

MONROE COUNTY

Rhonda Haag Chief Resilience Officer Monroe County

Monroe County Roadway Vulnerability Case Study – Key Largo

June 25, 2020





## **Presentation Outline**

- I. Overview of Countywide Project
- II. Sea Level Rise Projections
- III. Stillwright Point Analysis
- **IV.** Policy Discussion
- V. Next Steps



## Countywide Roadway Vulnerability Study and Capital Plan



**Purpose:** Develop a long-term roads adaptation plan to mitigate projected Sea Level Rise (SLR) conditions.

Total Length of County Maintained Roads	1,658,221.0 Feet		314.06	Miles				
County Roads Spread Throughout 21 Different Keys, non-linear								
Total of 1202 Roadway Segments Throughout Project Limits								

### www.keysroadsplan.com

## Engineering Analysis – Sea Level Rise Projections

#### SE FL Climate Leadership Compact Updated Projections Released December 2019



#### NOAA Intermediate-High SLR is projected to be the following:

- MHHW Elevation relative to 2000 MSL
  - Naples Tide Gauge
  - 7.2" (0.6') NAVD88
- 9 inches by 2025 up to 1.37' NAVD88
- 17 inches by 2040 up to 1.99' NAVD88
- 31 inches by 2060 up to 3.16' NAVD88

## How Sea Level Rise will impact Stillwright Point

## How Sea Level Rise will impact Stillwright Point

**Center lane** (NOAA Intermediate-High)



## How Sea Level Rise will impact Stillwright Point

#### **S. Blackwater lane** (NOAA Intermediate-High)





0.25' of -

depth

## **Existing Conditions in Stillwright Point**

#### Existing Conditions / King Tide Flooding

- All water front properties
- Low roadway and private property elevations
- 1/3 of roadway length abuts natural ground areas
- Blackwater Sound NOAA tidal BUOY sets street flooding at approximately 0.40' (4.8") NAVD88. On October 8, 2019 it reached 1.03' NAVD88.
- Frequency of neighborhood flooding expected to increase with future sea level rise.



Pink highlighted areas denote areas susceptible to SLR flooding.

## **Engineering Analysis**



#### **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:

- Projected Water Surface Elevations
- Conduct Vulnerability/Prioritization Evaluation

## Existing Conditions in Stillwright Point

King Tide Flooding today vs consistent impacts from projected SLR (NOAA Intermediate-High)



#### **Perimeter Elevation Analysis**

- 2020 King Tide conditions.
  Vacant parcels, natural areas, and b/w homes with EL. below ±1.5' NAVD88.
- 2025 Consistent inflow of sea water through Vacant parcels, natural areas, and b/w homes with EL. below 1.37' NAVD88.
   (20 locations)
- 2035 Consistent inflow of sea water through Vacant parcels, natural areas, and b/w homes with EL. below 1.79' NAVD88.
   (66 locations)
- 2045 Consistent inflow of sea water through Vacant parcels, natural areas, and b/w homes with EL. below 2.26' NAVD88.
   (112 locations)

## Stillwright Point Solution: Raising the road...

Installing curb & gutter with Pump/Injection Well System – Roadway Target EL. 1.87' NAVD88 (0-1.75' EL. Difference)



With flush shoulders above natural ground and Pump/Injection Well System - Roadway Target EL. 3.26' NAVD88 (0.7'-3.15' EL. Difference)



#### **Alternative 1**

#### Alternative 2



## Stillwright Point Solution: Raising the road...

Flush shoulders at natural ground level and Pump/Injection Well System - Roadway Target EL. 2.26' NAVD88 (0-2.15' EL. Difference)



With French Drain System - Roadway Target EL. 0.9' NAVD88 (0-0.88' (10.5") EL. Difference)



#### **Alternative 4**

Alternative 3

# Alt. 4 - Would adding a couple of asphalt inches and installing an exfiltration drainage system work?

- How will it perform?
  - Minimum short term benefits
  - With or w/o drainage features, salt water flooding will still occur along the roadsides
  - With or w/o drainage features condition will be exacerbated by rain events
  - Flooding will accelerate roadway deterioration (By 2035 95% of roadways will be in Poor Conditions)





The solution to sea level rise

## **Accessibility Evaluation**

- Driveway Connection
- Pedestrian Accessibility





## Summary of Alternatives – What's Next

- Evaluated Alternatives that enable transportation accessibility beyond 2045
- Work in partnership with private properties for long term resiliency
- Completion of the County wide study, including the Stillwright Point analysis, will enable a complete understanding of the areas of concern and overall adaptation improvements

Criteria	Alternative 1 Raising the road with curb & gutter with Pump/Injection Well System	Alternative 2 Raising the road with flush shoulders above natural ground and Pump/Injection Well System	Alternative 3 Raising the road with flush shoulders at natural ground level and Pump/Injection Well System	Alternative 4 Raising the road with French Drain System
Max elevation raising of the road	1.75′	3.15′	2.15′	0.88′
Front Yard Encroachment	0' to 8.5'	6' to 13'	0' to 7.5'	No Impact
Initial Investment	\$20,195.708.31	\$20,077,976.56	\$21,060,147.60	\$ 2,697,283.3
Annual O&M Cost	\$ 17,662.00	\$ 9,600.00 - 17,662.00	\$ 180,000.00	



## Summary of Stillwright Point

- Challenging Existing Conditions:
  - Low roadway and private property elevation
  - Limited Right-of-Way and number/location of Utilities
  - Increasing Sea Level Rise conditions
- Evaluated 4 Alternatives that address the roadway
  - Alt. 4 does not provide extended benefit
  - Alt. 3 concern with functionality and permitting requirements
  - Alt. 1-2 Provision of long term accessibility
- Partnership with residents for long term resiliency goal



## Thank You!