




BUREAU OF RESEARCH



New Jersey Department of Transportation

22nd Annual NJDOT Research Showcase

Preparing Today for a Resilient Tomorrow

COMING SOON:

NJDOT Flood Risk Visualization Tool

22nd Annual NJDOT Research Showcase
October 29, 2020 | 9:45 to 10:30 AM

Presentation Outline

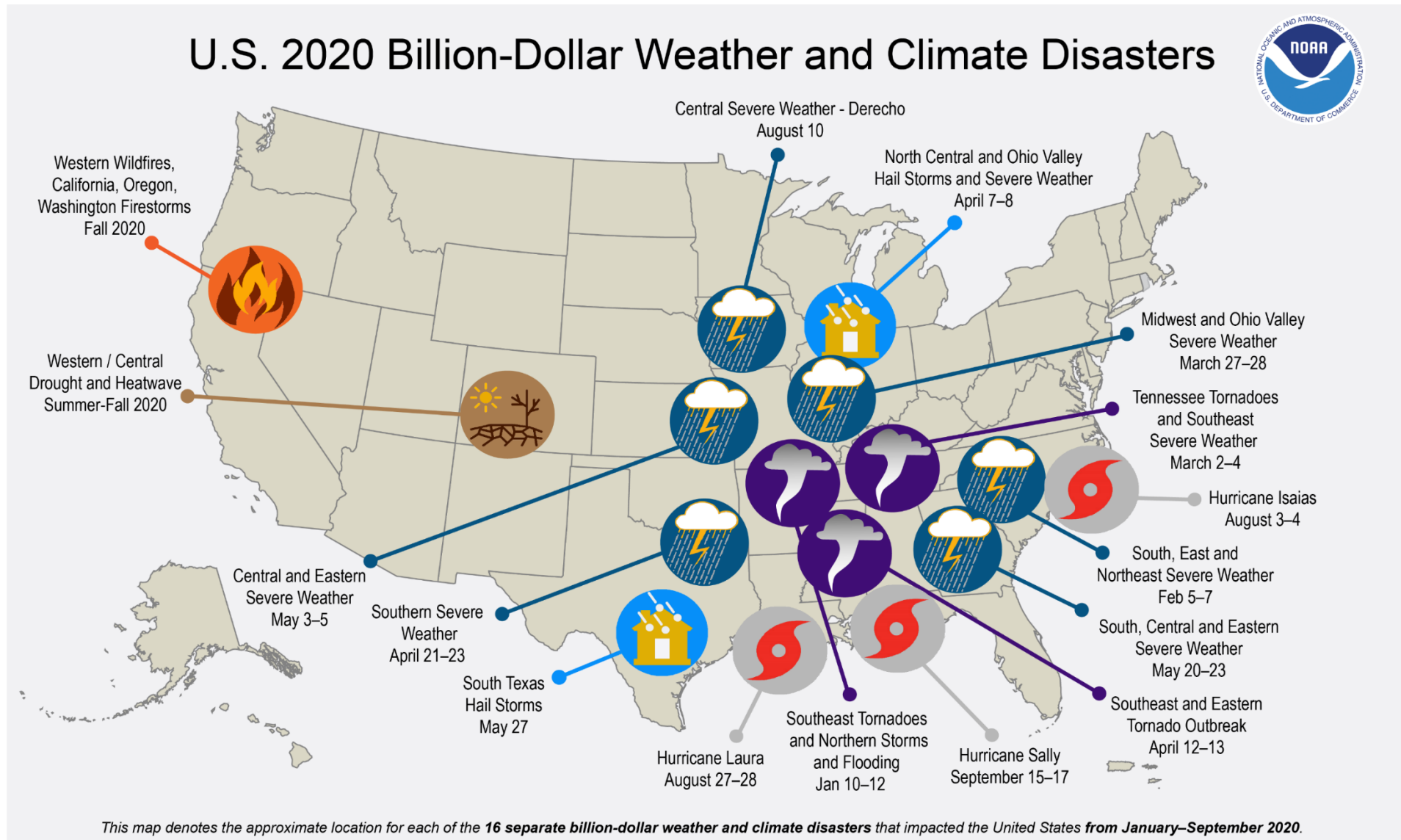
- Background & Context
 - Why resilience is important
 - NJDOT Resilience Efforts
- Project Overview
 - Purpose and phasing
- Results and outcomes to date
 - Version 1.0 prototype
 - Internal workflows findings
 - Recommendations for incorporating resilience in problem screening
 - Proposed Technical Advisory Panel
- Next steps



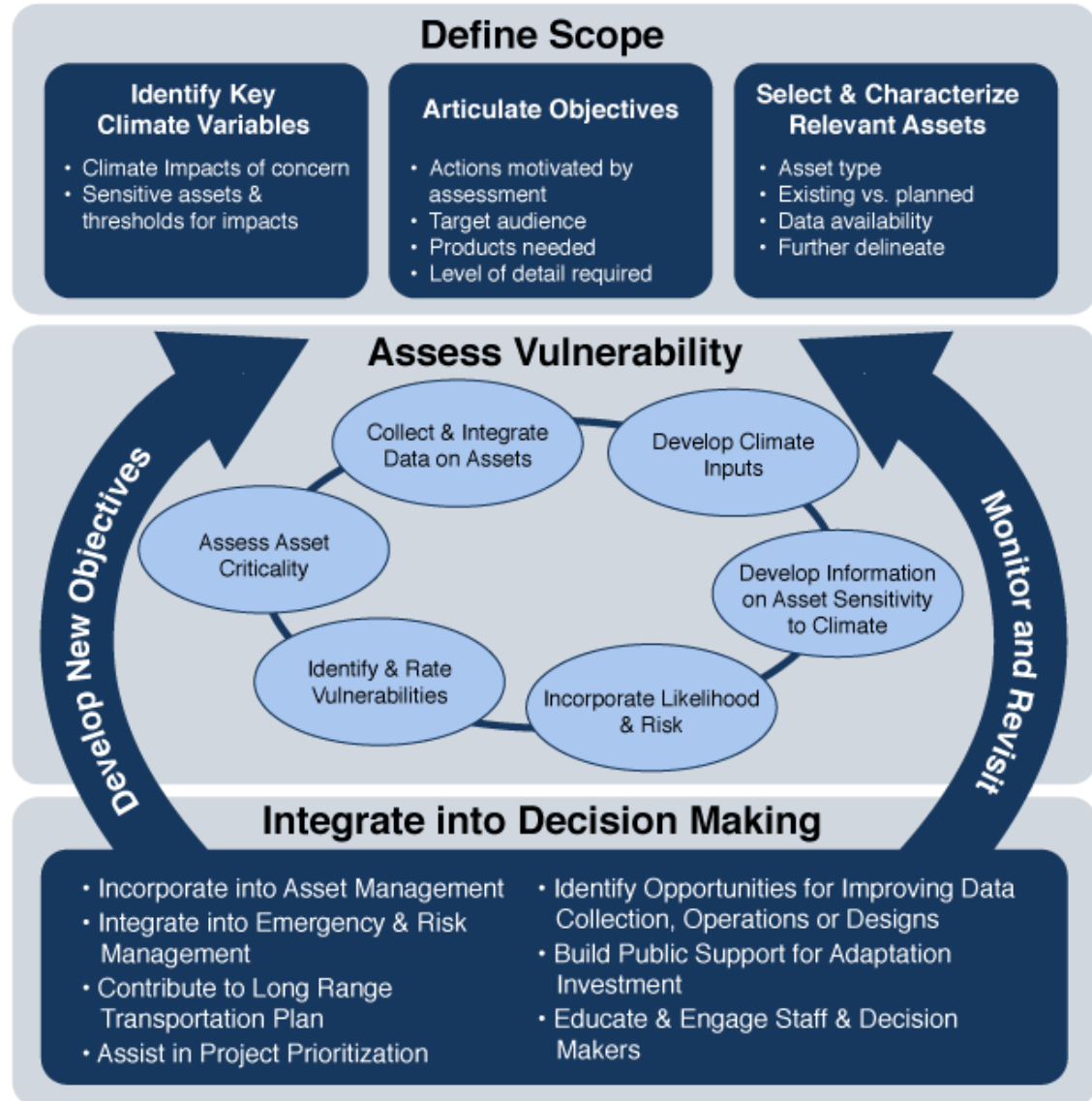
NJDOT Flood Risk Visualization Tool

BACKGROUND

Why Resilience is Important



National Emphasis on Resilience



Vulnerability Assessment and Adaptation Framework

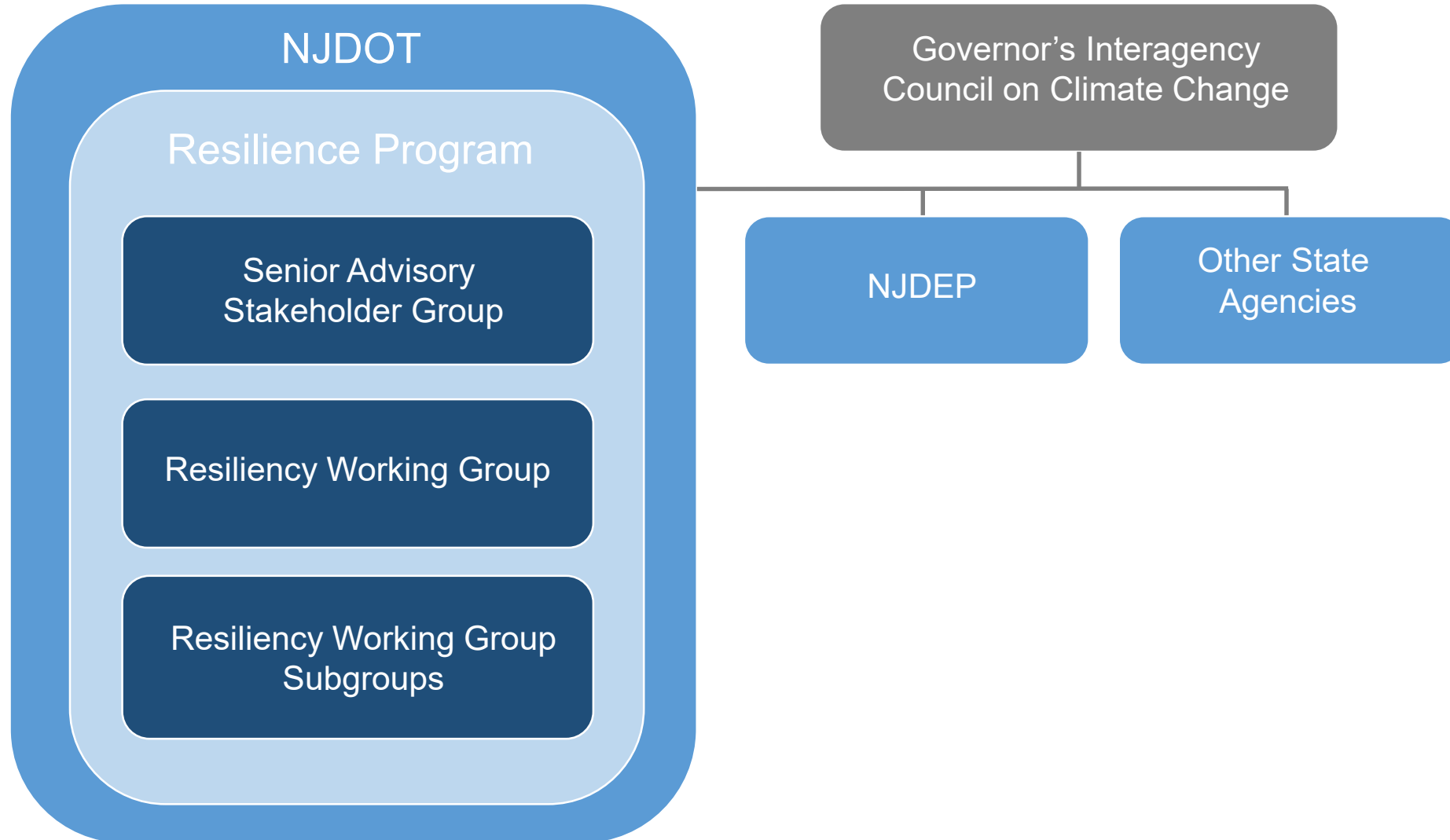
THIRD EDITION

FEDERAL HIGHWAY ADMINISTRATION
OFFICE OF PLANNING, ENVIRONMENT, & REALTY

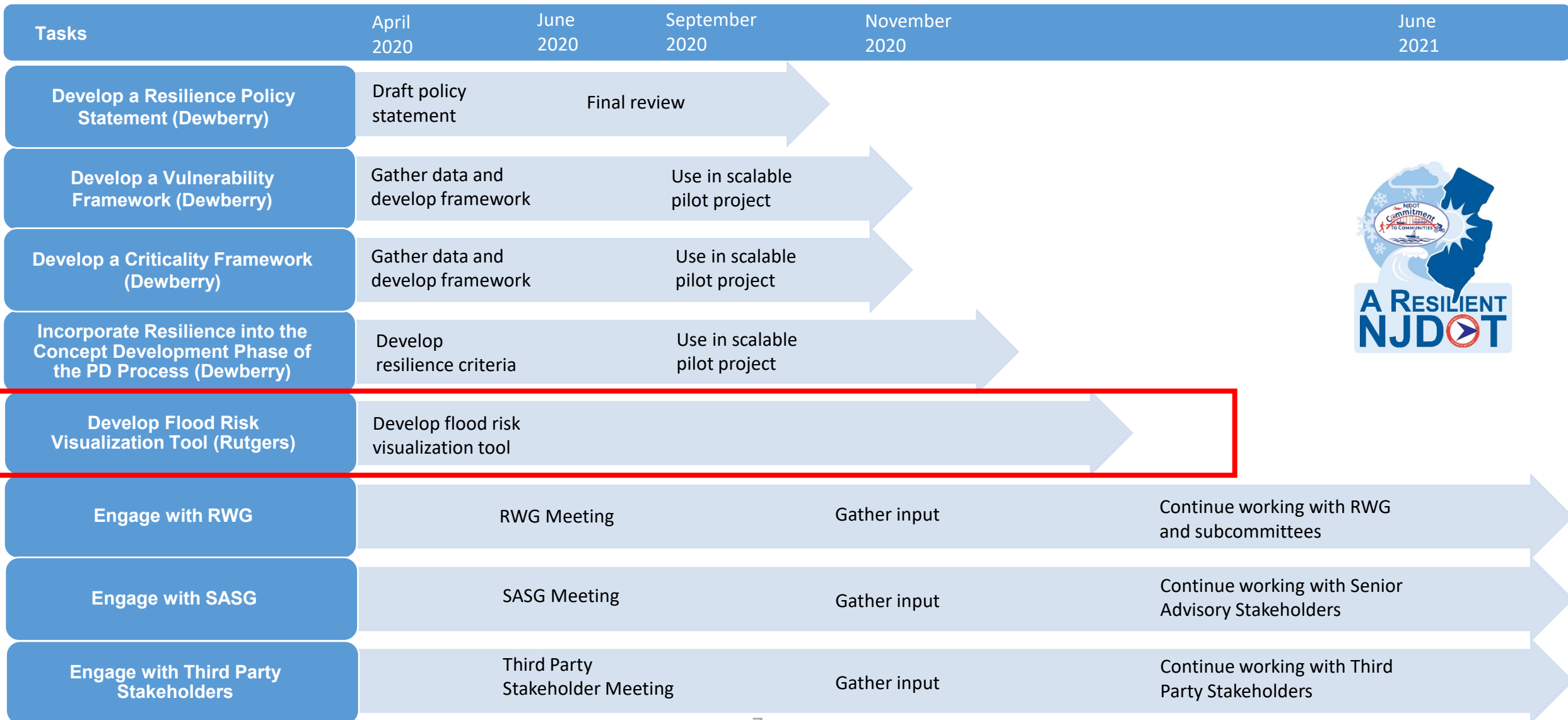


U.S. Department of Transportation
Federal Highway Administration

NJDOT Resilience Program Organization



Timeline of On-going Efforts



NJDOT Flood Risk Visualization Tool

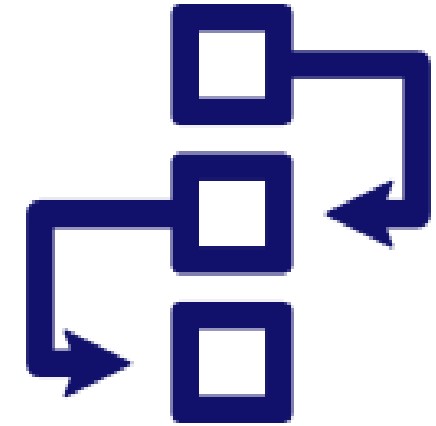
PROJECT OVERVIEW

Project Purpose

- Create an GIS-based visualization tool
 - Map potential exposure to weather and climate hazards based on latest science
 - Inland and coastal flooding from rain events, storm surge and sea level rise
 - Heavy precipitation
 - Extreme temperature
 - “Zoom to” location widget to find specific infrastructure/assets
- Make recommendations for how NJDOT can incorporate the data and mapping from the tool in transportation planning, project development, operations and maintenance decisions

Phase 1 – Tool Development

- Understand work flows and data needs
 - Manager-level input
- Design user interface and functionality
 - End-user input
- Provide near-term capacity to “flag” projects potentially impacted by flood inundation
 - Coastal - NJFloodMapper data
 - Inland - FEMA Flood Hazard maps
- Version 1.0 tool available by December 2020



Phase 2 – Enhanced Inland Flood Mapping Capability

- New Layer 1: Specific Storm-Event Flooding Scenarios
 - Resilient NJ flood modeling applied statewide (HEC-RAS Two-Dimensional Rain on Grid)

Flooding Condition	Type
Current	1. MHHW + 2% annual chance, 2-hour storm event
	2. MHHW + 1% annual chance, 24-hour storm event
Future	3. MHHW + SLR 2070 (2.4 ft.)
	4. MHHW + SLR 2070 (2.4 ft.) + (2% annual chance, 2-hour storm event + 10% increase in rainfall)
	5. MHHW + SLR 2070 (2.4 ft.) + (1% annual chance, 24-hour storm event + 10% increase in rainfall)
	6. MHHW + SLR 2070 (2.4 ft.) + Superstorm Sandy in 2070 (High Water Mark = 8.3 ft.)

- New Layer 2: Flexible Screening-level Mapping Protocol
 - Informed by “Technical Advisory Panel” input
 - Visualization of future flood inundation (coastal, riverine and combined riverine/storm surge in tidal river basins) based on user selected parameters
- Version 2.0 tool available by June 2021

NJDOT Flood Risk Visualization Tool

RESULTS & OUTCOMES TO DATE

Version 1.0 Prototype

- Boundaries
 - County
 - Municipality
- NJDOT Tool Panel
 - Roadway network (SLD database)
 - Zoom to mile marker selection
 - Bridge location (Work in progress)
- Flood Hazards
 - Coastal - total water level, SLR, Sandy surge extent, SLOSH Cat 1-4
 - Inland - FEMA Flood Zones
- Climate Hazards (precipitation, temperature)

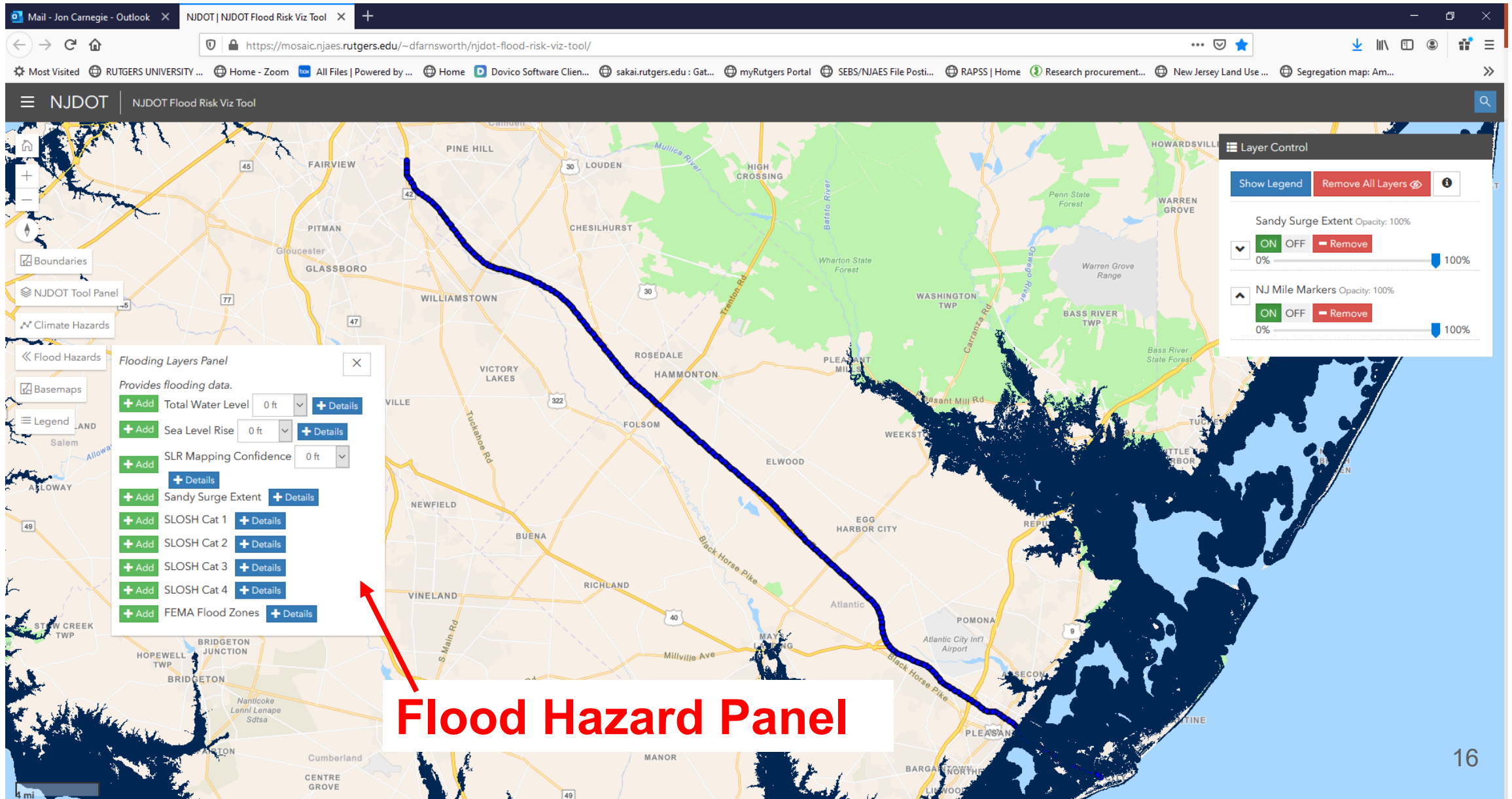


Version 1.0 Prototype

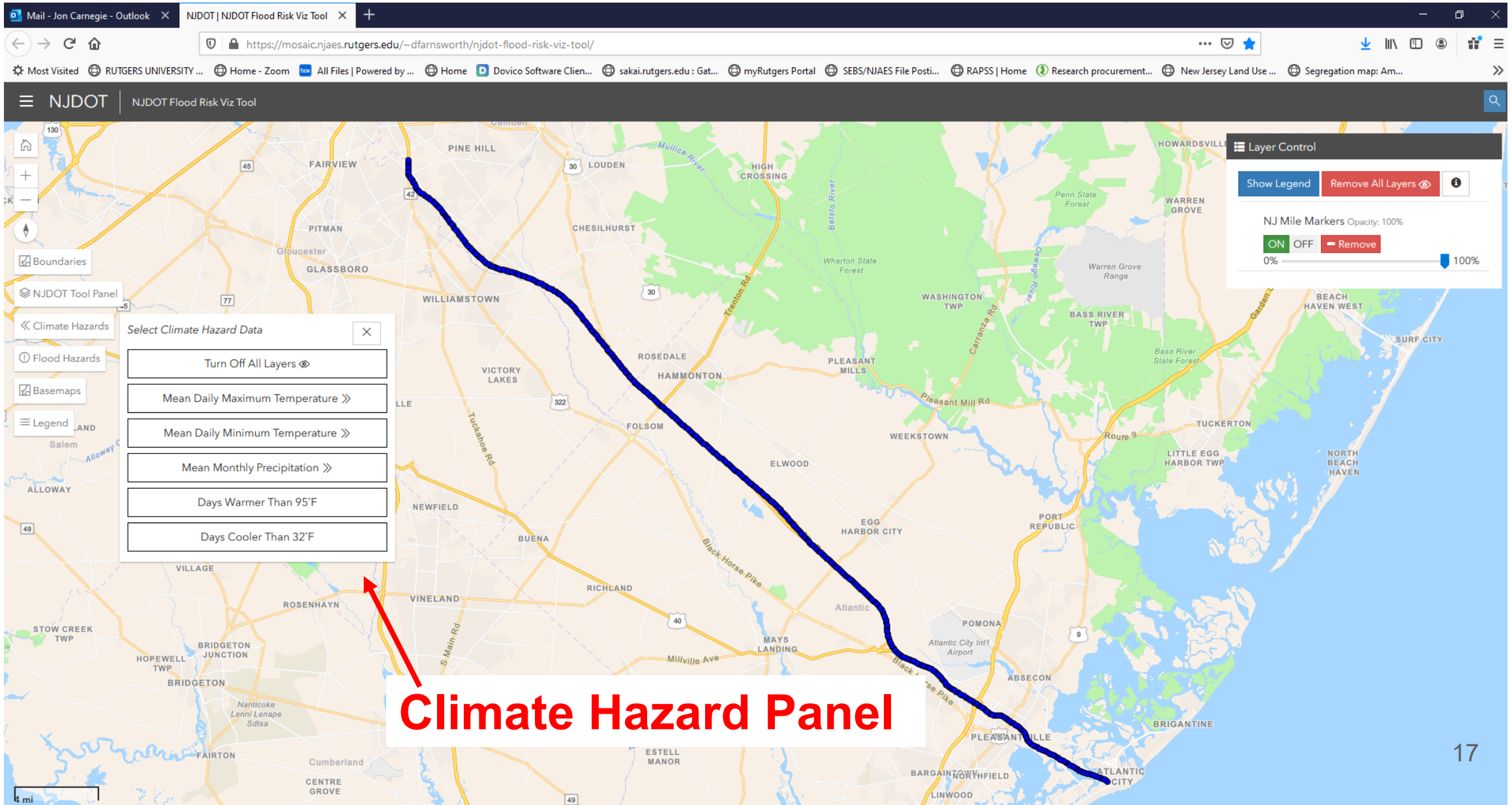
The screenshot displays the NJDOT Flood Risk Viz Tool web application. The interface includes a map of New Jersey with a blue line representing a selected road network. Three red arrows point to specific UI elements:

- Main Tools Panel:** Points to a sidebar on the left containing navigation links: Boundaries, NJDOT Tool Panel, Climate Hazards, Flood Hazards, Basemaps, and Legend.
- NJDOT Tool Panel:** Points to a central panel titled "NJDOT Flood Risk Viz Tools" which includes:
 - A "Road Networks" section with an "Add" button and a dropdown menu set to "Interstate Highways".
 - A "US Roads by Type" section with an "Add" button and a "Details" button.
 - An "NJ Mile Markers" section with a dropdown menu set to "ATLANTIC CITY EXPRESSWAY".
 - Fields for "Select Mile Marker 1:" and "(Optional) Select Mile Marker 2:", both with dropdown menus.
 - "Zoom to Selection" and "Reset" buttons at the bottom.
- Legend Controls:** Points to a "Layer Control" panel on the right side of the map, which includes:
 - Buttons for "Show Legend" and "Remove All Layers".
 - Controls for "NJ Mile Markers Opacity: 100%", with "ON", "OFF", and "Remove" options.
 - Controls for "Interstate Highways Opacity: 100%", with "ON", "OFF", and "Remove" options.

Version 1.0 Prototype



Version 1.0 Prototype



Internal Workflows Meeting (Aug 7)

- 24 participants from various parts of the department
- Key questions:
 - Where in the project development process should flood risk be considered and how?
 - What asset/infrastructure should be incorporated in the tool in addition to roads and bridges (e.g., signals, ITS, other)?
 - What data and information about flood risk would be beneficial to have?



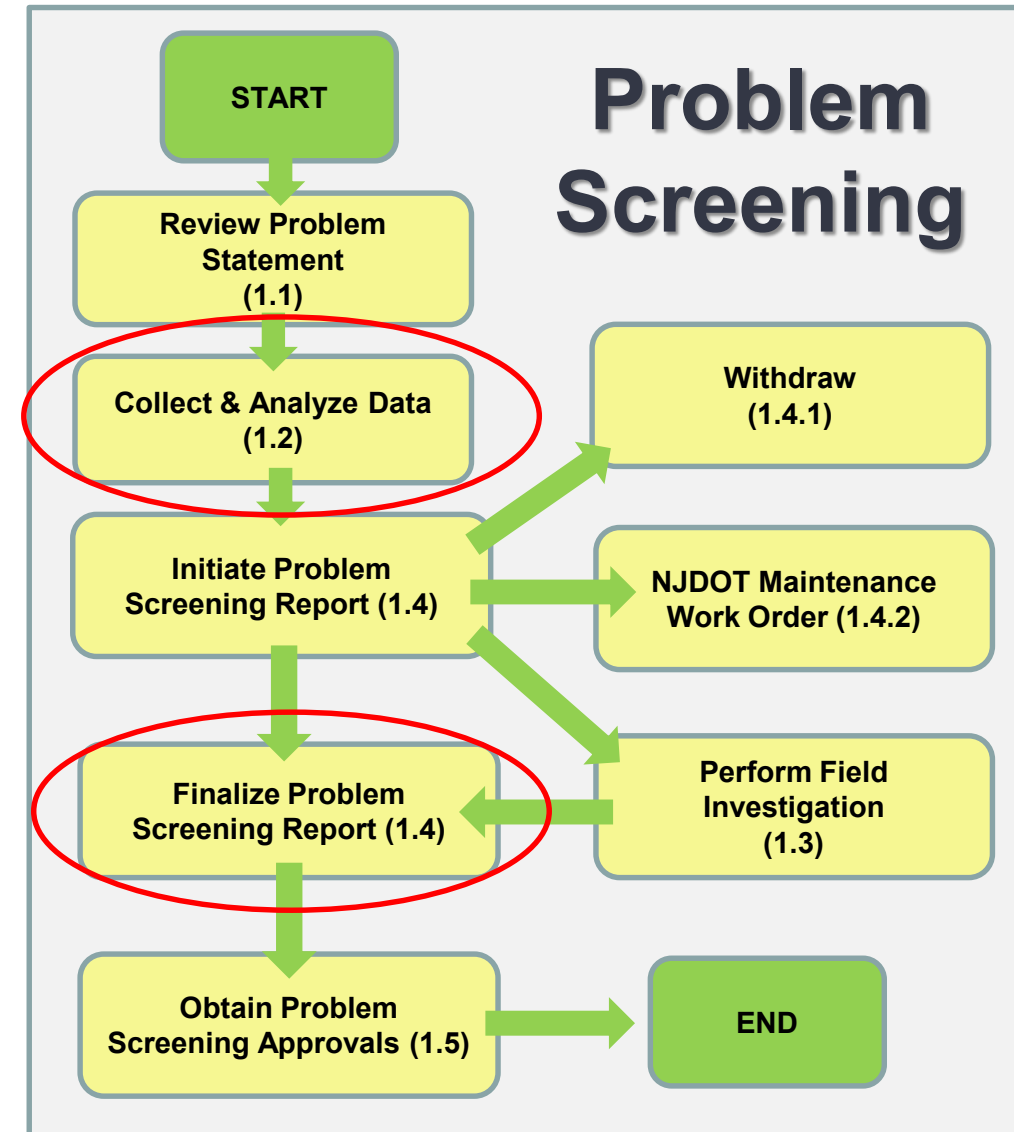
Internal Workflows Meeting (Aug 7)

Outcomes:

- Flood Risk Visualization Tool designed to **identify/flag potential exposure to flooding**
 - Data on asset **criticality** is also needed to determine the degree to which flood risk should be addressed in project design
- **Problem Screening** is the most appropriate step to include potential flood exposure data
 - Flood risk should also be considered in more detail as part of **concept development**
- It may be appropriate to include additional asset/infrastructure data including signals, ITS, and perhaps others
 - **Follow up needed with TOS&S**
- There is a need to coordinate flood exposure data with data and outputs from the Drainage Management System (DMS)
 - **Follow up needed with DMS**

Incorporating Resilience into Problem Screening

- Collect and Analyze Data (1.2)
 - New Resilience data collection activity (1.2.1.X)
 - Flood Risk Visualization Tool data and mapping
 - Criticality Tool output
 - Others as available
 - Coordinate with SMEs from the Bureau of Environmental Resources
- New Resilience section of the Problem Screening Report (1.4)
- Changes to Risk Register?



Proposed Technical Advisory Panel

- Up to four meetings
- Members to include:
 - Academic researchers (Rutgers, Stevens, Monmouth, Cornell, University of Bristol, UC-Davis, others?)
 - Federal agencies (FEMA, USGS, Army Corps)
 - State agencies (NJDOT, NJDEP)
- Topics to be addressed:
 - Flood modeling methods and techniques
 - Future precipitation and other assumptions and values needed for accurate flood depictions
 - Short- and long-term approaches to address predictive inland flood hazard and combined storm surge and river flow flooding in tidal river basins



Next Steps – Fall 2020

- Get input from DOT subject matter experts
 - TOS&S workflows follow up
 - DMS workflows follow up
 - End-user tool design input meeting(s)
- Convene Technical Advisory Panel Meeting #1
- Continue to advance tool development process
 - Database integration
 - User interface design and testing





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