What is at Risk? Pinellas County's Resiliency Program is Making Waves

Kelli Hammer Levy, Division Director

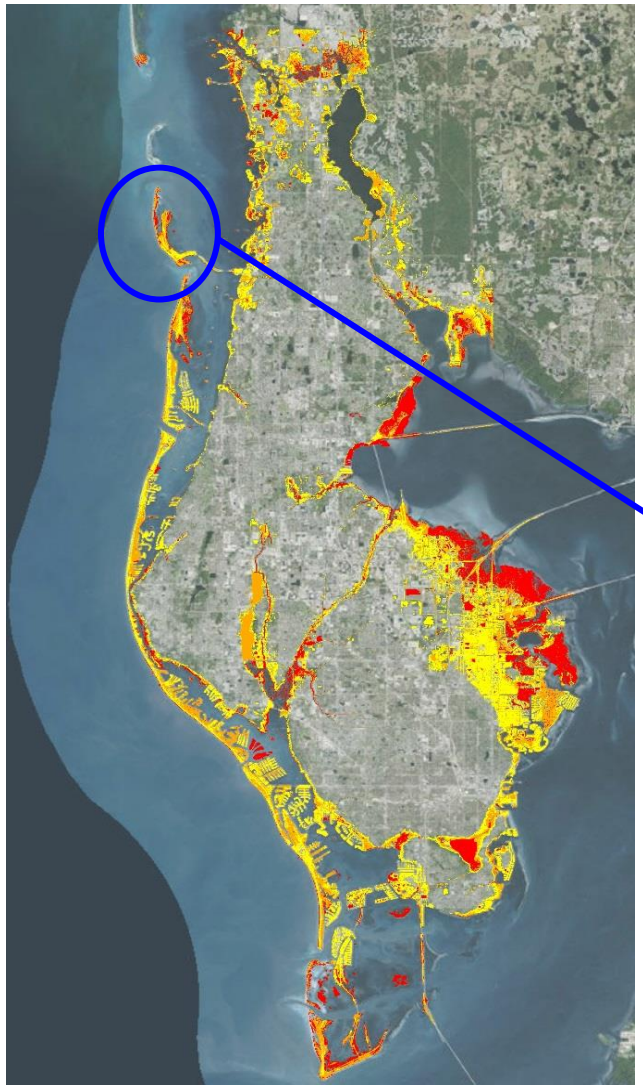
Overview

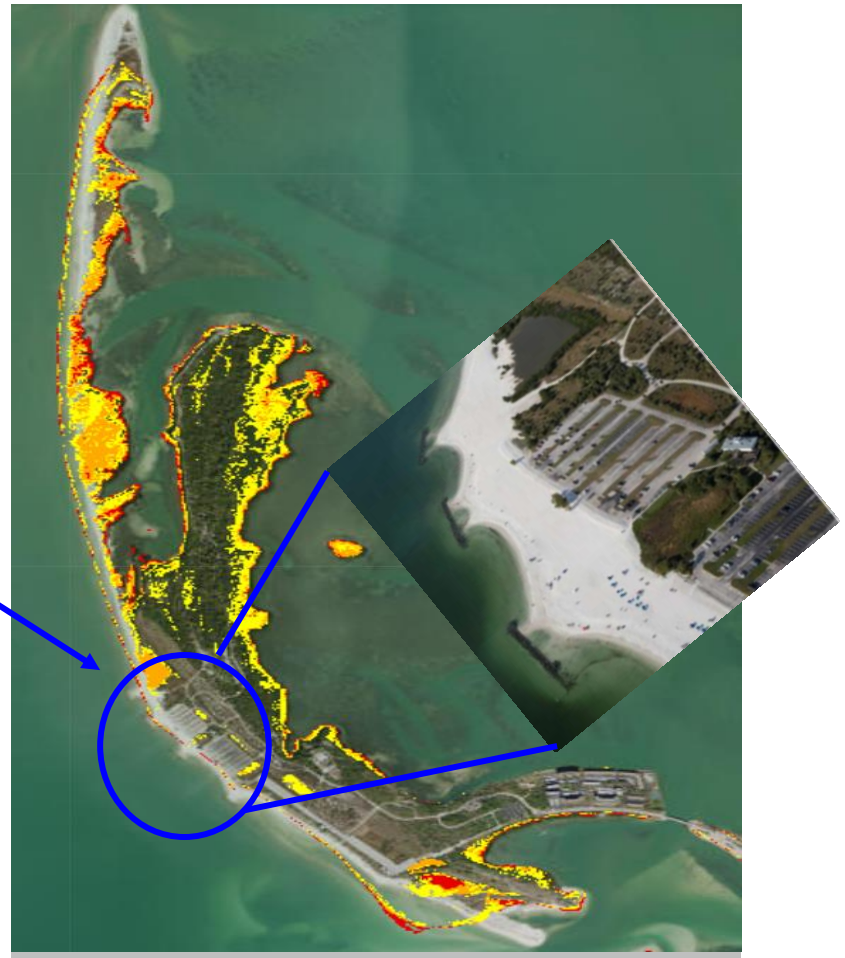
- Local challenges
- Climate Science Advisory Panel (CSAP)
  - Regional projections
  - Guidance
- Accounting for SLR in capital improvements
- Countywide Vulnerability Assessment
  - SLR
  - Storm Surge
  - Assessment
  - Adaptation
- Next steps and other efforts
- Questions

Elena 1985

A resilient Tampa Bay, one that acknowledges and responds to coastal vulnerabilities, is one that can support the economic, environmental, and cultural prosperity of this unique and highly valuable region

Local Challenges

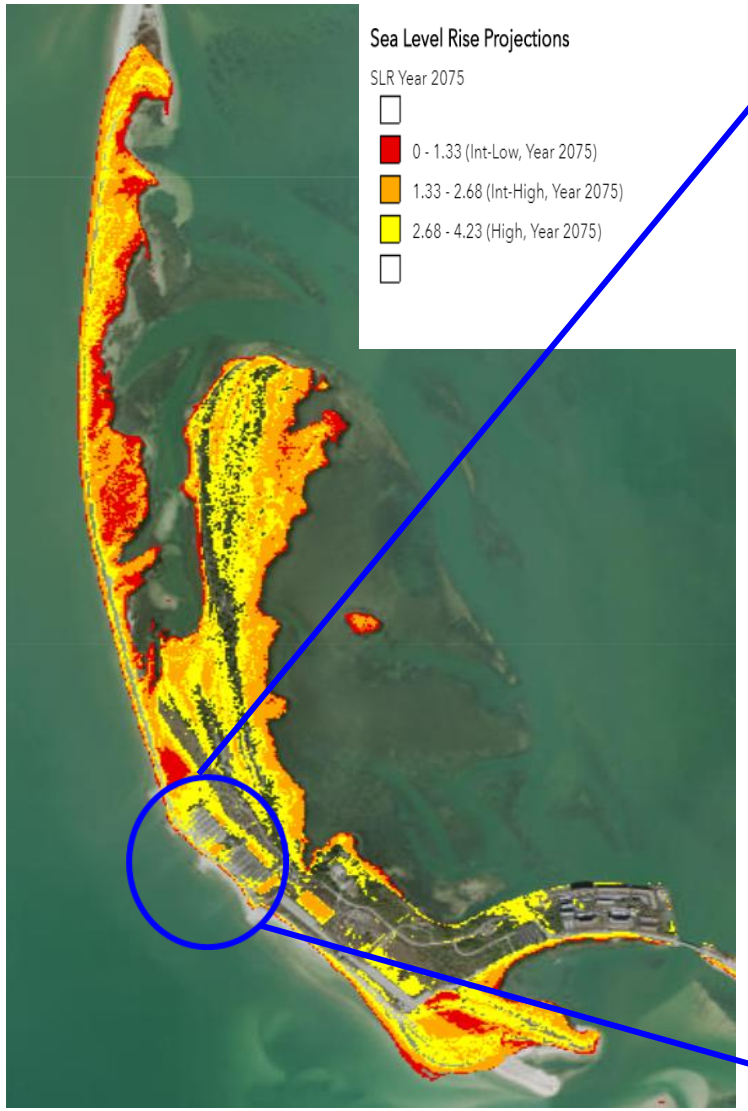


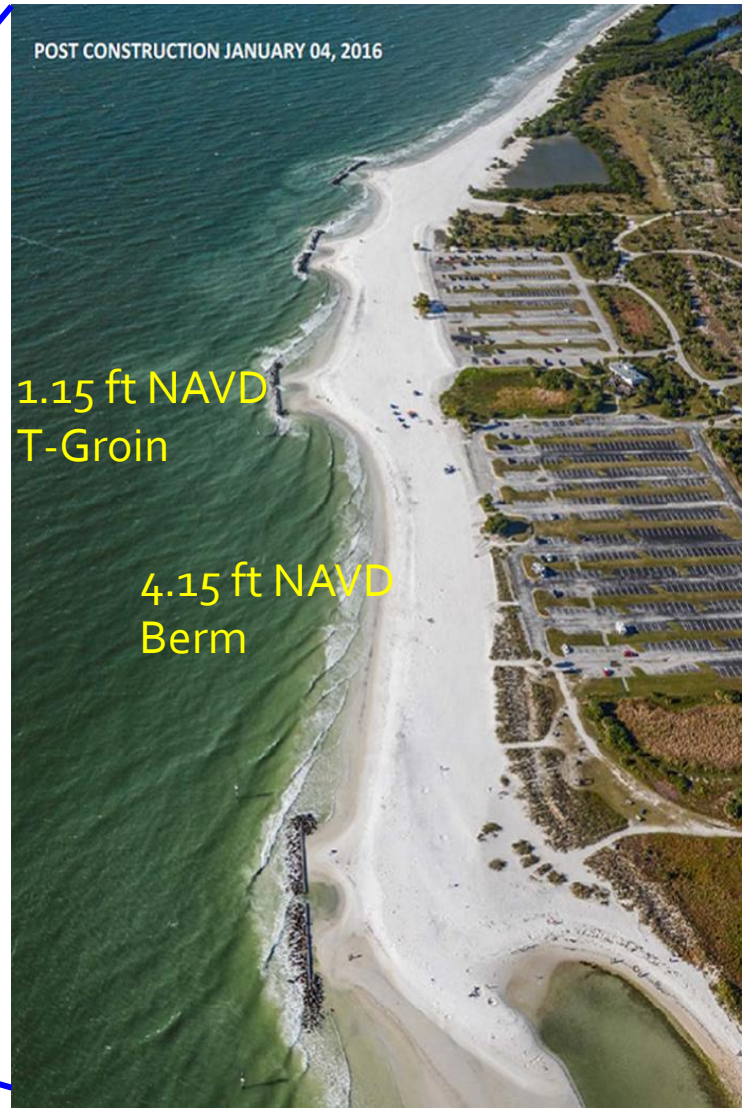


2050 Inundation Maps (without tidal impacts and no storm surge)

- Intermediate Low (0 – 0.8ft)
- Intermediate High (0.8 -1.46ft)
- High – High (1.46 – 2.22ft)

Local Challenges 2075



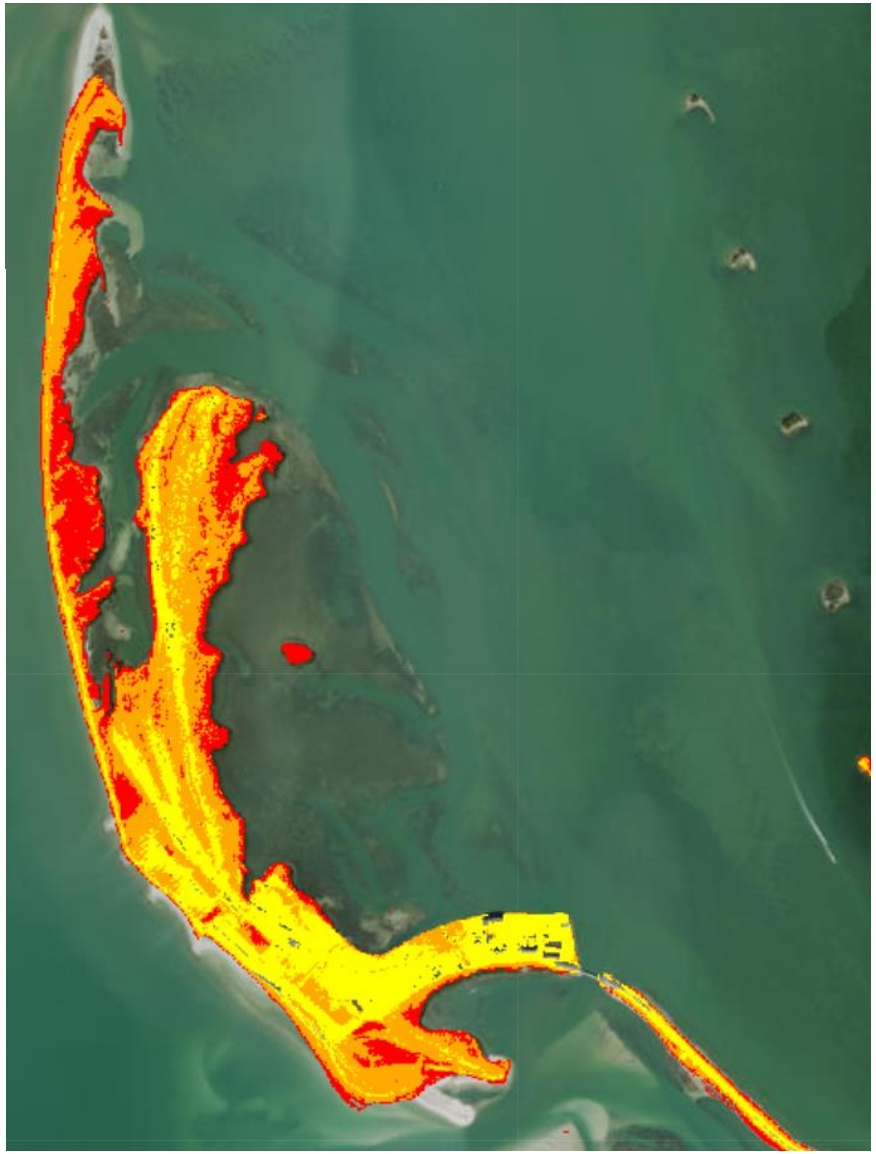


Local Challenges 2100

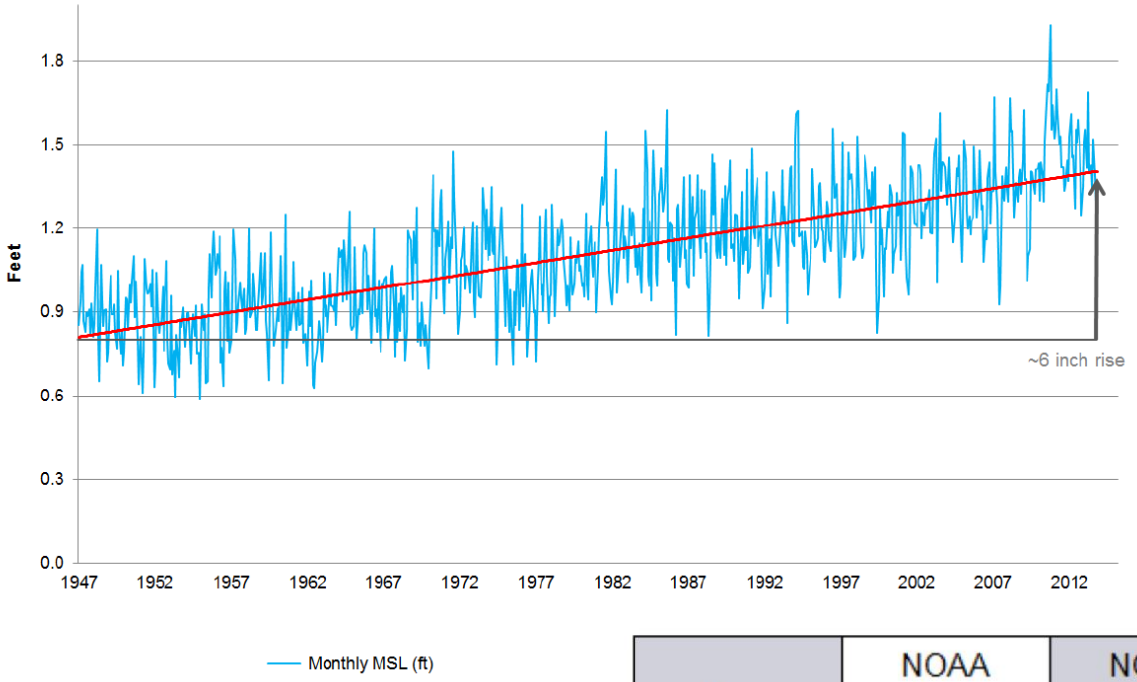
Sea Level Rise Projections

SLR Year 2100

- 0 - 2 (Int-Low, Year 2100)
- 2 - 4.3 (Int-High, Year 2100)
- 4.3 - 6.9 (High, Year 2100)



CSAP Regional Projections for Tampa Bay



Year	NOAA Low (Feet)	NOAA Int Low (Feet)	NOAA Int High (Feet)	NOAA High (Feet)
1992[13]	0.00	0.00	0.00	0.00
2025	0.28	0.38	0.60	0.84
2035	0.37	0.53	0.90	1.31
2050	0.50	0.80	1.46	2.22
2065	0.63	1.10	2.15	3.35
2075	0.71	1.33	2.68	4.23
2100	0.93	1.97	4.26	6.89

CSAP Guidance

- Use SLR scenarios to inform policy and planning
- In developing adaptation strategies consider
  - Multiple scenarios
  - Location
  - Lifespan of project
  - Project cost
  - Criticality of function
- Make decisions based on an acceptable level of risk
- Projections of SLR should be consistent with present and future National Climate Assessment estimates and methods (**update coming)
- Projections of SLR should be regionally corrected

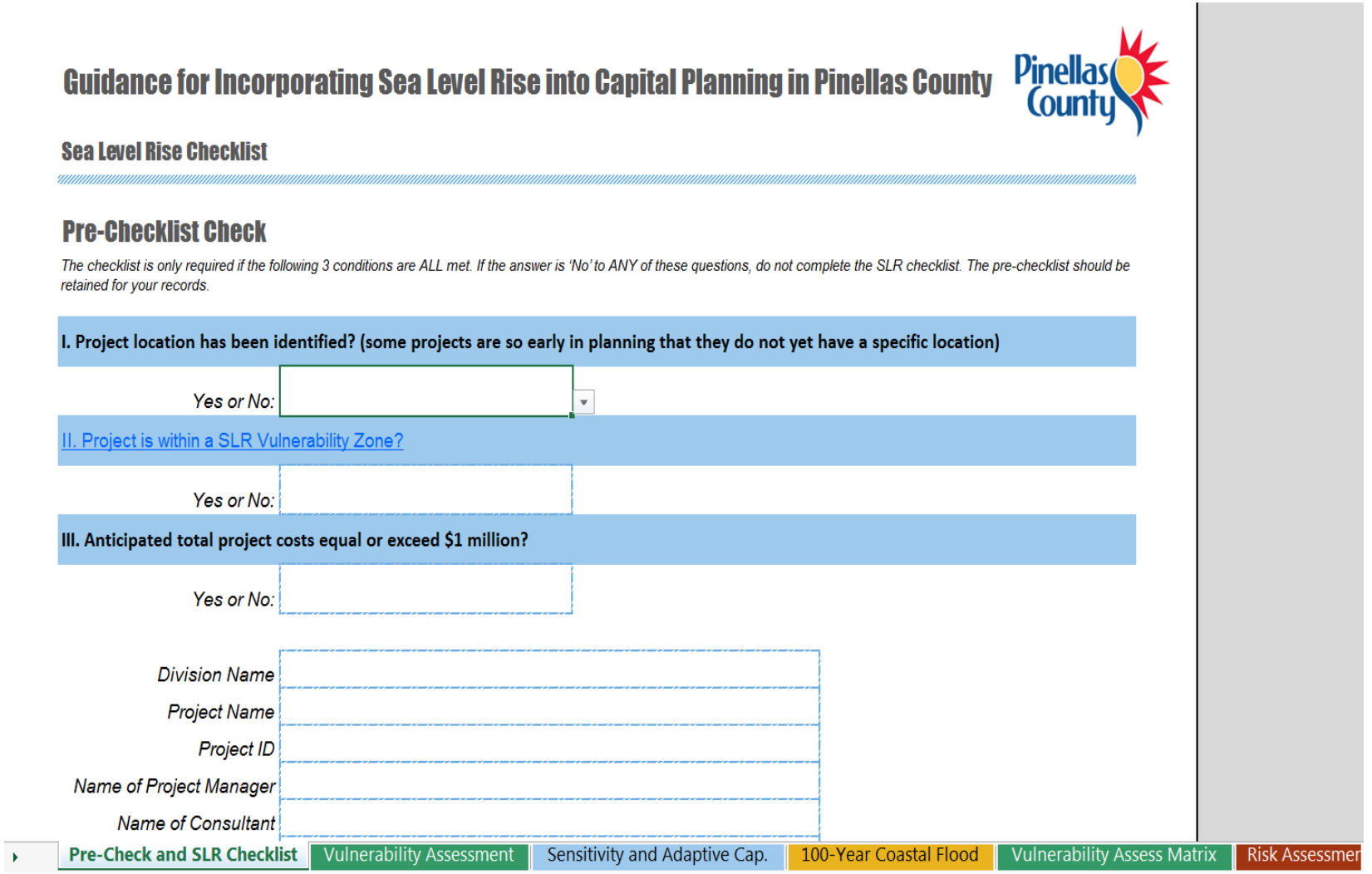
Taking the guidance and making it reality!

How to incorporate the CSAP SLR guidelines into our capital planning efforts?

Pinellas County Guidance for Incorporating Sea Level Rise into Capital Planning

- What information is needed to use the tool?
- What questions are asked?
- How is the outcome used?
- Accountability

Pinellas County Guidance for Incorporating Sea Level Rise into Capital Planning



Guidance for Incorporating Sea Level Rise into Capital Planning in Pinellas County

Sea Level Rise Checklist

Pre-Checklist Check

The checklist is only required if the following 3 conditions are ALL met. If the answer is 'No' to ANY of these questions, do not complete the SLR checklist. The pre-checklist should be retained for your records.

I. Project location has been identified? (some projects are so early in planning that they do not yet have a specific location)

Yes or No:

II. Project is within a SLR Vulnerability Zone?

Yes or No:

III. Anticipated total project costs equal or exceed $1 million?

Yes or No:

Division Name

Project Name

Project ID

Name of Project Manager

Name of Consultant

Pre-Check and SLR Checklist | Vulnerability Assessment | Sensitivity and Adaptive Cap. | 100-Year Coastal Flood | Vulnerability Assess Matrix | Risk Assessmer

Pinellas County Guidance for Incorporating Sea Level Rise into Capital Planning

- Pre-check
  - Location
  - SLR vulnerability zone
  - Project cost
- SLR Checklist
  - Project information
    - Asset type
    - Remaining or future functional lifespan
    - Planning horizon

Pinellas County Guidance for Incorporating Sea Level Rise into Capital Planning

- Vulnerability Assessment
  - Exposure
    - Site specific information
    - Lowest ground elevation (LGE) and MHHW
    - SLR at the end of the planning horizon
    - Examples Questions
      - Vulnerability to permanent inundation during functional lifespan during various scenarios?
      - Vulnerability to temporary flooding from 100-yr coastal flood?
      - Is the project seaward of the CCCL?

Pinellas County Guidance for Incorporating Sea Level Rise into Capital Planning

- Vulnerability Assessment
  - Sensitivity
    - Low – minimal impact
    - Medium – ability to maintain most functions
    - High – complete loss of function
  - Adaptive Capacity
    - High- tolerance to flooding impacts is good
    - Medium – response needed to restore function
    - Low – no ability to adapt

Pinellas County Guidance for Incorporating Sea Level Rise into Capital Planning

- Risk Assessment
  - Anticipated level of damage
    - Low – Asset is easily repaired/replaced
    - Medium – Complete replacement or costly repairs
    - High – Asset cannot be replaced at same location
  - Service Disruption
    - Low – No loss of service
    - Medium – Loss of service does not threaten public health and safety (non-critical)
    - High – Loss of service is high and a threat to public welfare

Pinellas County Guidance for Incorporating Sea Level Rise into Capital Planning

- Risk Assessment
  - Cost to replace/repair for public health and safety
    - Low – No or little cost to restore asset
    - Medium – Moderate costs
    - High – High costs to fully replace or high secondary costs
- Adaptation strategy & Project Team Review
- Department Certification

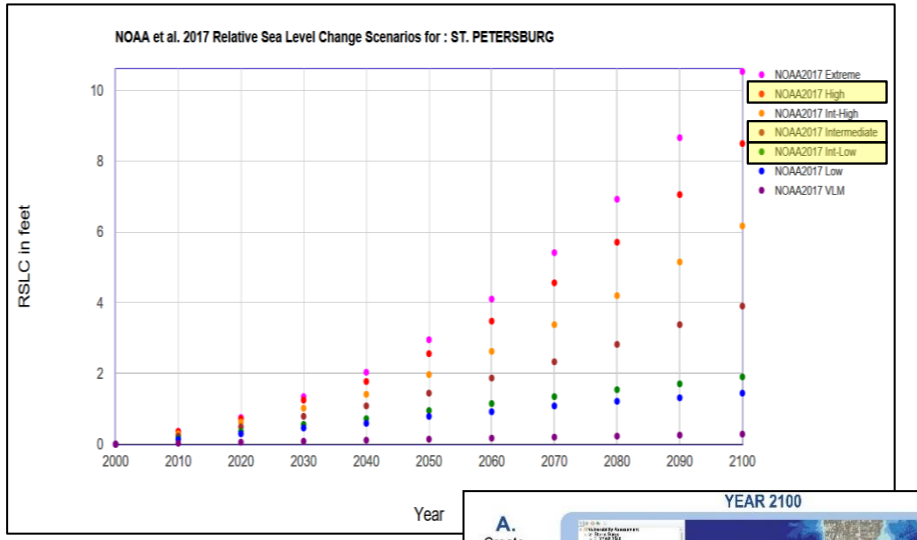
County-Wide Vulnerability Assessment of Critical Infrastructure

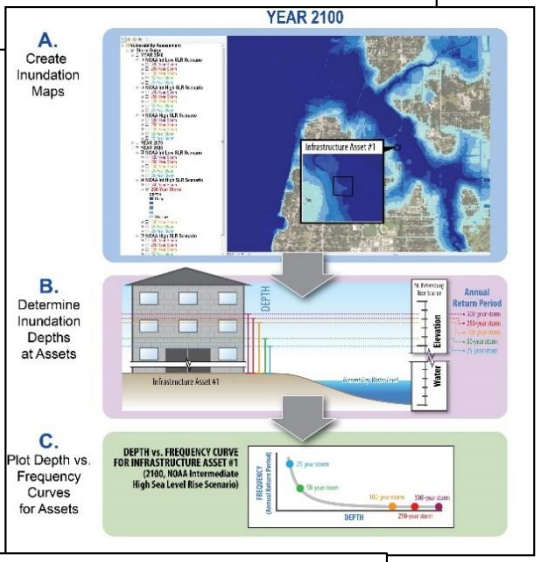
Phases of Work

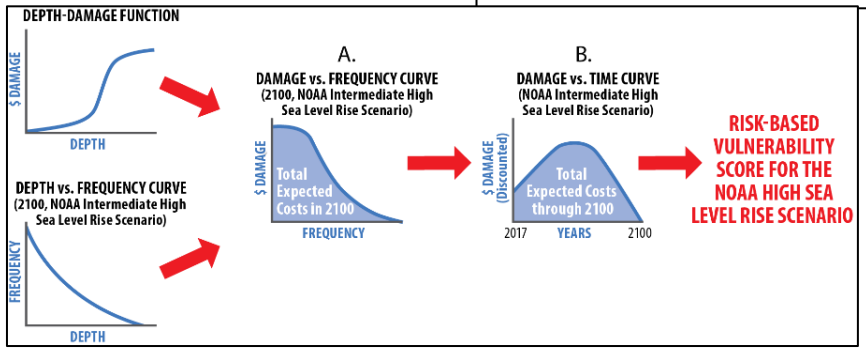
- Phase 1 – Project Management (ongoing)
- Phase 2 – Data Collection and Preparation (now)
- Phase 3 – Vulnerability Analysis (now)
- Phase 4 – Adaptation Assessments
- Phase 5 – Final Report

The Challenges

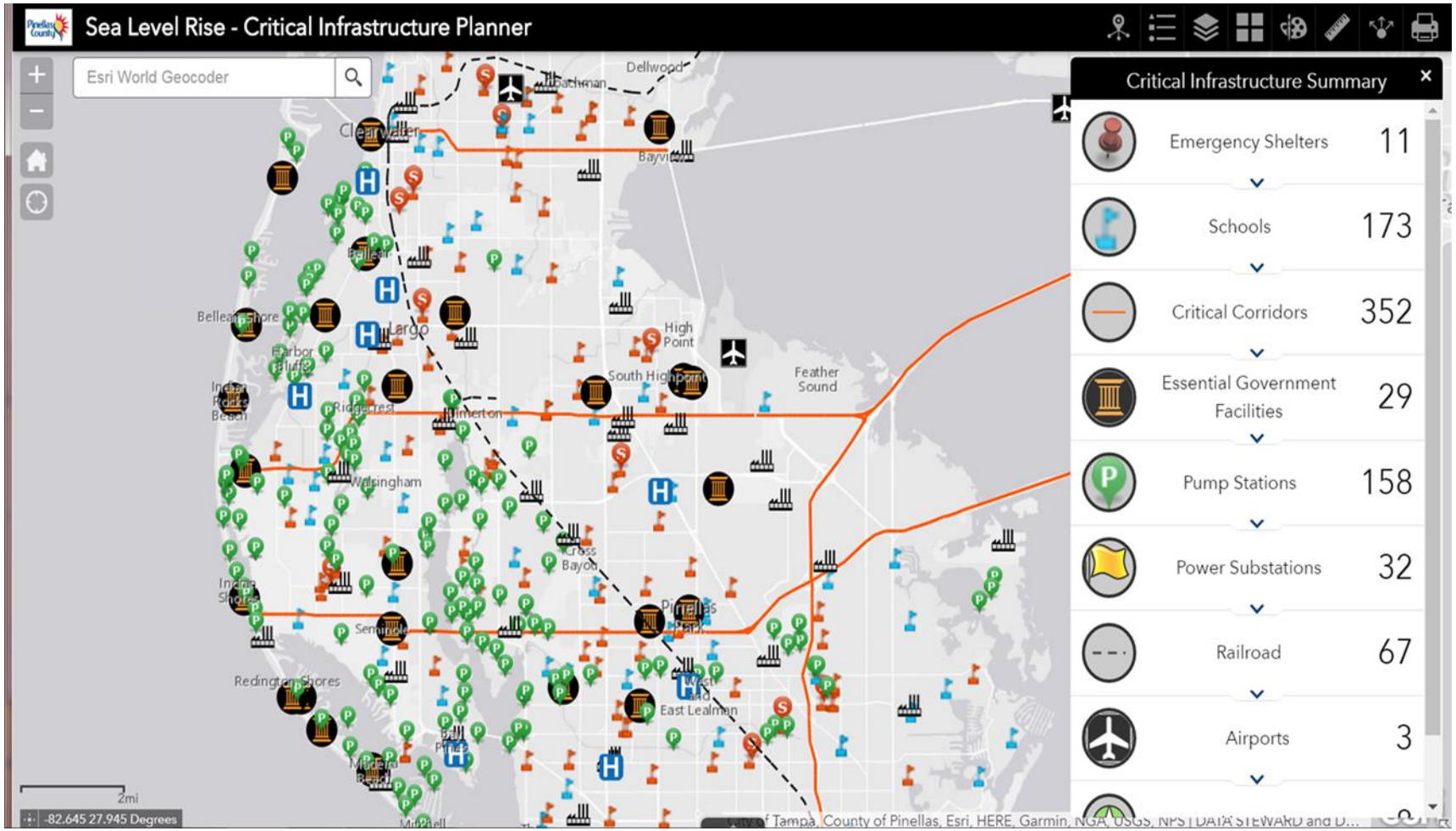
- Create data that guides decisions on risks
- Address recognized uncertainties in future projections
- Establish a data-driven framework for future decision making
- Create the mechanisms for conducting risk assessments for existing or future assets





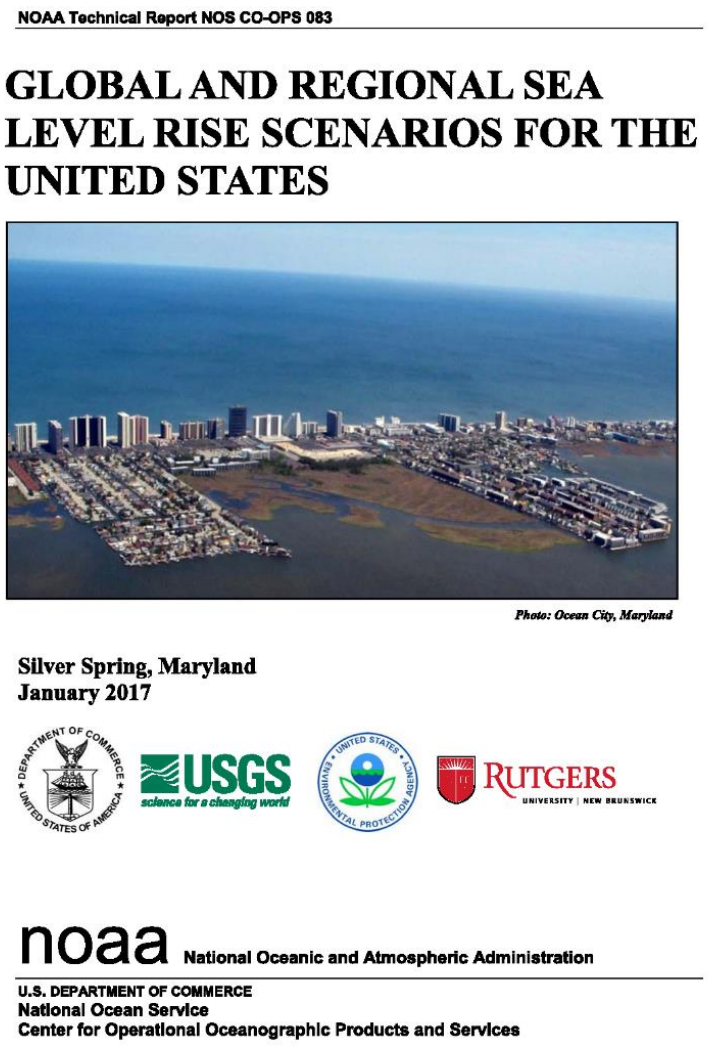


- Acquire/Format/Create Asset Data
  - Six asset categories
    - Transportation
    - Water supply
    - Wastewater
    - Stormwater
    - Natural gas
    - Electricity
  - Determine sub-set of critical assets for study
  - Assign elevation data to each asset



Data Collection & Preparation

- Hazard Data
- Two hazards
  - Tidal (non-storm) flooding
  - Storm surge
- Four time periods
  - Current (storm surge only)
  - 2040
  - 2070
  - 2100
- Three future SLR scenarios
  - NOAA 2017 Intermediate-Low Scenario
  - NOAA 2017 Intermediate Scenario
  - NOAA 2017 High Scenario



NOAA Technical Report NOS CO-OPS 083

GLOBAL AND REGIONAL SEA LEVEL RISE SCENARIOS FOR THE UNITED STATES

Photo: Ocean City, Maryland

Silver Spring, Maryland
January 2017

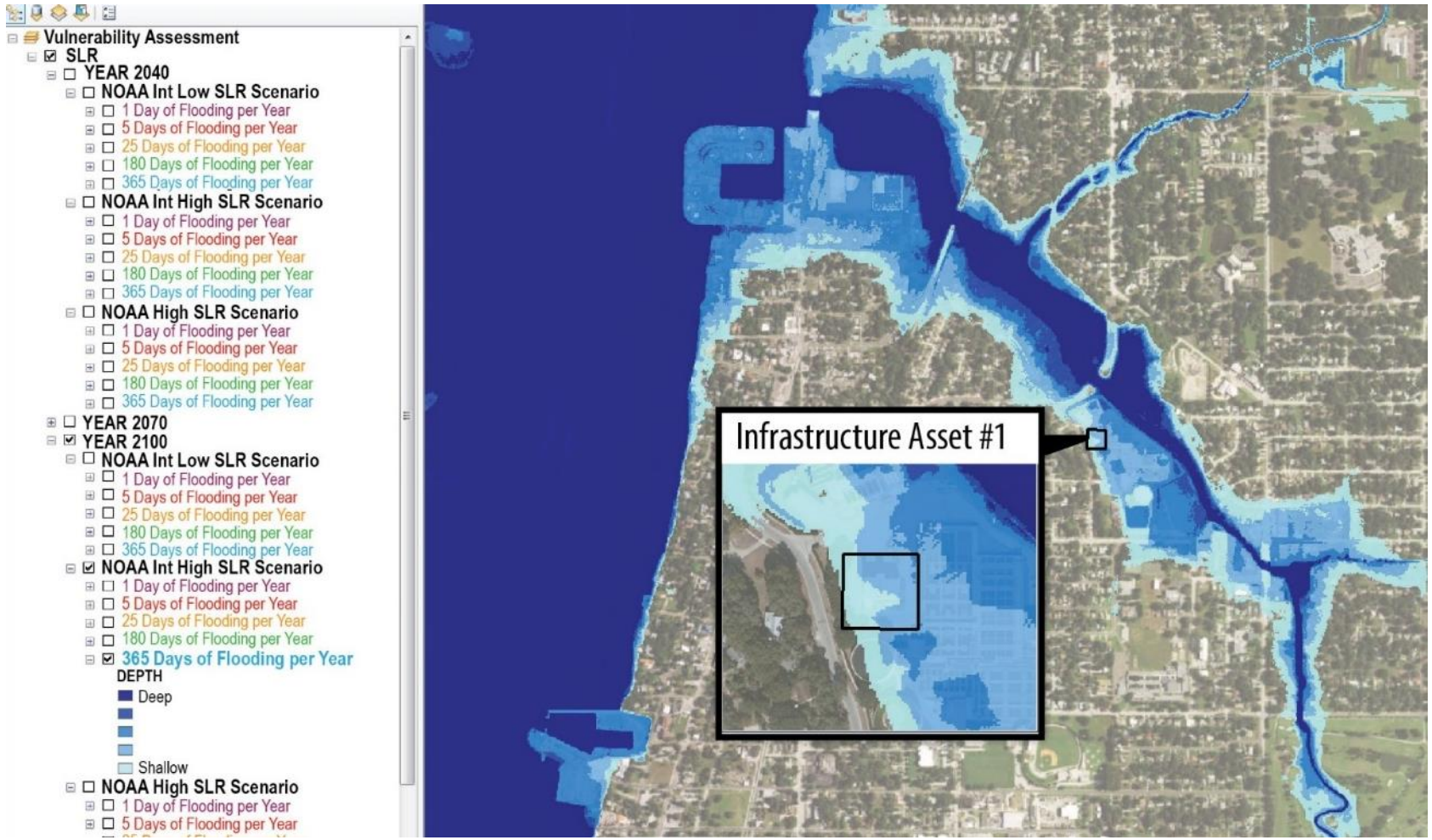
noaa National Oceanic and Atmospheric Administration

U.S. DEPARTMENT OF COMMERCE
National Ocean Service
Center for Operational Oceanographic Products and Services

Enter Project Name
Scenarios for ST. PETERSBURG
NOAA2017 VLM: 0.00285 feet/yr
All values are expressed in feet

Year	NOAA2017 VLM	NOAA2017 Low	NOAA2017 Int-Low	NOAA2017 Intermediate	NOAA2017 Int-High	NOAA2017 High	NOAA2017 Extreme
2000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.03	0.13	0.16	0.23	0.30	0.36	0.36
2020	0.06	0.30	0.36	0.49	0.62	0.72	0.75
2030	0.09	0.46	0.56	0.79	1.02	1.25	1.35
2040	0.11	0.59	0.72	1.08	1.41	1.77	2.03
2050	0.14	0.79	0.95	1.44	1.97	2.56	2.95
2060	0.17	0.92	1.15	1.87	2.62	3.48	4.10
2070	0.20	1.08	1.35	2.33	3.38	4.56	5.41
2080	0.23	1.21	1.54	2.82	4.20	5.71	6.92
2090	0.26	1.31	1.71	3.38	5.15	7.05	8.66
2100	0.29	1.44	1.90	3.90	6.17	8.50	10.53

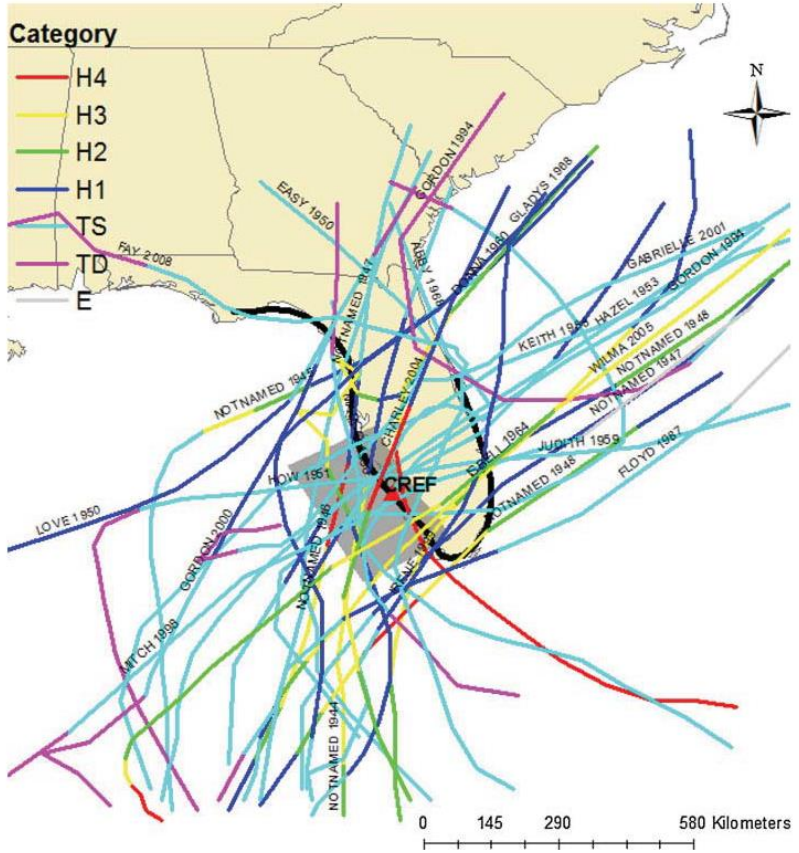
- Tidal Flooding Data (Sea Level Rise)
- Map areas subject to tidal flooding
  - Express in terms of frequency (days of flooding / year)
  - Five frequency increments
  - Connected vs. disconnected areas
- Deliverables
  - 45 GIS layers of tidal flooding depth (5 frequencies x 3 years x 3 SLR scenarios)
  - 45 GIS layers of tidal flooding elevation (if significant tidal datum variation)



Data Collection & Preparation

Storm Surge Data

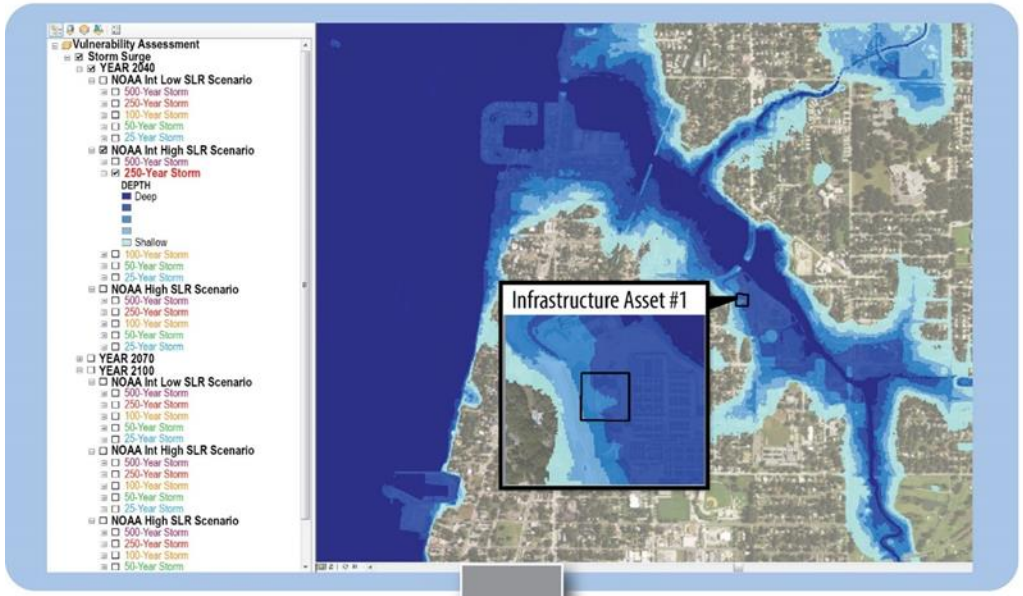
- Storm surge model
  - U of FL CH3D hydrodynamic model
  - Future climate change-enhanced storms
- Map areas subject to storm surge inundation
  - Express by frequency (return period)
  - Five frequency increments (25-, 50-, 100-, 250-, & 500-yr storms)
- Deliverables
  - 50 GIS layers of storm surge flooding depth [5 return periods x 3 future years x 3 SLR scenarios] + 5 return period maps for current conditions)
  - 50 GIS layers of storm surge flooding elevation
  - Model grid files with topo & bathymetry



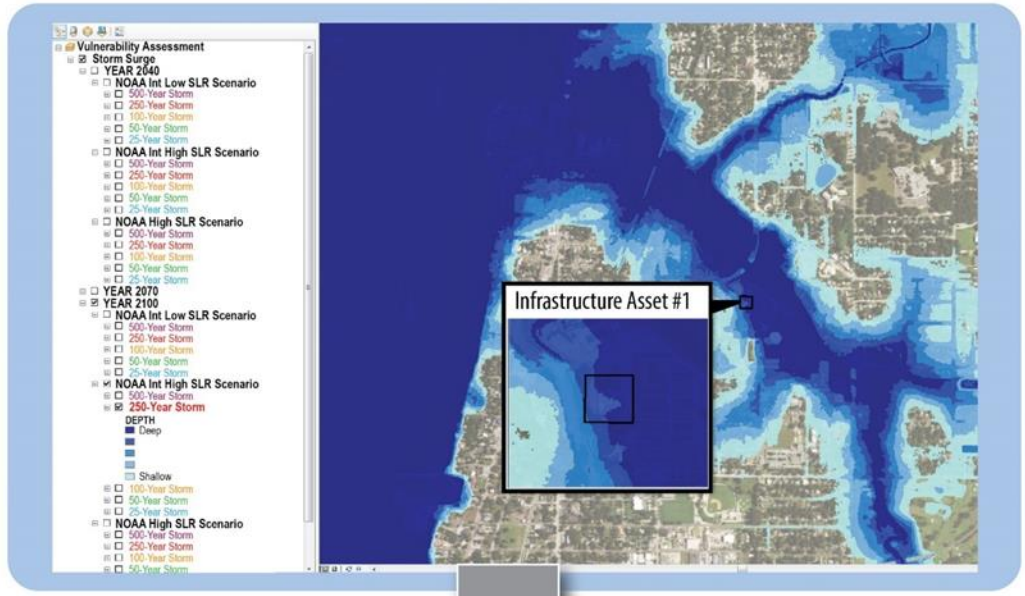
Phase 3 Vulnerability Analysis

- Goals of vulnerability analysis
  - Identify assets exposed to climate hazards
  - Determine consequence costs of impacts
  - Prioritize assets for detailed facility-level adaptation assessments (Phase 4)
- Conduct Asset Exposure Analysis
  - Overlay assets with the flood maps using GIS
    - Depth of flooding
    - Timing of flooding

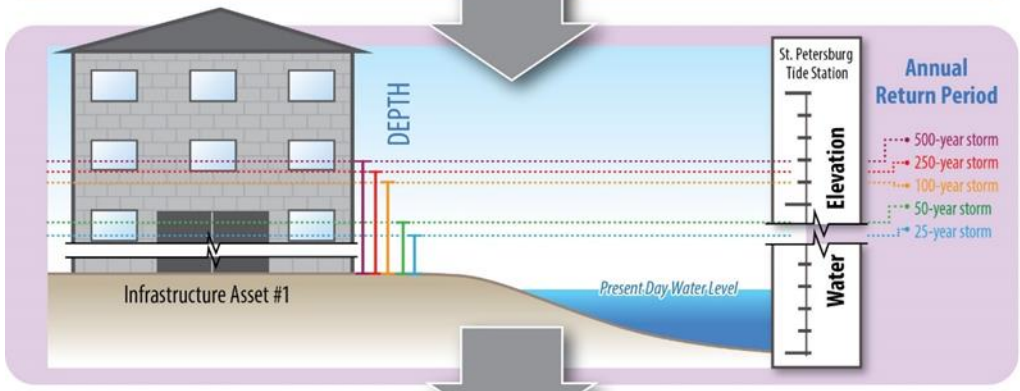
YEAR 2040



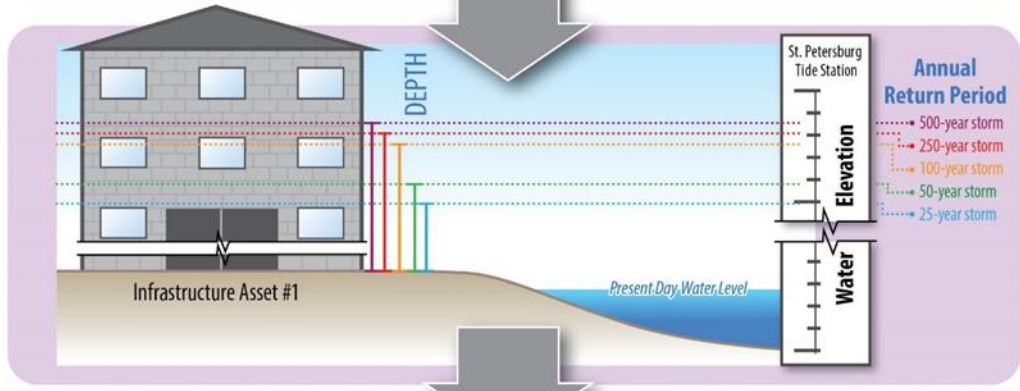
YEAR 2100



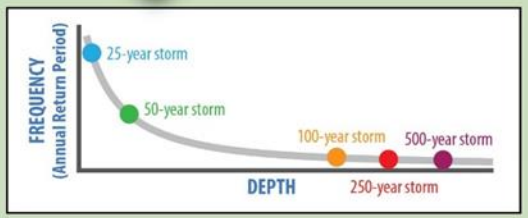
A. Create Inundation Maps



B. Determine Inundation Depths at Assets

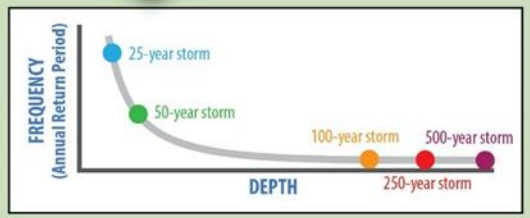


DEPTH vs. FREQUENCY CURVE FOR INFRASTRUCTURE ASSET #1
(2040, NOAA Intermediate High Sea Level Rise Scenario)



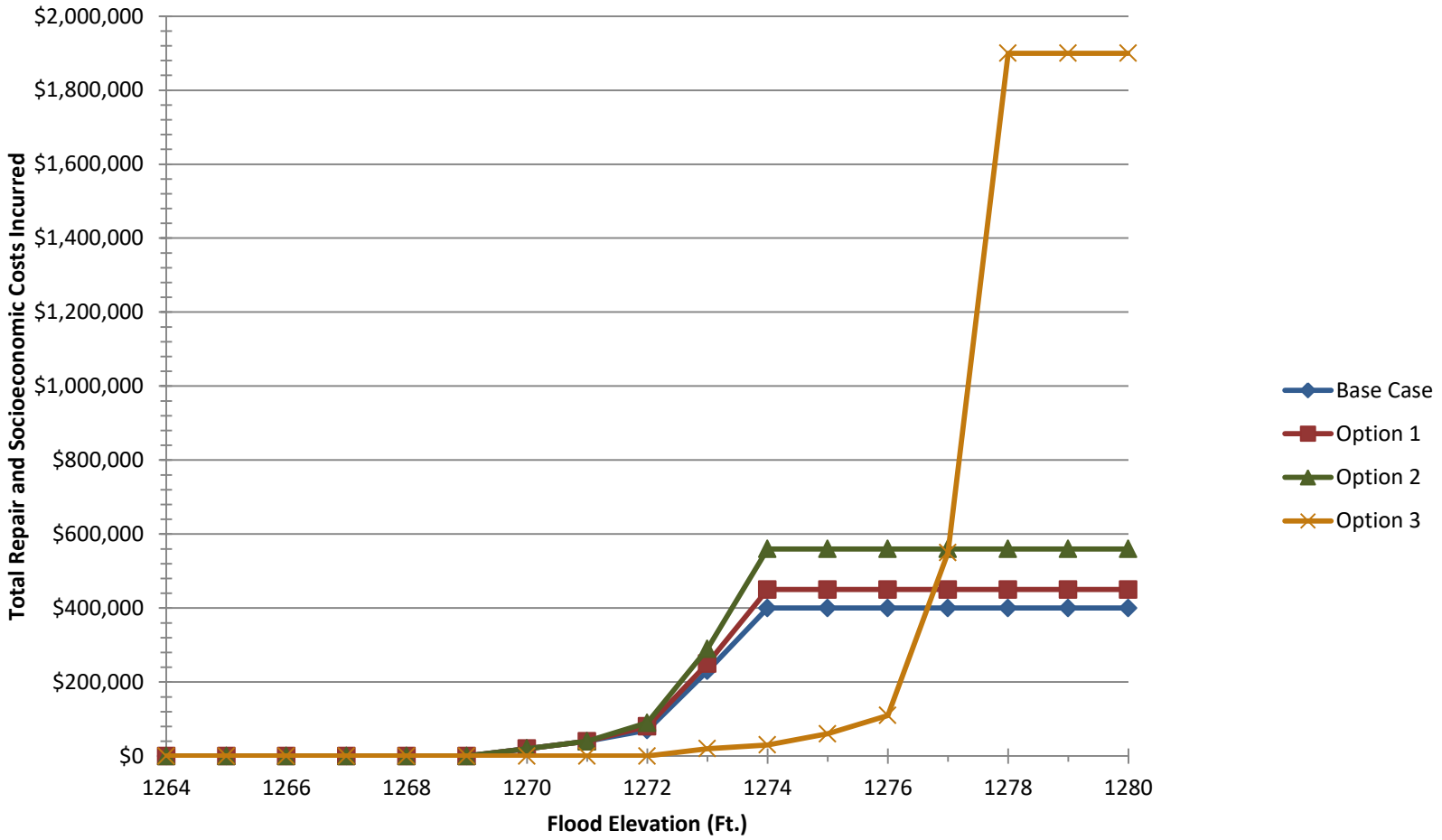
C. Plot Depth vs. Frequency Curves for Assets

DEPTH vs. FREQUENCY CURVE FOR INFRASTRUCTURE ASSET #1
(2100, NOAA Intermediate High Sea Level Rise Scenario)

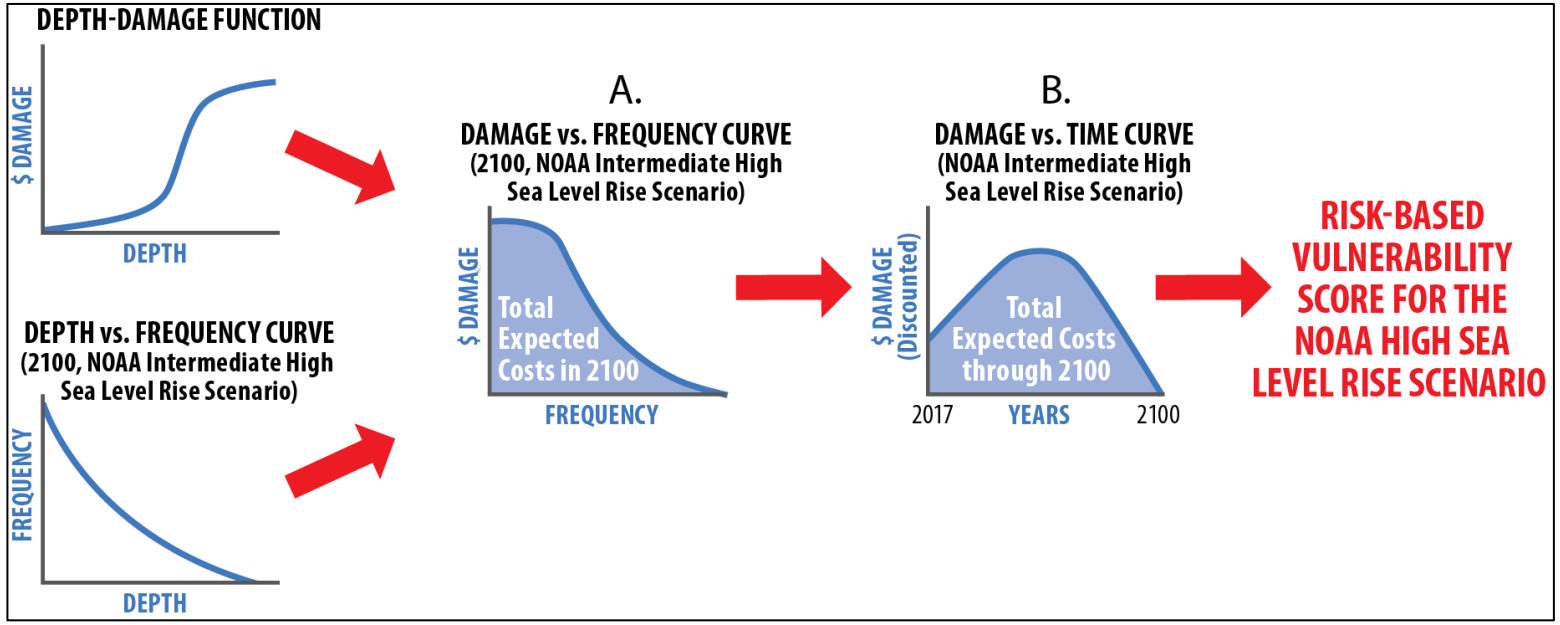


Note: Flooding extents and depths exaggerated for illustrative purposes

- Develop Asset Depth-Damage Functions
  - Select subset (30-40) of the most critical exposed assets to carry forward in the analysis
    - Number TBD based on the types of assets exposed
  - Create depth-damage function for each selected asset
    - Functions relate depth of flooding to its costs
    - Engineering analyses
    - Economic analyses

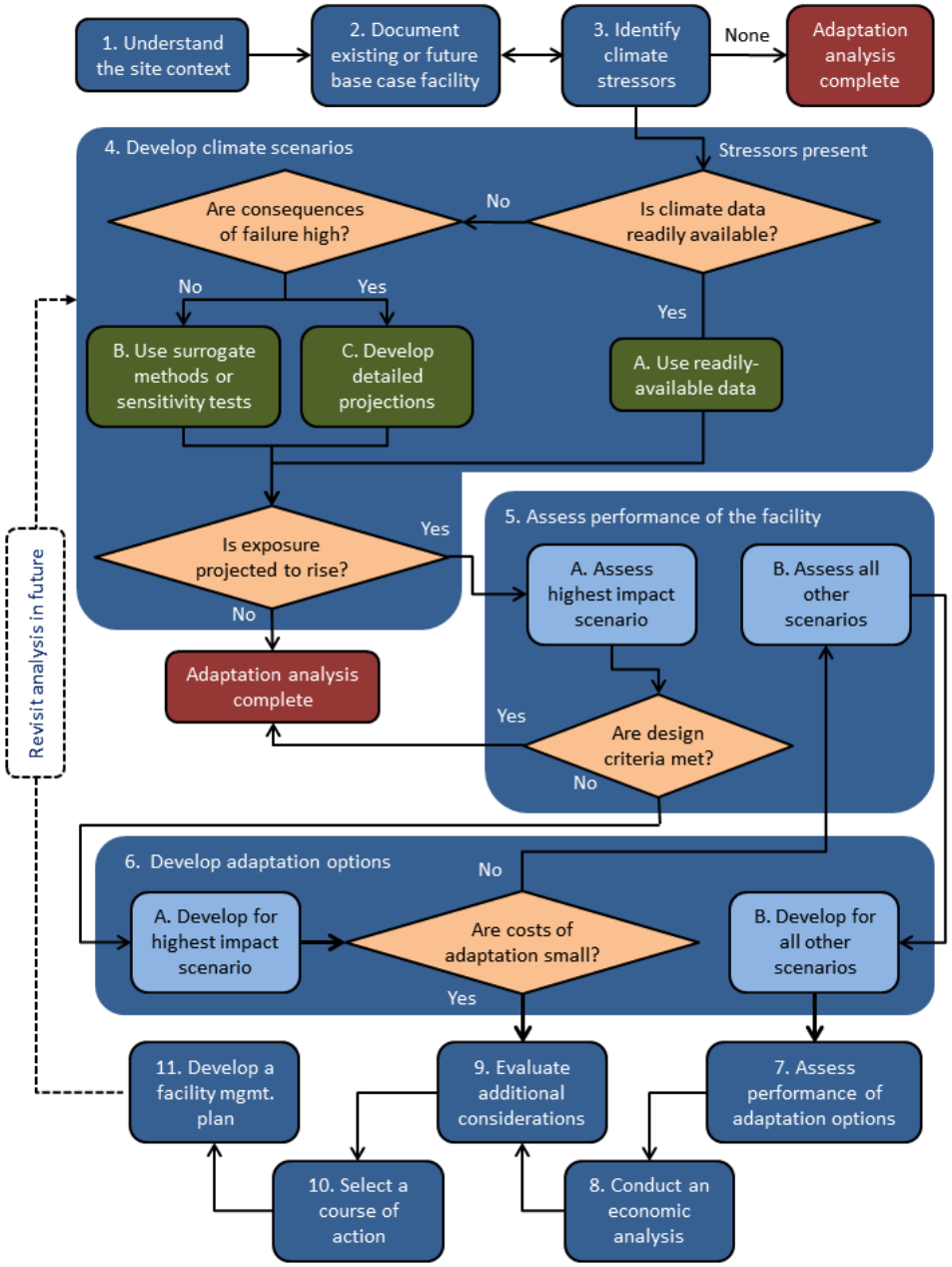


- Undertake Vulnerability Scoring and Asset Ranking
  - Calculate expected damage costs for selected exposed assets
    - Inclusive of both tidal flooding and storm surge costs
    - Consider changing frequency of events due to climate change
  - Rank assets by expected damage costs
    - Use to help prioritize detailed facility-level analyses



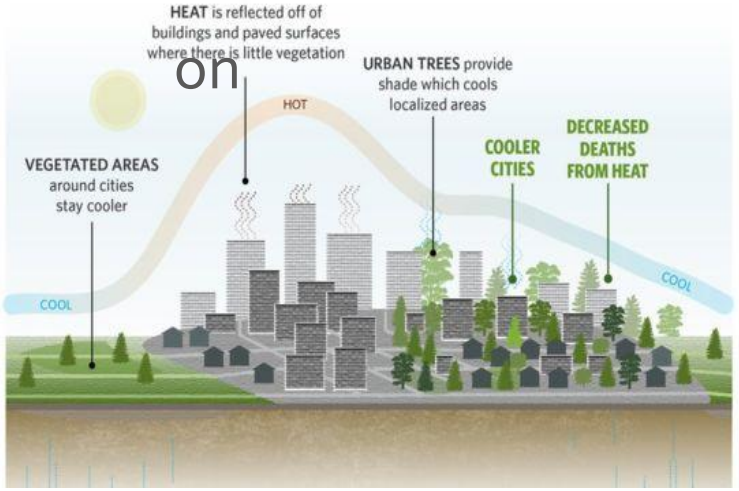
Phase 4 Adaptation Assessments

- Facility-Level Adaptation Assessments
  - Select five highly vulnerable assets for detailed study
  - Utilize FHWA's Adaptation Decision-making Assessment Process (ADAP)
    - Document the asset's exposure in detail (engineering-level)
    - Formulate adaptation options (up to three per asset)
    - Determine the most cost-effective adaptation option



Next Steps and Other Efforts

- Regional Efforts and Partnerships
  - Climate Science Advisory Panel (CSAP)
    - One Bay (TBRPC)
  - Initiative on Coastal Adaptation and Resilience (ICAR) (University of South Florida)
  - St. Petersburg College Sea Level Rise Collaborative
  - Climate Ready Estuaries (TBEP)
  - Wastewater-Stormwater Task Force
- 2018 - future
  - Consider changes based on 2017 SLR information
  - Heat island impacts
  - Rain intensity and frequency



Questions

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