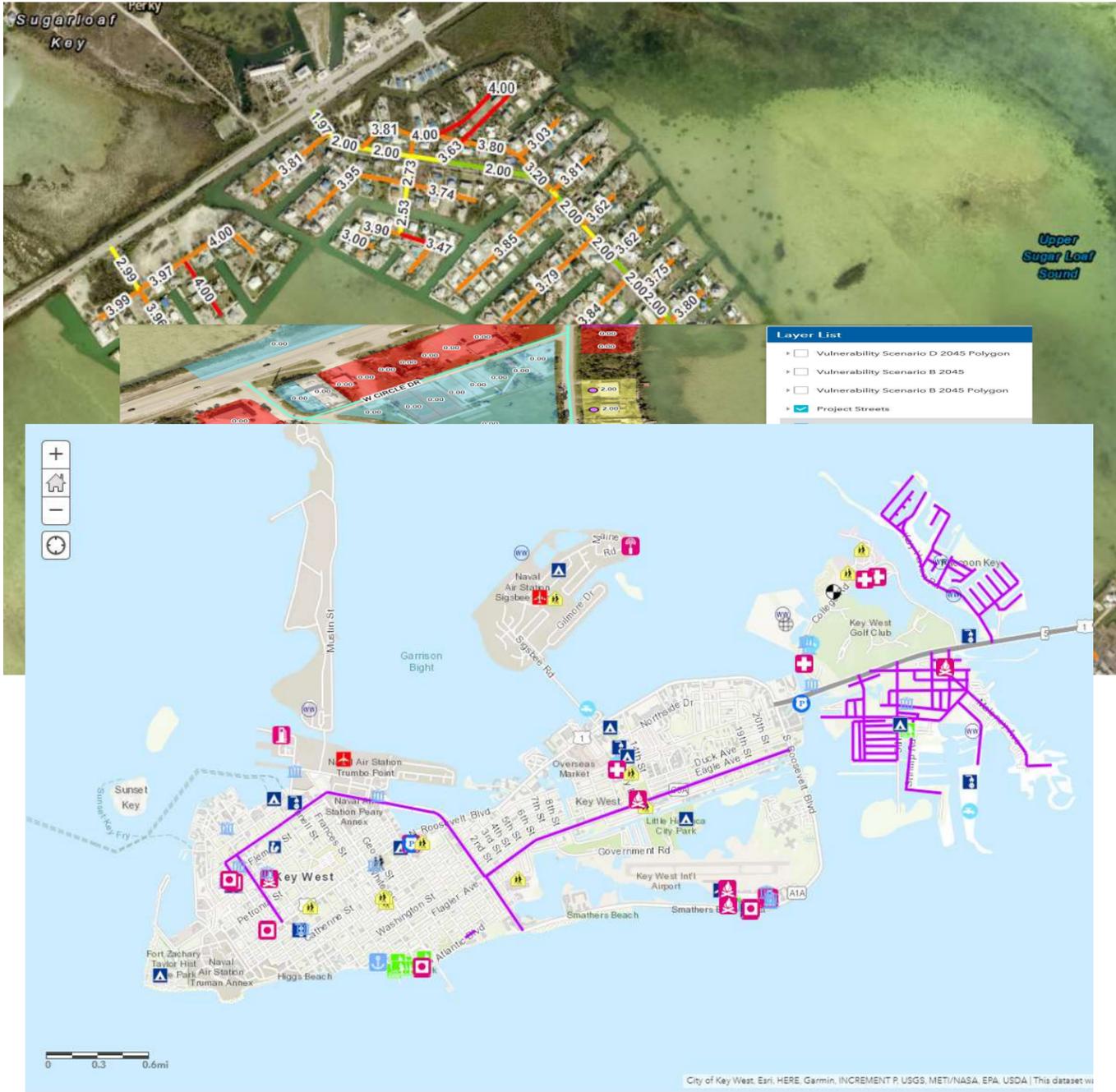


Roadway Groundwater Clearance

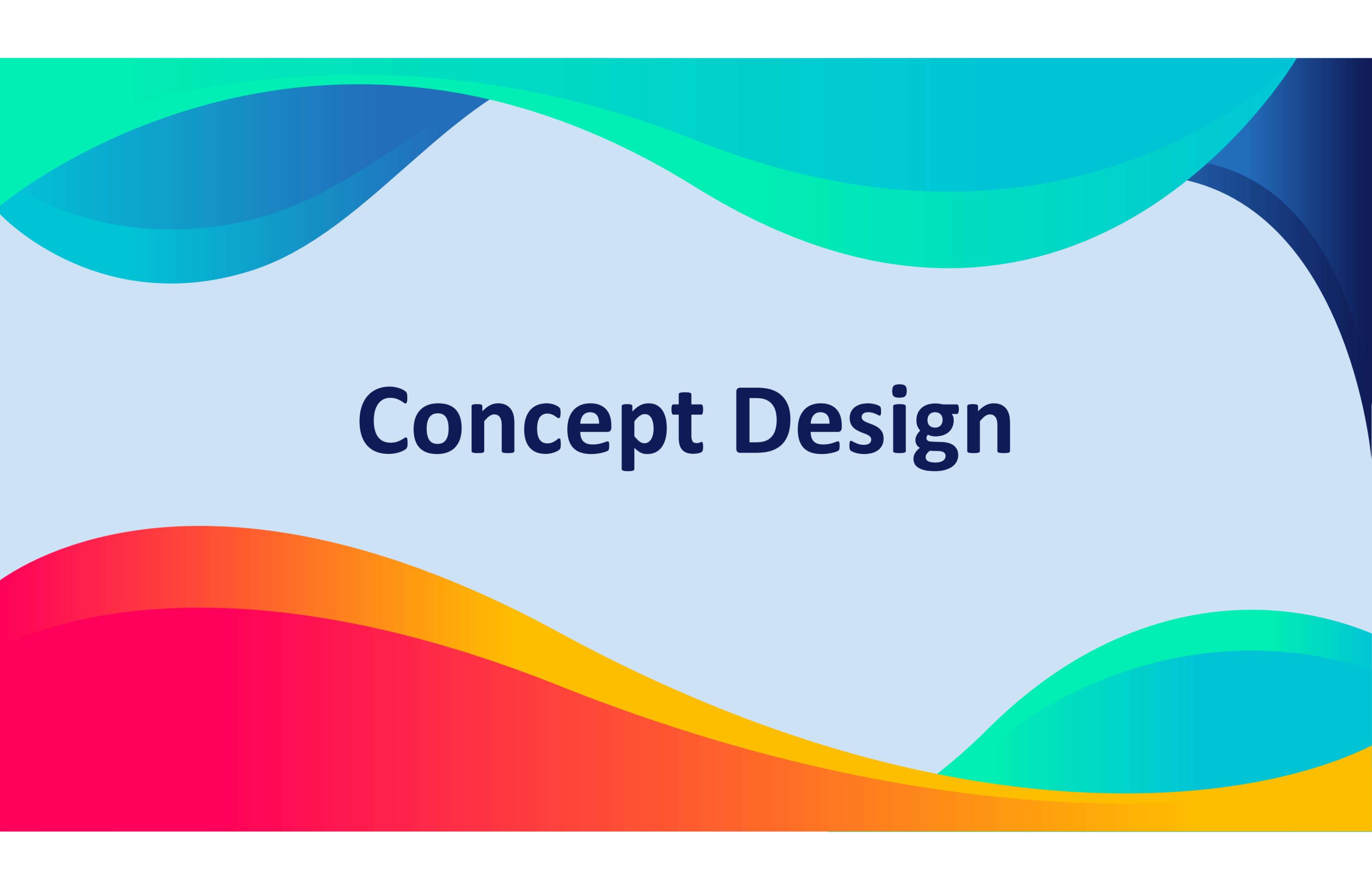
Vulnerability and Criticality Assessment



Criticality Evaluations Factors	Weighting Percentages
Vulnerability Score	50%
Number of Residential Units	25%
Roadways Associated with Critical Facilities (Police, Fire, etc.)	10%
Wetlands/Natural Habitats associated with Road Segment	5%
Roadway Functional Classification and Evacuations Routes	5%
Non-Residential Parcel (Commercial Buildings)	3%
T&E and Focus Species Associated with Road Segment	2%



Roadway Associated with Critical Facilities



Concept Design

Tavernier Ocean Shores – Stinger Road



Right Of Way

Right Of Way

Stinger Road
Lowest existing roadway elevation 0.9 FT (NAVD88)

2045 SLR Water Levels



Stinger Road
Lowest existing roadway elevation 0.9 FT (NAVD88)

Proposed Improvements



Right Of Way

Right Of Way

Edge Of Pavement Elevation raised by approximately 16" above existing ground with stormwater system to mitigate King Tides.

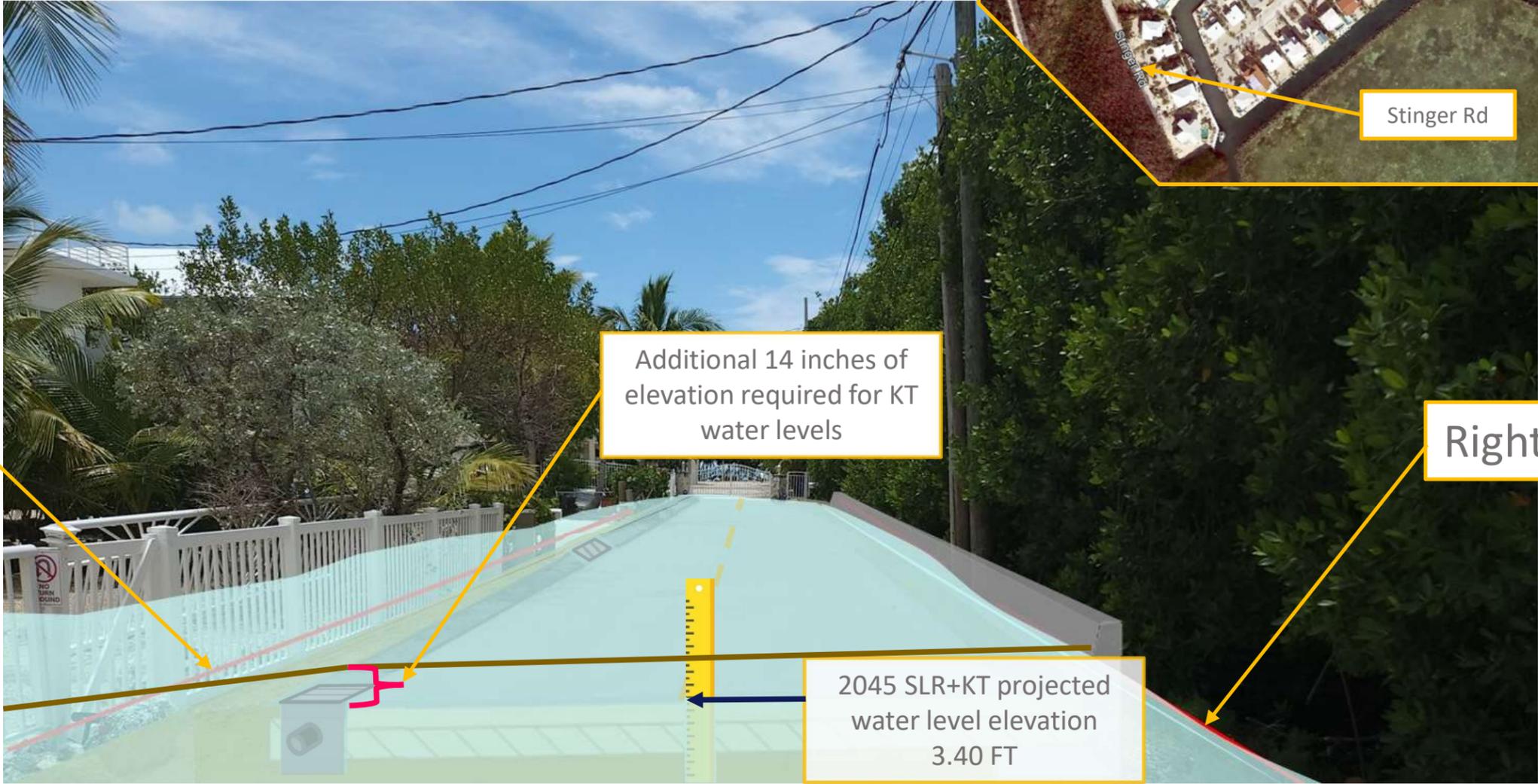
Stinger Road
Lowest existing roadway elevation 0.9 FT (NAVD88)

Proposed Improvements with 2045 SLR Water Levels



Stinger Road
Lowest existing roadway elevation 0.9 FT (NAVD88)

Proposed Improvements with 2045 SLR + KT Water Levels



Stinger Road
Lowest existing roadway elevation 0.9 FT (NAVD88)

Tavernier Ocean Shores – Dubonnet Road



Right Of Way

Right Of Way

Dubonnet Road
Lowest existing roadway elevation 1.46 FT (NAVD88)

2045 SLR Water Levels



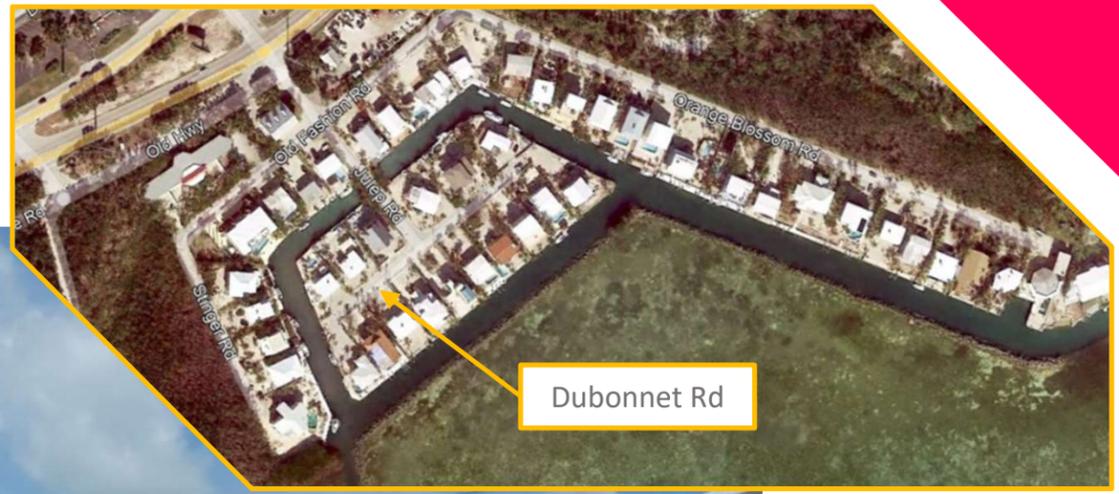
Right Of Way

Right Of Way

SLR projected Water Elevation
2.26 FT (NAVD88)
(Approximately 10" above existing ground)

Dubonnet Road
Lowest existing roadway elevation 1.46 FT (NAVD88)

Proposed Improvements



Right Of Way

Right Of Way

Edge Of Pavement Elevation raised by approximately 10" above existing ground with stormwater system to mitigate King Tides.

Dubonnet Road
Lowest existing roadway elevation 1.46 FT (NAVD88)

Proposed Improvements with 2045 SLR Water Levels



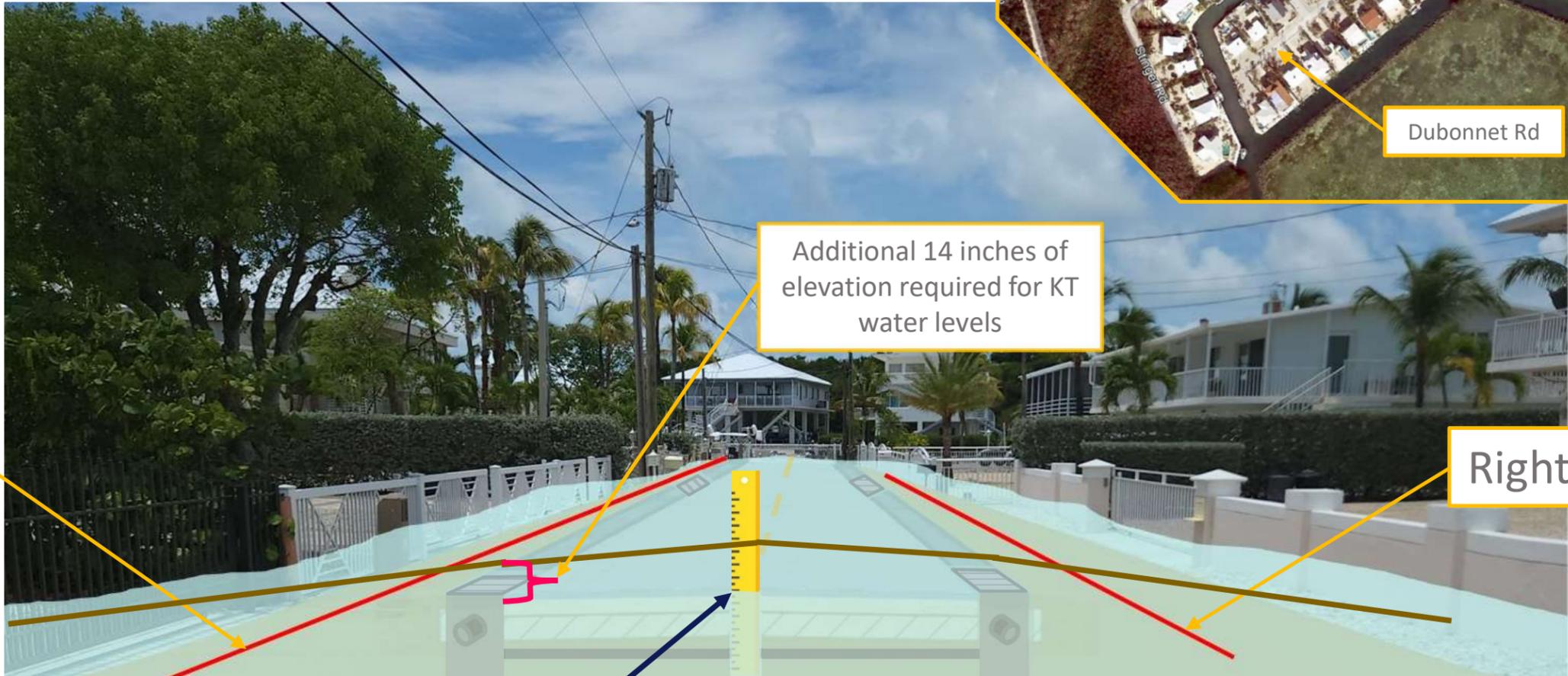
Right Of Way

Right Of Way

2045 SLR projected water level elevation 2.26 FT

Dubonnet Road
Lowest existing roadway elevation 1.46 FT (NAVD88)

Proposed Improvements with 2045 SLR + KT Water Levels



Right Of Way

Additional 14 inches of elevation required for KT water levels

Right Of Way

2045 SLR+KT projected water level elevation 3.40 FT

Dubonnet Road
Lowest existing roadway elevation 1.46 FT (NAVD88)

Tavernier Harbor/Tavernier Park Pointview Road



Right Of Way



Pointview Road
Lowest existing roadway elevation 2.83 FT (NAVD88)

Proposed Improvements



Right Of Way



Right Of Way

Edge Of Pavement Elevation raised by approximately 7" above existing ground with no stormwater system required.

Pointview Road
Lowest existing roadway elevation 2.83 FT (NAVD88)

Proposed Improvements with 2045 SLR + KT Water Levels



Right Of Way



2045 SLR+KT projected water level elevation 3.40 FT

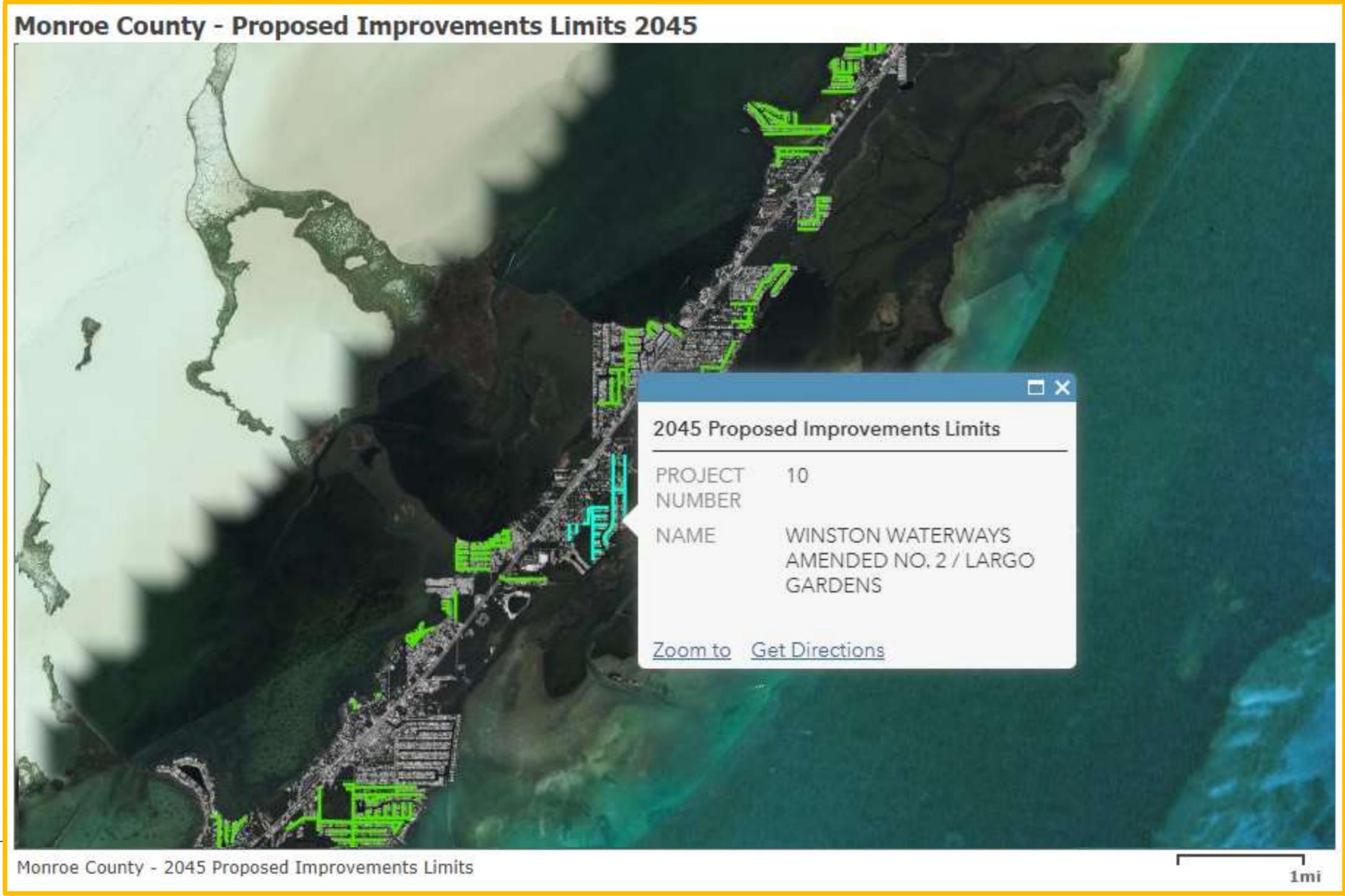
Right Of Way

Pointview Road
Lowest existing roadway elevation 2.83 FT (NAVD88)

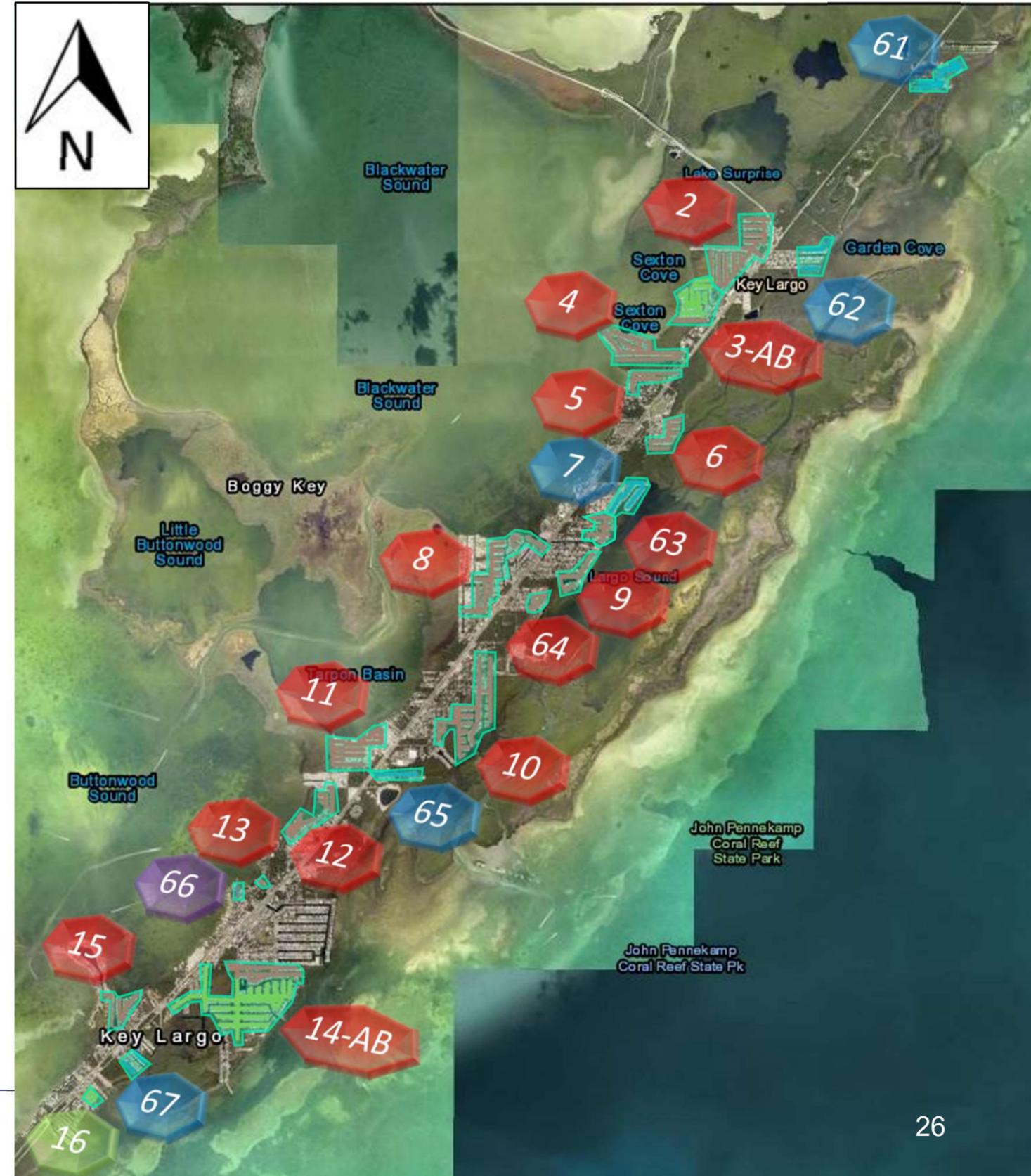
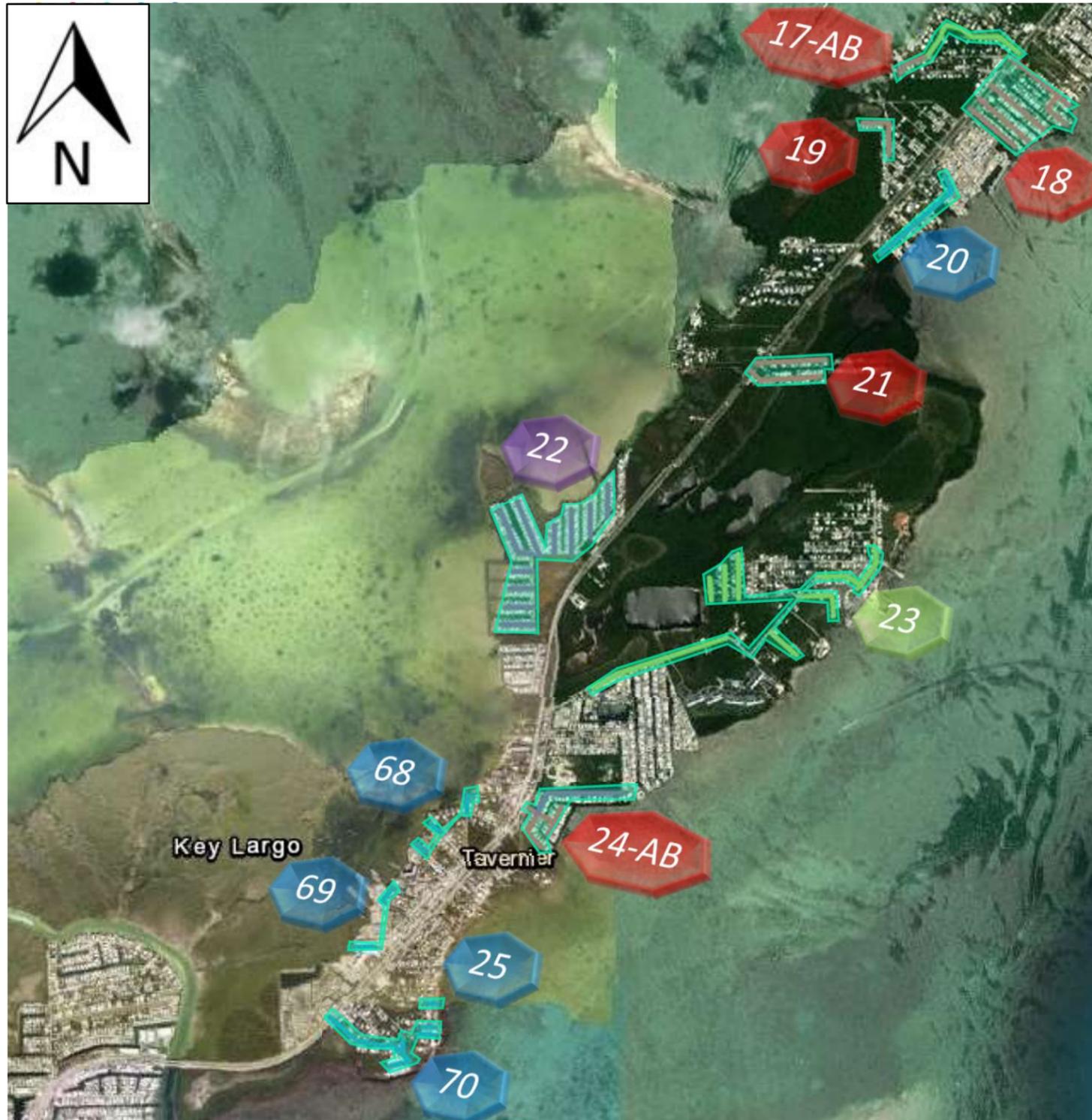


Neighborhood Areas

Neighborhood Areas



Project Locations – Upper Keys



Project Locations – Middle Keys



Project Locations – Lower Keys



Project Locations – Lower Keys



Project Locations – Lower Keys





Adaptation Plan and Program Cost

Adaptation Plan by Year of Projected Impact



UPPER KEYS

- 16 Neighborhood Areas
- 4 Phased Neighborhood Areas
- Total Length: 18.09 miles
- Total Initial Construction Cost Estimate: **\$217,400,940**

2025
Year of projected vulnerability

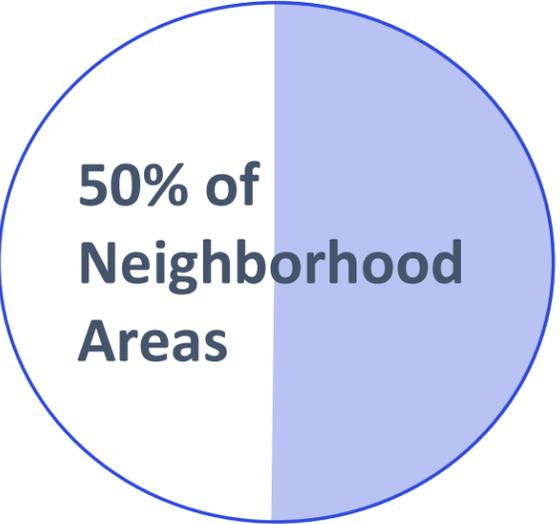
MIDDLE KEYS

- 1 Neighborhood Area
- 1 Phased Neighborhood Area
- Total Length: 0.77 miles
- Total Initial Construction Cost Estimate: **\$14,266,515**

Projected NOAA 2017 Intermediate-High + King Tides will affect the following:

LOWER KEYS

- 18 Neighborhood Areas
- 9 Phased Neighborhood Areas
- Total Length: 65.42 miles
- Total Initial Construction Cost Estimate: **\$657,157,789**



35 Neighborhood Areas
14 Phased Neighborhood Areas
Total Length: 84.29 miles
Total Initial Construction Cost Estimate: **\$888,825,245**
Annual O&M : **\$1,630,803**

Adaptation Plan by Year of Projected Impact



UPPER KEYS

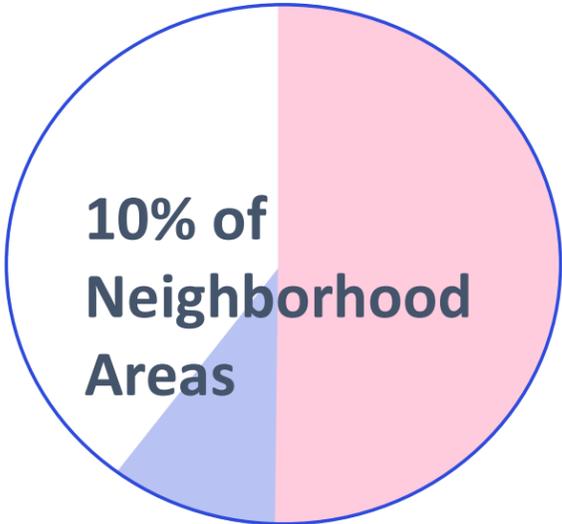
- 2 Neighborhood Areas
- 3 Phased Neighborhood Areas
- Total Length: 6.93 miles
- Total Initial Construction Cost Estimate: **\$67,055,109**

2030
Year of projected vulnerability

LOWER KEYS

- 3 Neighborhood Areas
- 2 Phased Neighborhood Areas
- Total Length: 10.48 miles
- Total Initial Construction Cost Estimate: **\$112,536,118**

Projected NOAA 2017 Intermediate-High + King Tides will affect the following:



5 Neighborhood Areas
 5 Phased Neighborhood Areas
 Total Length: 17.41 miles
 Total Initial Construction Cost Estimate: **\$179,591,227**
 Annual O&M: **\$339,356**

Adaptation Plan by Year of Projected Impact



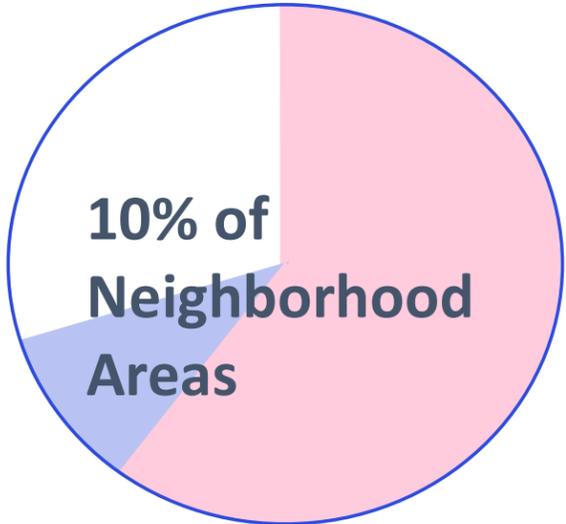
UPPER KEYS

- 2 Neighborhood Areas
- 1 Phased Neighborhood Area
- Total Length: 1.45 miles
- Total Initial Construction Cost Estimate: **\$15,177,559**

2035
Year of projected vulnerability

LOWER KEYS

- 3 Neighborhood Areas
- 4 Phased Neighborhood Areas
- Total Length: 16.81 miles
- Total Initial Construction Cost Estimate: **\$144,138,677**



5 Neighborhood Areas
 5 Phased Neighborhood Areas
 Total Length: 18.26 miles
 Total Initial Construction Cost Estimate: **\$159,316,236**
 Annual O&M: **\$307,851**

Projected NOAA 2017 Intermediate-High + King Tides will affect the following:

Adaptation Plan by Year of Projected Impact



UPPER KEYS

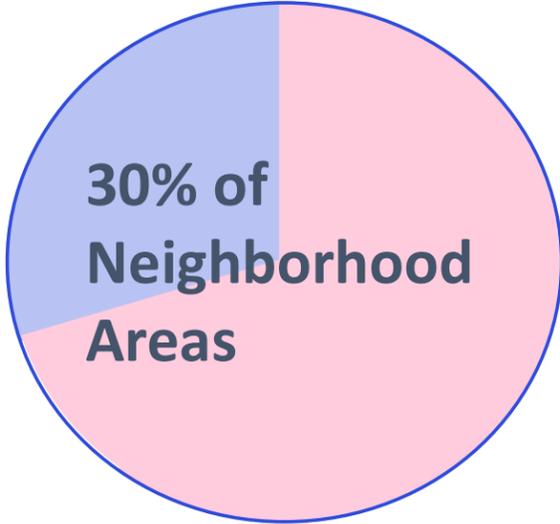
- 11 Neighborhood Areas
- Total Length: 4.65 miles
- Total Initial Construction Cost Estimate: **\$39,680,840**

MIDDLE KEYS

- 1 Phased Neighborhood Areas
- Total Length: 6.34 miles
- Total Initial Construction Cost Estimate: **\$64,613,147**

LOWER KEYS

- 13 Neighborhood Areas
- 3 Phased Neighborhood Areas
- Total Length: 35.63 miles
- Total Initial Construction Cost Estimate: **\$273,713,469**

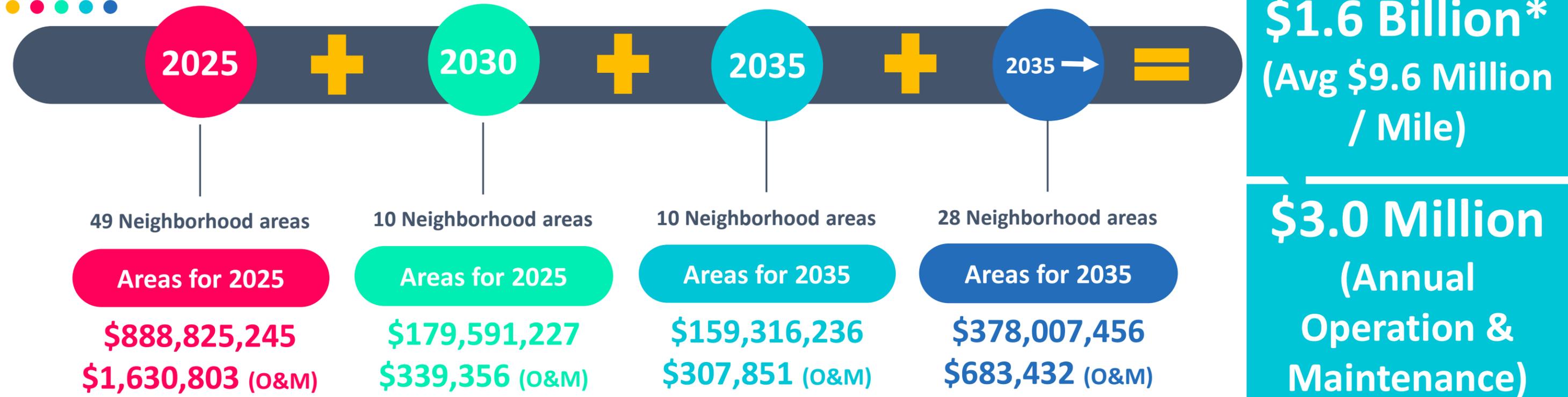


24 Neighborhood Areas
 4 Phased Neighborhood Areas
 Total Length: 46.62 miles
 Total Initial Construction Cost Estimate: **\$378,007,456**
 Annual O&M: **\$683,432**

**Beyond
 2035
 Year of projected
 vulnerability**

Projected **NOAA 2017 Intermediate-High + King Tides** will affect the following:

Adaptation Plan and Program Cost



Projected **SLR + King Tides** will affect the following:

(SLR Condition: NOAA 2017 Intermediate-High + King Tides)

2045

Unincorporated Countywide %

Miles of Vulnerable and Critical County Maintained Roadways	166 MI	53%
# of Residential Units along County Maintained Roadways	13,399 Res. Units	76%

* Cost estimate is conceptual and does not include design, right-of-way acquisition, harmonization/cost to cure, and legal fees. Cost estimates are preliminary and subject to change. Cost Estimate is based on 2020 Dollars.



Project Website

www.keysroadsplan.com



Keys Roads Plan

Home Project Who We Are **Maps** Updates Gallery Contact Us

Monroe County Roads Elevation Viewer

Based on LIDAR Data for 2019

Existing Monroe County Roads Elevation

PROJECT INFORMATION
Monroe County Roads Vulnerability Analysis Project

Monroe County - 2045 Proposed Improvements Linds Viewer

Neighborhood Areas Recommendations

Monroe County Criticality Evaluation Viewer

Criticality Evaluation Viewer

RELATED LINKS
County Website
on Keys!



Keys Roads Plan

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Monroe County Roads Vulnerability Analysis

CHECK EXISTING ROADWAY ELEVATIONS

CHECK PROPOSED ROADWAY ADAPTATION LIMITS

ROADWAY ADAPTATION CONCEPTUAL PLANS

PROJECT INFORMATION
Monroe County Roads Vulnerability Analysis Project

MAPS
Study Area Maps

UPDATES
Events and Resources

RELATED LINKS
County Website
Green Keys!



Keys Roads Plan

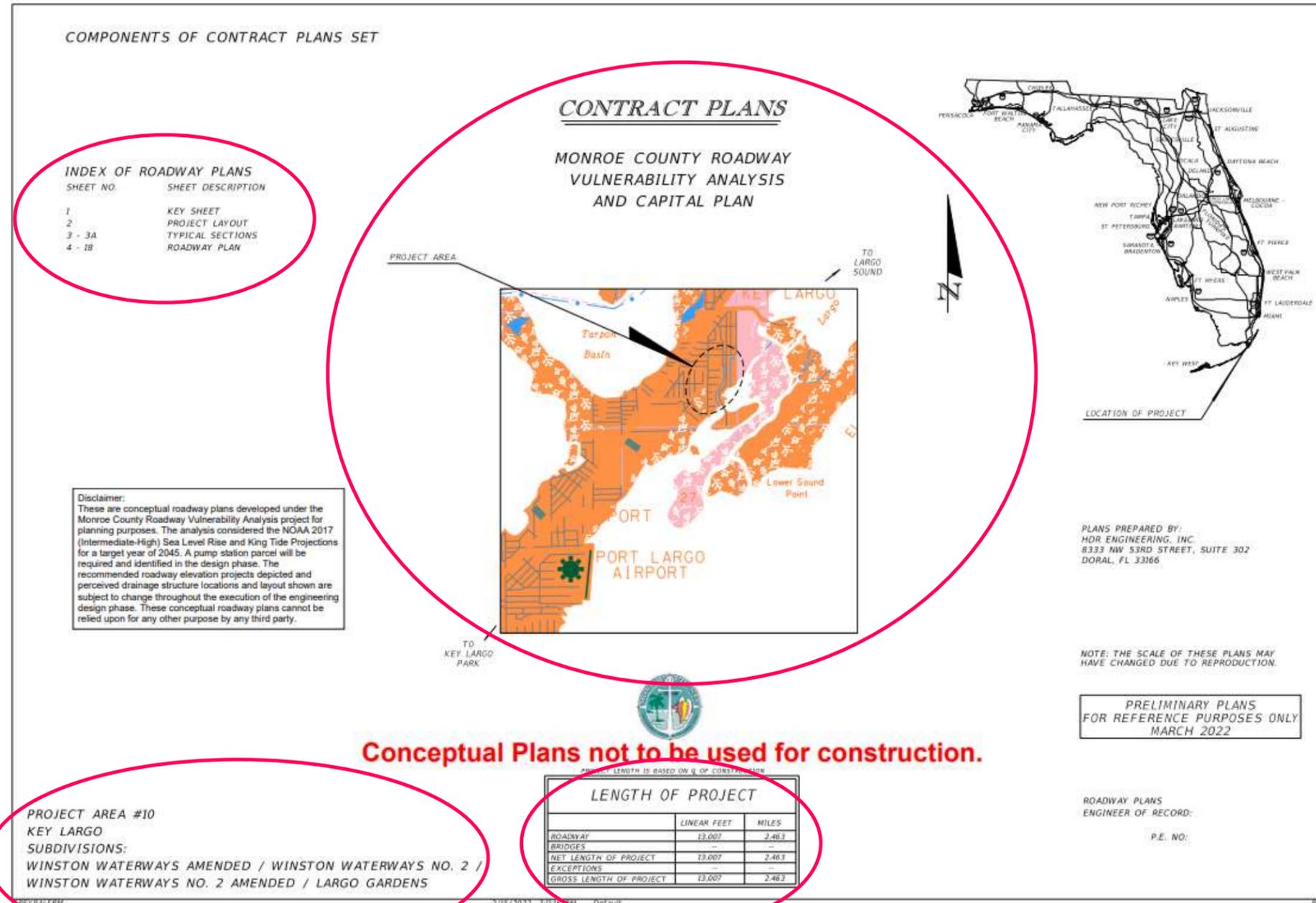
Home Project Who We Are Maps Conceptual Plans More

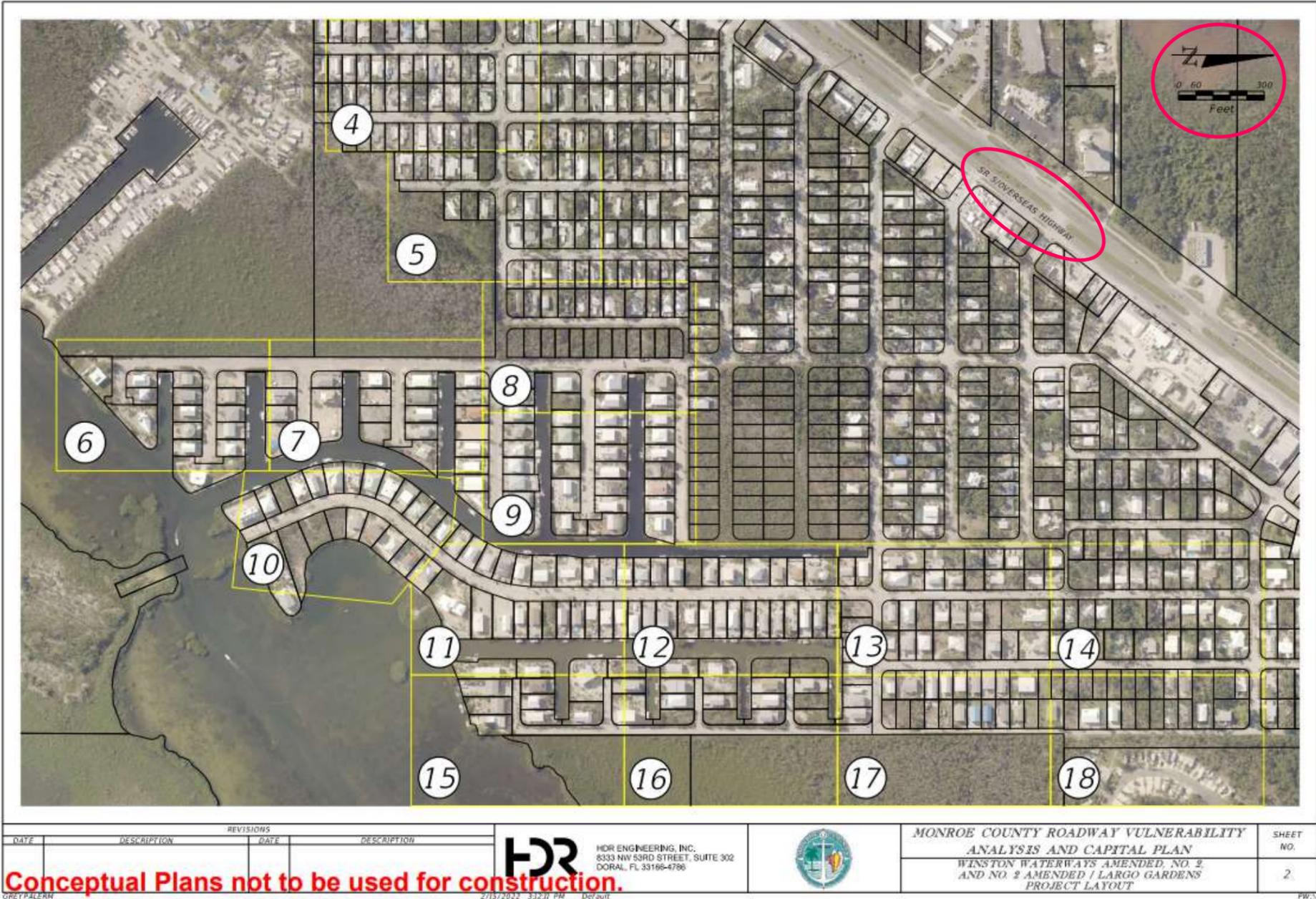
Upper Keys

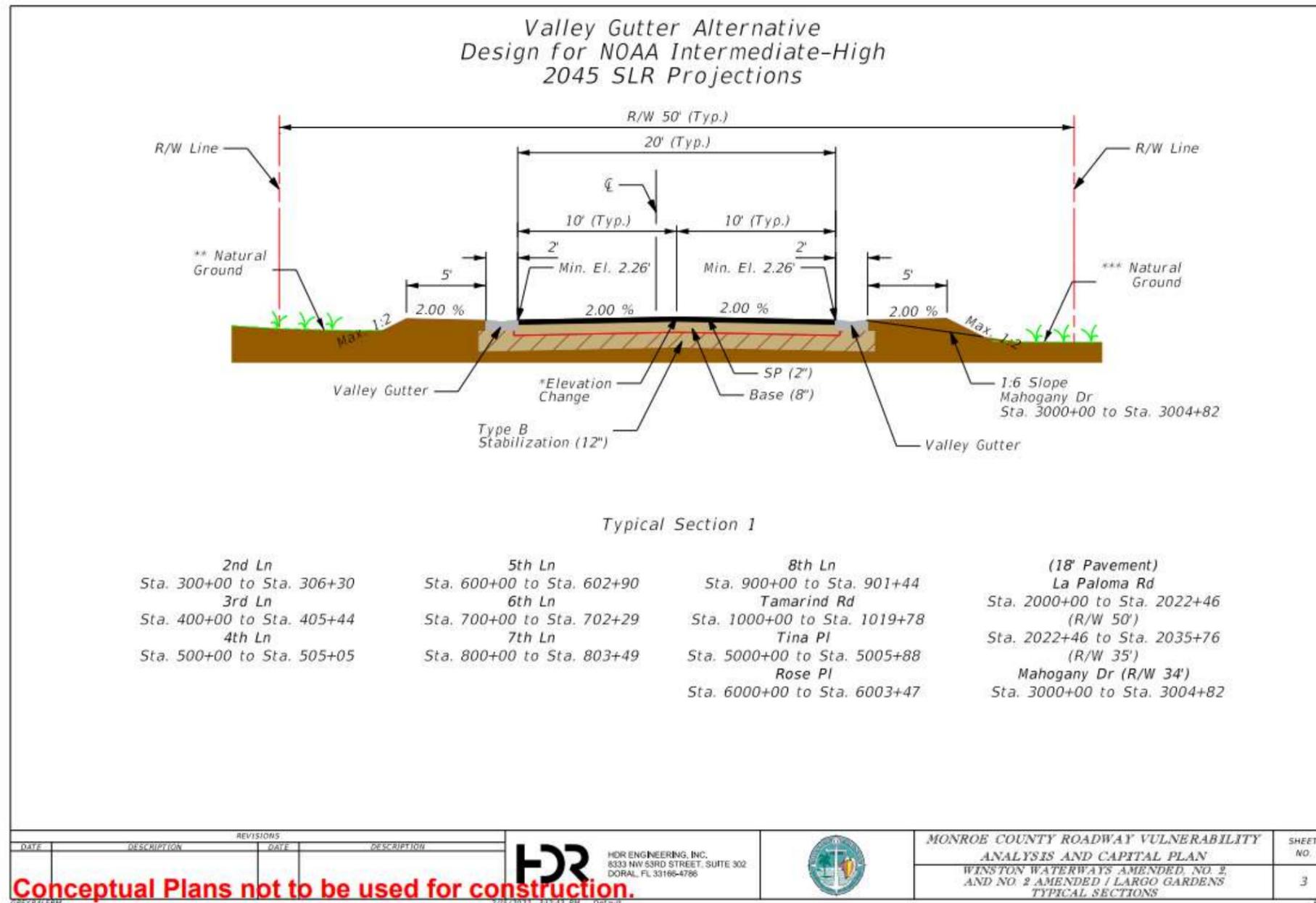
KEY LARGO

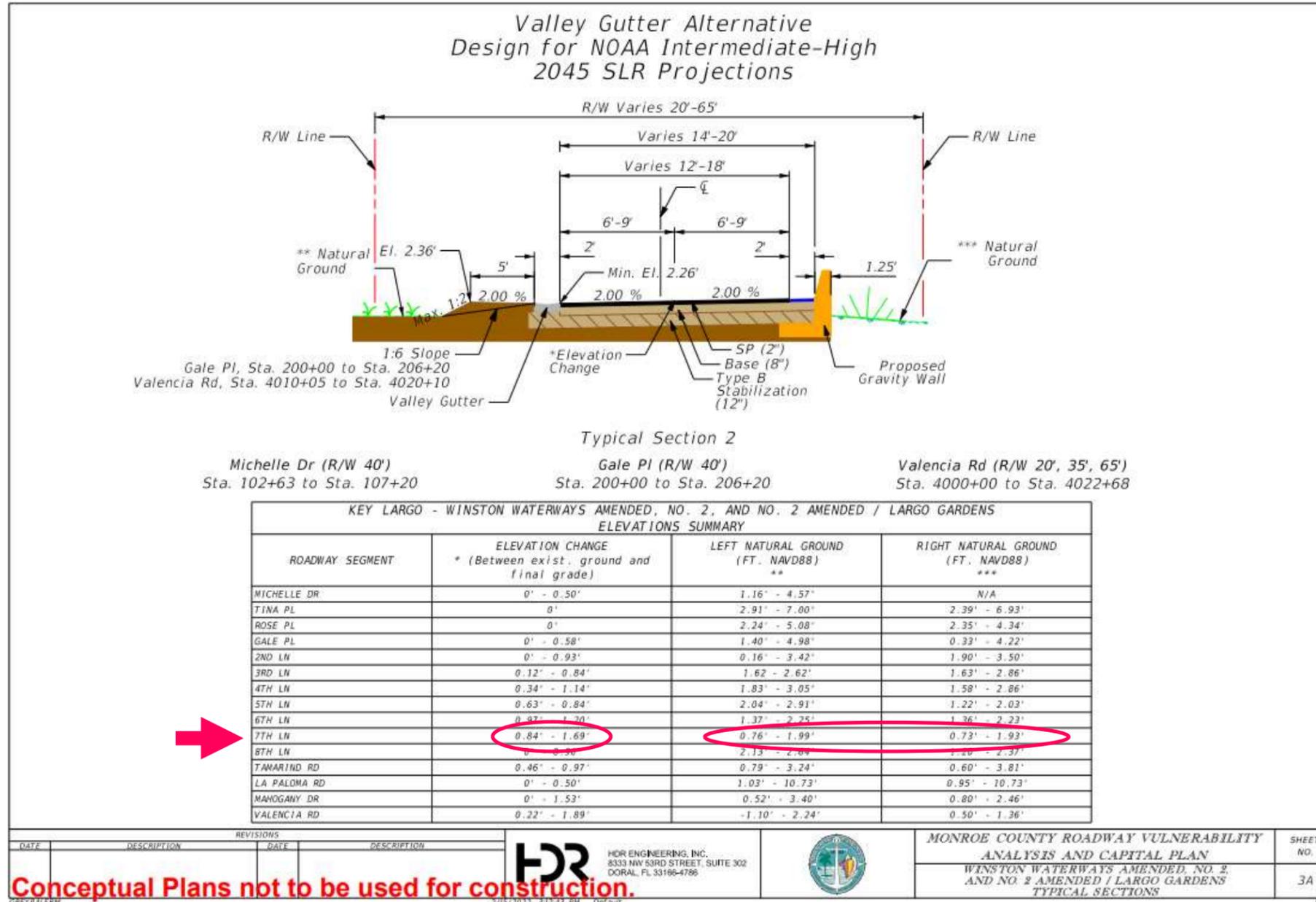
- Area 1 [Card Sound Road](#)
- Area 2 [Lake Surprise Estates](#)
- Area 3 [Sexton Cove Estates](#)
- Area 4 [Stillwright Point 1 and 2, Paradise Point Cove](#)
- Area 5 [Riviera Village Revised](#)
- Area 6 [Mobile Homesites Plats 2 and 4](#)
- Area 7 [Largo Sound Village](#)
- Area 8 [Cross Key Waterway Estates, Twin Lakes](#)
- Area 9 [Largo Sound Park, Anglers Park Shores](#)
- Area 10 [Winston Waterways, Largo Gardens](#)
- Area 11 [Key Largo Trailer Village, Key Largo Trailer Park 1st Addition](#)
- Area 12 [Sunset Waterways, Key Largo Park Amended](#)
- Area 13 [Buttonwood Shores](#)
- Area 14 [Key Largo Beach, Key Ocean Shores, Harbor Shores, Thompson, Sunset Cove](#)
- Area 15 [Buccaneer Point, Pirate's Cove 1st Addition](#)

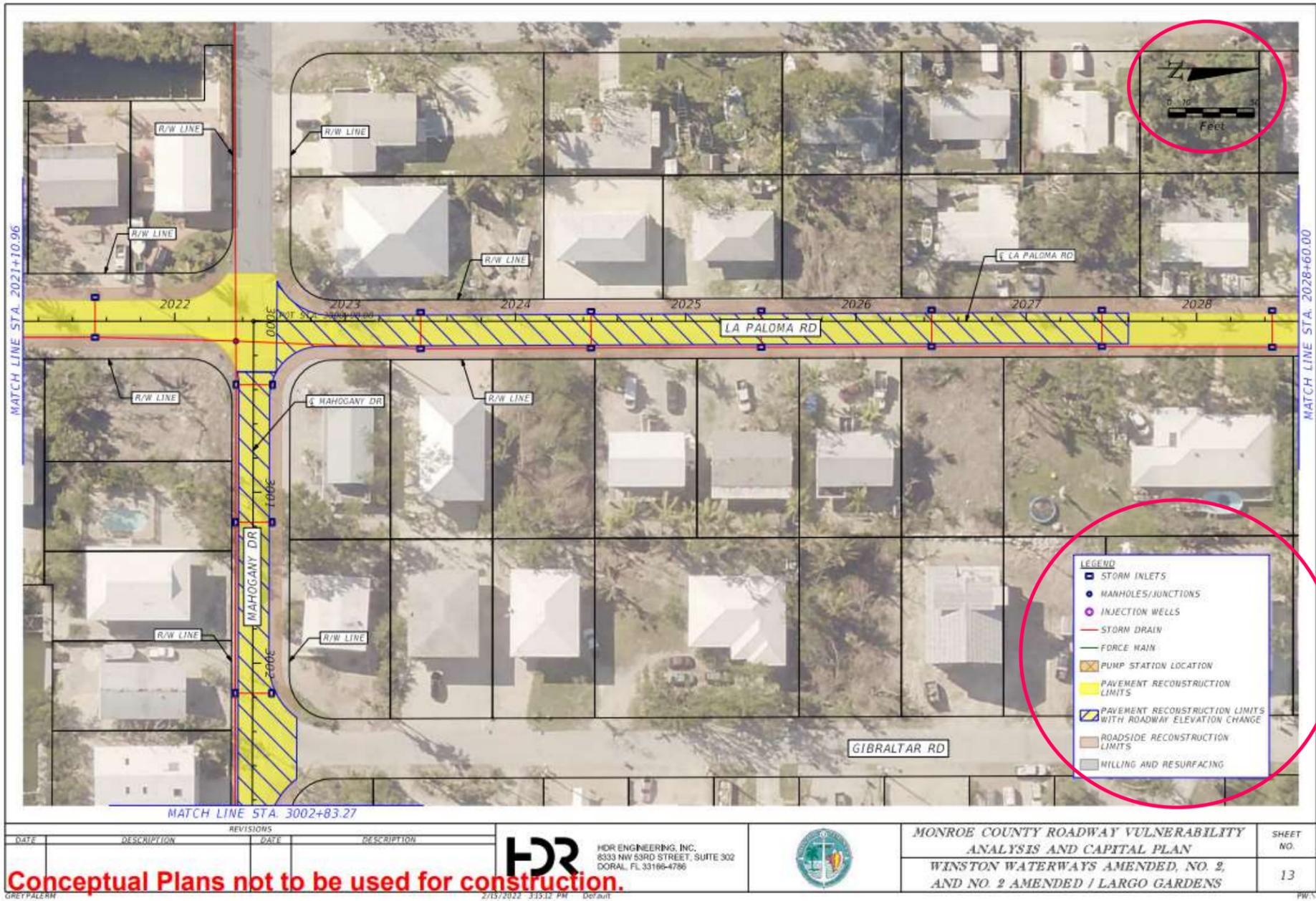












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Monroe Vulnerability

CHECK EXISTING ROADWAY ELEVATIONS

ROADWAY

PROJECT INFORMATION

Monroe County Roads Vulnerability Analysis Project

MAPS

Study Area Maps

CONTACT

CONTACT US BY COMPLETING THE FORM BELOW

Name Email

Subject

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Submit



Policy & Implementation

Implementation Components

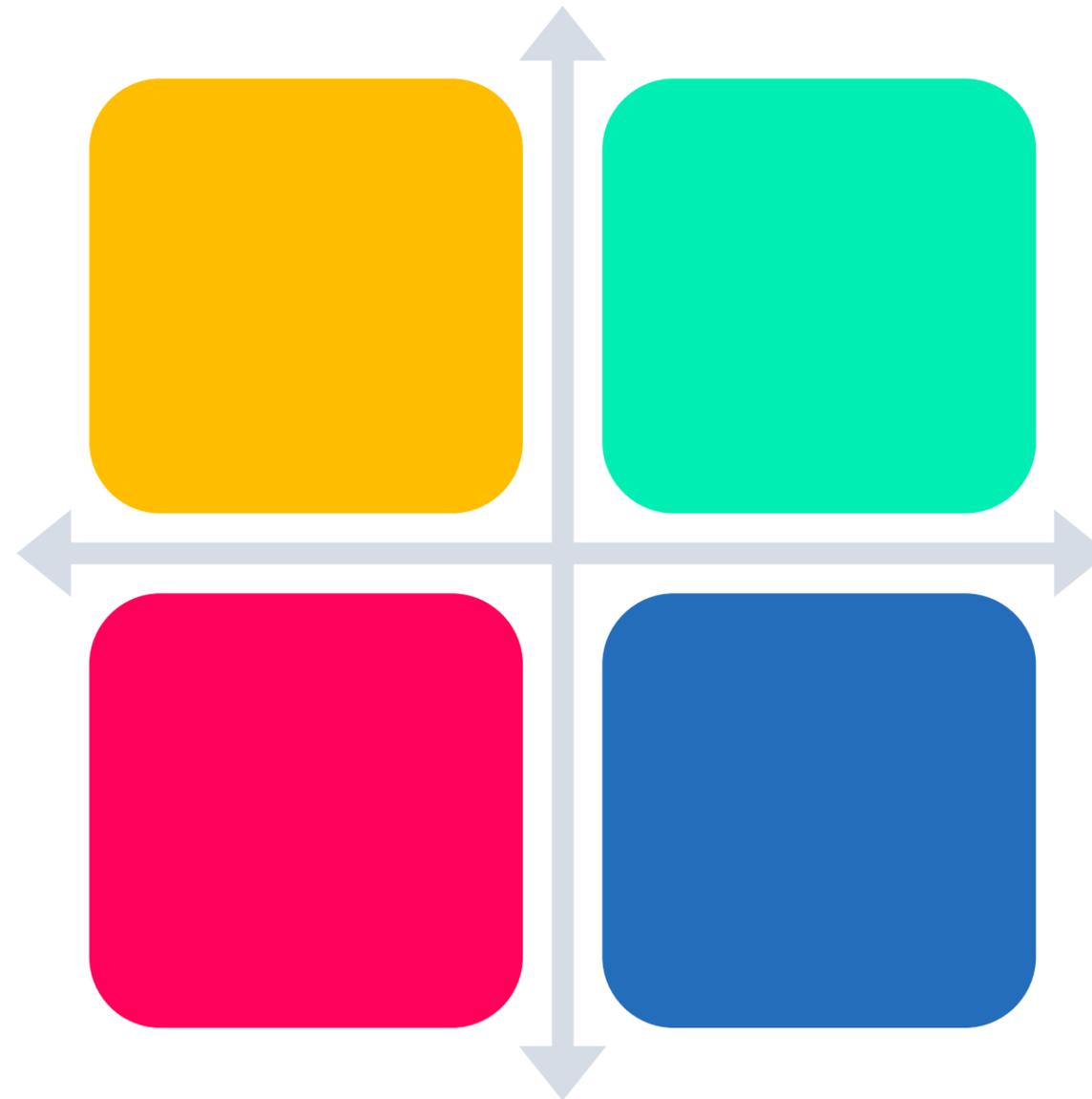


01 Plan Intent

The Roads Plan is intended to summarize priorities for road elevation and stormwater based on priority ranking criteria and provide concept cost estimates.

02 Implementation

Policy changes will be needed to implement the roads program, e.g., Comp Plan policy, design standards, etc.



03 Funding

The program can be implemented project by project when funds are available or as a program funded by specified sources.

04 Funding Sources

Examples of funding: general funds, grant funds or special assessments, or any of these sources, and others combined.

Needed Policy Changes



<i>Implementation Strategy</i>	<i>Timeframe</i>
Comprehensive Plan: Roads Policy (FLOS-R) and LOS commitment “clean up”	Short (1-2 yrs)
Policy on road drainage (not creation of private property stormwater system)	Short (1-2 yrs)
Modify Code on updated design standards (SLR + King Tide Estimates)	Short-Medium (1-3 yrs)
Review and modify road abandonment procedures (consider flooding)	Short-Medium (1-3 yrs)
Funding Strategy (Project by project or programmatic)	Short-Medium (1-3 yrs)
Private property adaptation policies (e.g., shorelines + fill + onsite stormwater)	Medium-Long (2-4 yrs)

Monroe County Proactive Planning Approach



County Wide Adaptation

- Roads
- Habitat/Resources
- Elevate or mitigate County buildings
- Infrastructure



Private Response

- Elevate or mitigate private structures
- Lot fill and driveways
- Shorelines



Achieving Resiliency

- County services and assets
- People
- Habitat
- Economy

“Failing to plan is planning to fail” (Alan Lakein)



PROJECT GOALS:

1. Help make the Keys more resilient by developing a long-term roads adaptation plan to mitigate projected Sea Level Rise (SLR) impacts on roadways.
2. Develop planning level cost estimate for Countywide roadway adaptation.
3. Provide supporting technical information to facilitate roadway adaptation projects.

Yet to come...



County Researching Funding Sources



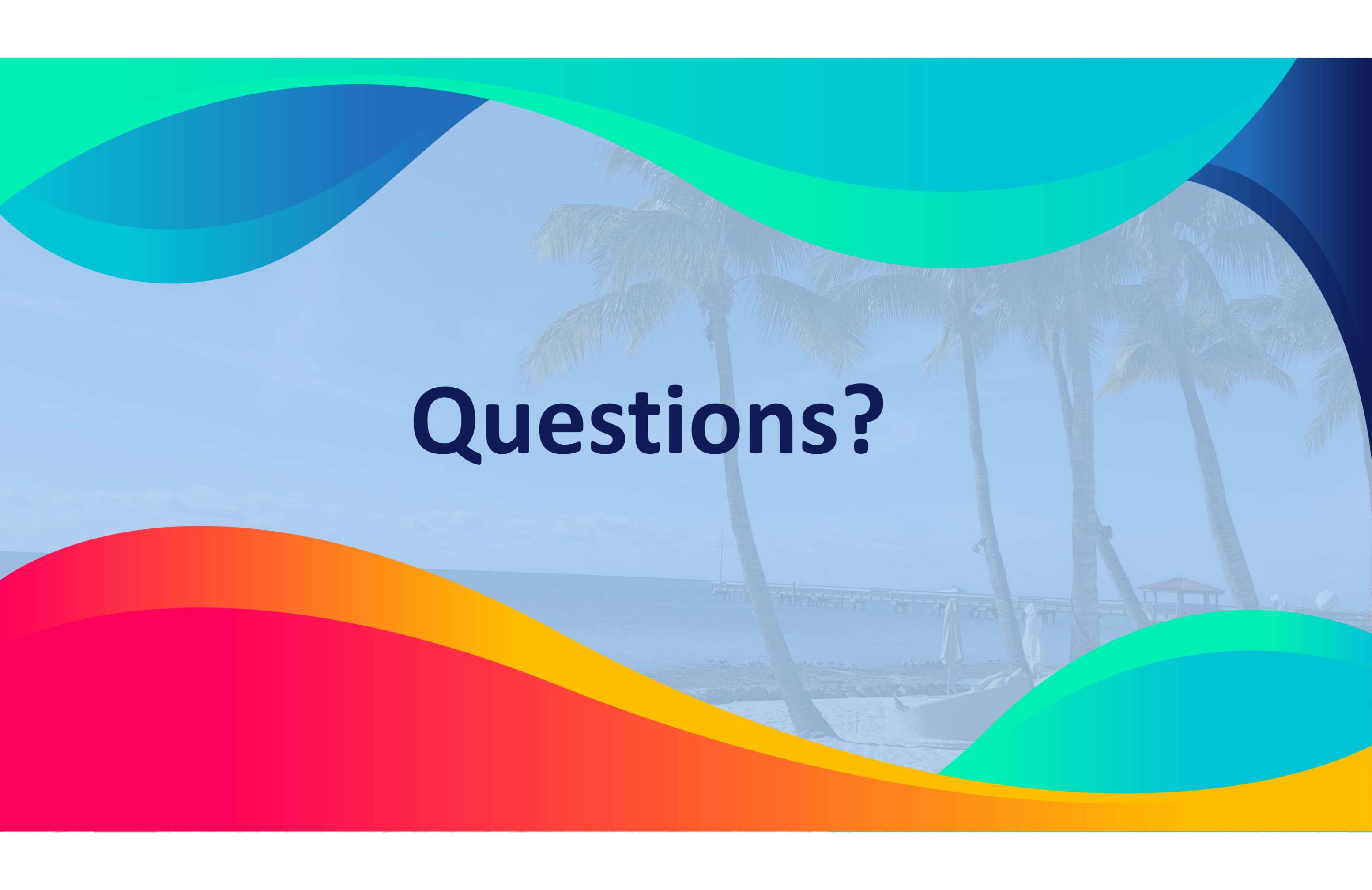
Discussion on private property adaptation policies



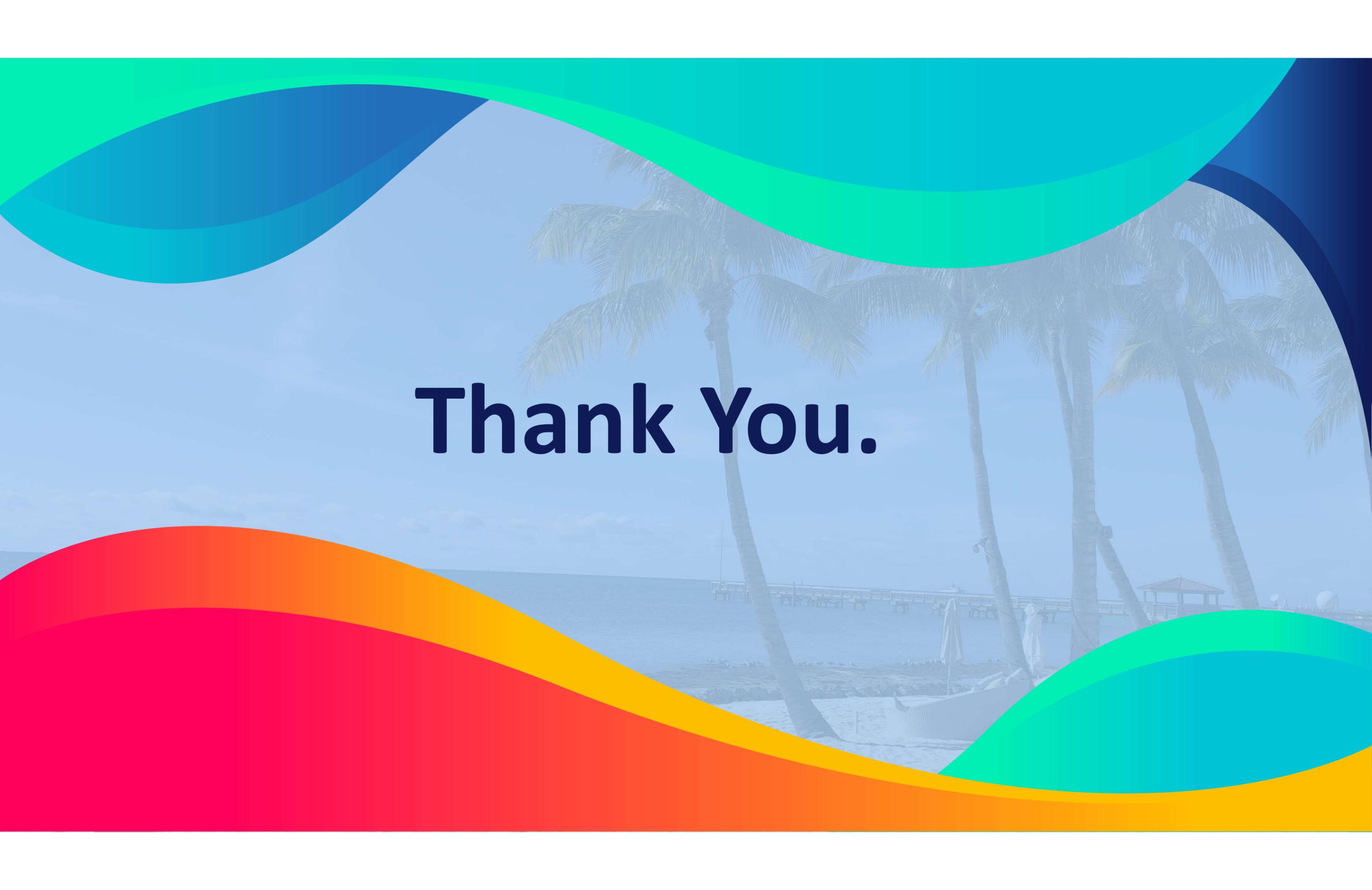
Completion of Policy and Regulation Analysis



Final Report and Presentation to BOCC (September 2022)



Questions?



Thank You.