

**RHODE ISLAND STATEWIDE PLANNING PROGRAM**  
**Rhode Island State Planning Council**

Friday, November 12, 2015  
RIDO, Conference Room A  
One Capitol Hill, Providence, RI

**APPROVED MINUTES**

**I. Attendance**

1. Members Present

Mr. Michael DiBiase, Chair	Director, Rhode Island Department of Administration
Ms. Lisa Vura-Weis, Vice-Chair	Deputy Chief, Office of the Governor
Mr. Kevin Flynn, Secretary	Associate Director, Division of Planning
Mr. Peter Alviti	Director, Rhode Island Department of Transportation
Ms. Meredith Brady	Representing Peter Alviti, Rhode Island Department of Transportation
Ms. Jeanne Cola	Non Profit Community Development Representative
Mr. Grover Fugate	Executive Director, Rhode Island Coastal Resources Management Council
Mr. Ryan Gardiner	Representing Mr. Thomas Mullaney, Rhode Island Department of Administration, Budget
Mr. Doug McLean	Representing Mr. L. Vincent Murray, RI League of Cities & Towns, Government Official Representative
Ms. Ana Novais	Representing Nicole Alexander-Scott, Director Rhode Island Department of Health
Ms. Sandy O'Connor	Governor's Designee
Ms. Amy Pettine	Representing Mr. Raymond Studley, Rhode Island Public Transit Authority
Ms. Lisa Primiano	Representing Ms. Janet Coit, Director, Rhode Island Department of Environmental Management
Ms. Amy Rainone	Representing Ms. Barbara Fields, Executive Director, Rhode Island Housing
Mr. Peder Schaefer	Representing Daniel Beardsley, Rhode Island League of Cities and Towns
Mr. Girard Visconti, Esq.	Large Business Representative
Mr. Michael Walker	Representing Stefan Pryor, Secretary of Commerce
Mr. Scott Wolf	Environmental Advocate

2. Members Absent

Ms. Jeanne Boyle	President's Designee, Rhode Island League of Cities and Towns
Ms. Ana Cano-Morales	Public Member
Mr. Roy Coulombe	Public Member
Ms. Marion Gold	Commissioner, Rhode Island Office of Energy Resources
Mr. Marcus Mitchell	Small Business Representative
Ms. Bonnie Nickerson	Director, Providence Department of Planning and Development
Mr. M. James Riordan	Public Member

Mr. Mathies Santos

Chair, Rhode Island Housing Resource Commission

3. Staff Present

Ms. Kimberly Crabill

RI Statewide Planning Program

Mr. Jared Rhodes

RI Statewide Planning Program

Ms. Karen Scott

RI Statewide Planning Program

Mr. Chris Witt

RI Statewide Planning Program

4. Guests Present

Ms. Teresa Crean

URI Coastal Resource Center/Rhode Island Sea Grant

Mr. Malcolm Spaulding

URI/Ocean Engineering

Mr. Peter Garino

Rhode Island Department of Transportation

## II. Agenda Items

1. Call to Order

Chairman DiBiase called the meeting to order at 9:06 a.m.

2. Approval of October 8, 2015 Meeting Minutes – for action

Chairman DiBiase asked for a motion to approve the minutes of October 8, 2015. Ms. Rainone moved to approve the minutes of October 8, 2015 as submitted. The motion was seconded by Ms. Cola. There being no discussion, the following members voted aye: Alviti, Cola, Flynn, Fugate, Gardiner, Novais, O'Connor, Pettine, Primiano, Rainone, Visconti, and Walker. Chairman DiBiase abstained. Not voting - Mr. Peder Schaefer and Mr. Doug McLean. Mr. Wolf and Ms. Vura-Weis were not present at this time. There were no nay votes.

3. Public Comment on Agenda Items – for discussion

There was none.

Mr. Walker departed.

4. FY 17- 26 Transportation Improvement Program Solicitation Package – for action

Chairman DiBiase introduced Karen Scott who presented the attached TIP Solicitation Package. Discussion was as follows:

Mr. Wolf arrived at 9:11 a.m.

Ms. Lisa Vura-Weis arrived at 9:18 a.m.

Chairman DiBiase gave some comments on the process and invited Department of Transportation (DOT) and Rhode Island Public Transit Authority (RIPTA) representatives to say a few words. In response DOT Director Alviti announced his goal of realigning the states needs with a realistic funding mechanism and construction schedule through the Department's proposed ten year plan and Rhode Works Tolling proposal.

Following his comments Ms. Pettine overviewed RIPTA's own ten year strategic planning initiative and pointed out that the proposed reduction in Federal Funding could make the challenge that much more difficult.

Mr. Schaefer asked what the difference in this proposed TIP process is from a municipal perspective as opposed to what was done last time. Ms. Scott pointed out that the major difference is the provision of a draft set of projects from DOT that is provided in the solicitation package to each municipality.

Chairman DiBiase requested a motion to approve which was given by Ms. Novais and seconded by Mr. Alviti.

Under discussion:

Ms. Rainone questioned if the scoring criteria from 2013 will be utilized this time. Ms. Scott responded that they wouldn't and that they have been updated as included in the packet under guiding principles.

There being no further discussion the following members voted aye: Alviti, Cola, Flynn, Fugate, Gardiner, Novais, O'Connor, Pettine, Primiano, Rainone, Visconti, Vura-Weis, and Wolf. Chairman DiBiase abstained. Not voting - Mr. Peder Schaefer, Mr. Doug McLean, and Mr. Michael Walker. There were no nay votes.

Mr. Alviti departed at 10 a.m. and was subsequently represented by Ms. Meredith Brady.

5. STORMTOOLS Informational Presentation - *for discussion*

Chairman DiBiase introduced Mr. Fugate, Ms. Crean, and Mr. Spaulding who delivered the attached STORMTOOLS presentation. Discussion was as follows:

Mr. Schaefer questioned whether the team was working with the National Flood Insurance Program to integrate the findings of the STORMTOOLS system into their flood insurance rate maps. Mr. Fugate responded that they were.

Ms. Rainone asked if the group is available to do training of state agency staff on STORMTOOLS. Mr. Fugate stated that their intent is to do 1 or 2 sessions for state agencies but there is a need to find a dedicated funding source to ensure long term access to training.

Mr. Wolf noted that FM Global or the Rhode Island Interlocal Risk Management Trust, who insure municipalities, might be interested in participating.

Ms. Cola noted that this information has huge implications for affordable housing provision. She went on to explain that folks with lower incomes, in particular, are very vulnerable to increasing insurance rates.

Ms. Pettine next pointed out the huge learning curve that RIPTA faced with the Newport Gateway Initiative.

6. 2016 Meeting Schedule – for action

Chairman DiBiase requested a motion to approve the 2016 meeting schedule as presented. Ms. Cola made the first motion and it was seconded by Mr. Fugate. There being no further discussion the following members voted aye: Brady, Cola, Flynn, Fugate, Gardiner, Novais, O’Connor, Pettine, Primiano, Rainone, Visconti, Vura-Weis, and Wolf. Chairman DiBiase abstained. Not voting - Mr. Peder Schaefer, Mr. Doug McLean, and Mr. Michael Walker. There were no nay votes.

7. 2015 Committee Nominations, Proposed “Slate of Names” - for introduction

Mr. Flynn introduced the proposed slate of names as contained in the agenda supplement.

8. Associate Director’s Report – for discussion

Mr. Flynn addressed the following items under the Associate Director’s report:

- Comp Plan Standards Rules and Regulations Hearings
- Pending Retirement

Discussion occurred as follows:

Director DiBiase first commented that it has been a privilege to work with Mr. Flynn directly over the last few months. He next noted that Mr. Flynn is a person of tremendous integrity which is really important in a job as the gatekeeper for real estate development, which is not an easy task. He also noted that Mr. Flynn is extremely conscientious and cares deeply about the work that he does. The Director closed by thanking Mr. Flynn for his dedication to his daily work.

Mr. Wolf commented that Mr. Flynn has been a real treasure for state government and for the State of Rhode Island as a whole. From a GrowSmart RI perspective, Mr. Flynn has been a great partner and his combination of vision and analytical precision will be missed.

Ms. Primiano next spoke on behalf of the Department of Environmental Management and Director Coit, stating that they have appreciated Mr. Flynn’s guidance on matters relative to State Properties Committee, comprehensive planning, legislation, and so many other things. We have a lot of respect for him and will miss him terribly. In closing, Ms. Primiano noted that they wish him all the best.

Mr. Fugate began his comments by stating that when he learned that Mr. Flynn was going to be hired as the Assistant Director, he knew that the right person had been chosen for the job. He next noted that Mr. Flynn has proven that to be true over the years. Mr. Fugate stated the word integrity comes to mind when he thinks of Mr. Flynn as he has been open and accessible. In closing, Mr. Fugate stated that he and Rhode Island Coastal Resources will miss Mr. Flynn and wish him the best of luck in his future endeavors.

Ms. Rainone commented that Mr. Flynn has been a great friend to affordable housing in the state and a great partner at the state level. It has been great working with him. Mr. Flynn was able to show integrity and present a rationale face through some irrational discussions. The state was lucky to have him especially through this last year. Mr. Flynn will be greatly missed.

9. Announcements

Mr. Wolf announced that GrowSmart RI and the Coalition for Transportation Choices is hosting a forum on the future of Transit in Rhode Island on December 1.

Mr. Fugate announced that there will also be an all-day conference on December 1<sup>st</sup> at Roger Williams University to discuss the legal ramifications of Sea Level Rise.

10. Adjourn

Chairman DiBiase asked for a motion to adjourn. Mr. Fugate motioned to adjourn. The motion was seconded by Mr. Flynn. There being no further discussion the following members voted aye: Brady, Cola, Flynn, Fugate, Gardiner, Novais, O'Connor, Pettine, Primiano, Rainone, Visconti, Vura-Weis, and Wolf. Chairman DiBiase abstained. Not voting - Mr. Peder Schaefer, Mr. Doug McLean, and Mr. Michael Walker. There were no nay votes. The meeting adjourned at 10:45 a.m.

Respectfully Submitted,



Kevin Flynn  
Secretary

## STATE PLANNING COUNCIL

Supplement to Agenda Item #4

November 12, 2015

### Transportation Improvement Program (TIP) FY 2017 – 2025

It is time again for the Metropolitan Planning Organization (MPO) for the State of Rhode Island, the State Planning Council, to initiate the development of the State's next Transportation Improvement Program (TIP). The TIP is a list of transportation projects the State of Rhode Island intends to implement using United States Department of Transportation funds. For transportation projects to utilize federal funds it must be included in the TIP. The TIP is the product of extensive data analysis coupled with a significant outreach effort to communities, public interest groups, and citizens throughout the state. The current TIP spans federal fiscal years 2013 through 2016, and will expire on September 30, 2016.

Federal regulations require that the State Planning Council, acting as the single statewide MPO in Rhode Island, adopt a new TIP at a minimum of every four (4) years. The TIP must present a four (4) year program, by year, and may present additional projects proposed for funding in future years. For the past several years, the TIP in Rhode Island has covered the required four federal fiscally constrained years and has included one additional category called "Future Years" which included projects that would be pursued should additional funds become available. This TIP, the FFY 17-25 TIP, is proposed to cover a longer time period by including the required four (4) fiscally constrained years and expanding the previous single "Future Years" category to give municipalities and the general public a better idea of which projects are moving through toward implementation.

As overviewed at the September October meeting, one of the largest shifts that has been occurring is the migration of transportation infrastructure planning to an asset management based system of planning, which increases the emphasis on preservation and maintenance to keep assets in good condition, avoiding more expensive long term costs. RIDOT has been working on a Ten Year Strategic Plan to prioritize and streamline funding for overall operations, pavement and drainage and reach the federally mandated 90% structural sufficiency of bridges, which was released on October 23, 2015. This Strategic Plan outlines two financial paths towards improving the condition of our infrastructure. The first path, the constrained scenario, would utilize existing federal and state transportation funding. The second path, the RhodeWorks proposal, would provide an additional investment above current funding in transportation infrastructure over the next decade. It is important to note that RIDOT's Ten Year Strategic plan is not the TIP; however the Ten Year Strategic Plan developed by RIDOT will become the foundation for outlining a program of investments through the TIP.

A key component of the TIP process is the incorporation of stakeholder input. Municipalities, citizens, state agencies, regional planning organizations, transportation providers, and non-profits may all submit project proposals. Attached you will find the following resources to facilitate this public participation process:

1. An FFY 13-16 TIP Status Report for both RIPTA and RIDOT. The RIDOT status report illustrates those projects that have been completed, those that are proposed for completion as part of the FY13-16 TIP, and those which are included in the RIDOT Ten Year Strategic Plan (under either

funding scenario). The RIPTA Status Report provides a narrative summary of how the funds in each TIP category were expended.

2. A cover letter to stakeholders overviewing the TIP development process.
3. A “Guide to Rhode Island’s FFY 2017-2025 TIP Development Process ” which details exactly how to participate in the TIP process.
4. Project Prioritization Cover Sheets which will be populated with all projects proposed in each specific municipality as part of the RIDOT Ten Year Strategic Plan for local prioritization. There is also the opportunity to prioritize additional projects for consideration.
5. A New Project Application for new projects proposed for inclusion in the TIP.
6. TIP Guiding Principles by which new projects will be evaluated. These Guiding Principles are based on the goals articulated in the Long Range Transportation Plan, *Transportation 2035*, and are very similar to the TIP Criteria used as part of the FFY13-16 TIP development process. Several bullet points are bold and underlined. These are new concepts that are proposed for inclusion into the evaluation, while the deleted text is proposed for removal or relocation.

While all interested parties may participate in the TIP process, the Statewide Planning Program proposes to specifically ask municipalities to:

1. Review the projects in the FFY 13-16 TIP Status Report and decide if any specific project that is not projected for implementation in the FFY 13-16 TIP or for inclusion in RIDOT’s Ten Year Strategic Plan is still relevant to the municipality’s transportation goals. These projects can be found in the “Must be added to Project Prioritization Cover Sheet for consideration” column.
2. Review the list of projects in RIDOT’s Ten Year Strategic Plan to ensure that all projects listed in the Plan capture the municipality’s most critical needs for bridge, pavement and traffic infrastructure improvements.
3. If there is a priority project that is not proposed for construction as part of the FFY 13-16 TIP and is not listed in RIDOT’s Ten Year Strategic Plan, submit it for consideration by completing the Application for New Projects.
4. Submit a single, prioritized list of projects on the Project Prioritization Cover Sheet that includes all municipal priority projects.

This proposed solicitation process was presented to and approved by the Council’s Transportation Advisory Committee at their October 22 meeting. If approved by the Council, the associated materials would be distributed as soon as possible and be followed up in early December with two public informational workshops. All stakeholder TIP submittals would then be due on January 8, 2015.

**ACTION REQUESTED: Adopt the proposed process, timeline and associated materials for the formal initiation of the FFY 17-25 Transportation Improvement Program.**



# AN OVERVIEW OF TIP GUIDING PRINCIPLES

FEDERAL FISCAL YEARS 2017—2025  
OCTOBER 2015



The TIP Guiding Principles outlined below are based on the goals articulated in the Long Range Transportation Plan, Transportation 2035. Applicants are asked to include a maximum 2 page narrative addressing the principles that are applicable to new projects. Staff of RIDOT will review Bridge, Pavement, Traffic and Drainage projects while subcommittees comprised of staff of the MPO, RIDOT, RIDEM, RIPTA and members of the Transportation Advisory Committee will evaluate all other types of projects and make recommendations to the full TAC and State Planning Council on specific projects for inclusion in the TIP. Although the projects will not be scored using a numeric scoring process, the subcommittees will use these guiding principles in their decision making.

Applicants are not required to address each specific bullet in the list below. These bullets are meant to be examples of how projects can demonstrate their support for the implementation of the overall guiding principles.

## MOBILITY BENEFITS

***Provide convenient transportation services and facilities that offer seamless and efficient connections across different modes for the maximum number of users.***

- Number of expected users
- Congestion relieved
- Improves access/function of more than one mode (Multimodal)
- Provides linkages between modes (Intermodal)
- Regional impact and/or partnership between municipalities
- Increases mobility choices, particularly in areas with low car ownership
- Improves user comfort, convenience or information (including intelligent transportation systems)

- Promotes walkability and bikeability of neighborhoods
- Improves access to activity centers (jobs, retail, services, and community facilities such as schools and parks)
- Connectivity (fills a gap in the transportation system)

## **COST EFFECTIVENESS**

***Provide cost effective solutions for supporting a sustainable transportation system with emphasis on preservation and maintenance of the existing system.***

- Cost (capital or operation) in proportion to expected benefit
- Demonstrates an efficient budget that minimizes cost without sacrificing function, safety, long term performance, or quality design
- Adds efficiency to or improves existing infrastructure
- Complements another local project or proposed TIP project
- Improves resiliency to the impacts of climate change
- Implements the principles of asset management

## **ECONOMIC DEVELOPMENT**

***Support a vigorous economy by facilitating the movement of people and goods within Rhode Island and the region.***

- Improves access to training and employment centers
- Supports job creation
- Facilitates the movement of goods
- Improves access to major tourism destinations
- Leverages local or private investment (including past investment in planning or design)
- Is within the Urban Service Boundary, or is within or connects two or more designated growth centers, downtowns, or village centers
- Facilitates the reuse of a brownfield or existing structure
- Connects the workforce with employment opportunities

## **ENVIRONMENTAL IMPACT**

***Recognize, protect and enhance the quality of the State's environmental resources through well-designed transportation projects and the effective operation of the system.***

- Improves air quality
- Promotes energy conservation
- Protects or improves water quality
- Protects important natural resources, including open space, recreational and agricultural lands
- Enhances scenic resources or historic districts
- Extends/enhances the greenway system

## SUPPORTS LOCAL AND STATE GOALS

***Encourage the partnership of local, state and region entities in implementing the State Guide Plan and Local Comprehensive Plans.***

- Local priority compared to other projects
- Implements specific actions in the local comprehensive plan
- Implements specific actions in the State Guide Plan
- Public Support

## SAFETY AND SECURITY

***Improve the safety and security of the entire transportation system.***

- Enhances safety, particularly to vulnerable road users
- Improves evacuation route
- Improves diversionary route
- Improves security of transportation asset
- Improves passenger safety

## EQUITY

***Ensure that the transportation system equitably serves all Rhode Islanders regardless of race, income, ethnic origin, age, or disability.***

- Enhances or preserves access to the transportation network in a minority neighborhood
- Enhances or preserves access to the transportation network in a low income neighborhood
- Enhances or preserves access to the transportation network for persons with a disability
- Enhances or preserves access to the transportation network for those with Limited English Proficiency
- Enhances or preserves to the transportation network for individuals 65 years and older

GUIDE TO RHODE ISLAND'S  
TRANSPORTATION IMPROVEMENT PROGRAM (TIP)  
DEVELOPMENT PROCESS

FEDERAL FISCAL YEARS 2017—2025



OCTOBER 2015

RHODE ISLAND  
STATEWIDE  
PLANNING  
PROGRAM





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## INTRODUCTION

The Metropolitan Planning Organization (MPO) for the State of Rhode Island, the State Planning Council, is launching the development of the Transportation Improvement Program (TIP) for federal fiscal years 2017 – 2025. This guide provides assistance to stakeholders interested in participating in the development of Rhode Island's TIP. All TIP materials detailed in this document are available at <http://www.planning.ri.gov/statewideplanning/transportation/tip.php> or by contacting Karen Scott, Assistant Chief of the Statewide Planning Program at [karen.scott@doa.ri.gov](mailto:karen.scott@doa.ri.gov) or 401-222-4411. All submissions are due January 8, 2016.

## OVERVIEW OF THE TRANSPORTATION IMPROVEMENT PROGRAM

The TIP is a list of transportation projects the State of Rhode Island intends to implement using United States Department of Transportation funds. For a transportation project to utilize federal funds it must be included in the TIP. The TIP is the product of extensive data analysis coupled with a significant outreach effort to communities, public interest groups, and citizens throughout the state.

A project's inclusion in the TIP is a critical step, but it does not represent an allocation of funds, obligation to fund, or grant of funds. Projects supported with federal dollars are only guaranteed funding after the Rhode Island Department of Transportation (RIDOT) or the Rhode Island Public Transit Authority (RIPTA) or the U.S. Department of Transportation (USDOT) reviews the design, financing, and environmental impacts of a project. Project sponsors must work cooperatively with RIDOT, RIPTA, or the federal agencies to guarantee the federal funding identified in the TIP. This federal guarantee is referred to as an obligation.

The first four years of the TIP must be fiscally constrained, meaning the list of projects in the TIP may not exceed the anticipated funding that is reasonably expected to be available over the four-year timeframe. In order to add projects to the TIP, sufficient revenues must be available. As a result, the TIP is not a wish list but a list of projects with anticipated, but not guaranteed, funding commitments during the timeframe.

## FEDERAL REQUIREMENTS OF THE TIP

Federal regulations require that the State Planning Council, acting as the single statewide MPO in Rhode Island, adopt a new TIP at a minimum of every four (4) years. The TIP must present a four (4) year program, by year, and may present additional projects proposed for funding in future years. For the past several years, the TIP in Rhode Island has covered the minimum four federal fiscally constrained years and has included one additional category called "Future Years" which included projects that would be pursued should additional funds become available. This TIP, the FFY 17-25 TIP, is proposed to cover a longer time period by including the required four (4) fiscally constrained years and expanding the previous single "Future Years" category to give municipalities and the general public a better idea of which projects are moving through development into implementation.

Moving Ahead for Progress in the 21st Century (MAP-21), the two-year bill authorizing federal transportation programs, was signed into law in 2012. Since its expiration in September 2014, three (3) short terms extensions have been passed. The current extension is set to expire on November 20, 2015. Congress is currently working towards a new, longer term transportation authorization bill.

MAP-21 requires states to develop plans that specifically address how they will improve and sustain the conditions of roads and bridges on at least the National Highway System (NHS). The NHS is a national network of the nation's most important roads. The roads in Rhode Island that are on the NHS are listed in tables by municipality at <http://www.planning.ri.gov/statewideplanning/transportation/reclass.php>.

MAP-21 requires states to set targets for the physical condition of highways and bridges and develop asset management plans outlining how they will achieve and sustain those targets into the future. This is a change

from previous Federal requirements, which focused on planning for how the highway network performs in terms of congestion, highway crashes and auto and truck air pollution. MAP-21 also requires states to accompany the asset management plan with a realistic financial plan that reports how much money is needed to achieve and sustain the set targets. The purpose of the financial plan is to highlight differences between the needed investment and projected revenues. While MAP-21 does not specify a specific goal for pavement condition for roads on the NHS, it does specify a goal of having no more than 10 percent of a state's NHS bridge deck area in poor condition. Currently, 22% of Rhode Island's bridges are structurally deficient (poor condition), which ranks Rhode Island last in the nation in overall bridge condition.

To address the requirements of MAP-21, the MPO has been working collaboratively with RIDOT, RIPTA and other transportation groups over the past several years to develop a strategy for stabilizing Rhode Island's bridge and pavement conditions. One of the largest shifts that has been occurring is the migration of transportation infrastructure planning to an asset management based system of planning, which increases the emphasis on preservation and maintenance to keep assets in good condition, avoiding more expensive long term costs. When asset management principles are implemented, taxpayers will save millions of dollars in future infrastructure costs and the future conditions of assets based on given investment levels can be compared. It focuses on making the best investment decisions that will result in the best long term benefit for the State's entire transportation network.

Even with the transition to transportation asset management and the implementation of a more strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle, Rhode Island's current funding levels are insufficient to make significant short term progress in improving the State's infrastructure condition.

## **FUNDING CONSTRAINTS ON THE TIP**

Similar to many other states, Rhode Island is facing a transportation funding crisis. The funding constraints encountered during the preparation of the current FFY 13-16 TIP have not significantly improved and both federal and state resources have become even further strained. For the FFY13-16 TIP, an average of approximately \$209 million dollars in federal highway funding was available per year. The Federal Highway Administration has advised the State to assume flat funding and continue to use an allocation of \$209 million per year for TIP planning. Similarly, for the FFY13-16 TIP, an average of approximately \$36 million in federal transit funding was available per year. The Federal Transit Agency has advised the state to assume flat funding, and to continue to use an allocation of \$36 million per year for TIP planning. Unfortunately, the available funding for new transportation projects is further reduced by the State's current commitments, including annual debt service, existing major projects, and mandated and mission-critical operations of RIDOT and RIPTA.

Historically, over 90% of Rhode Island's transportation construction program is funded through federal funds. As outlined above, that federal stream of funding has become unpredictable and has included several short term funding authorizations that are not conducive to the long range strategic planning that Rhode Island is working to implement. The state has recently taken some key steps to provide sustainable transportation infrastructure funding and broaden available resources. These steps include:

- Redirection of the gas tax to focus on transportation needs;
- Replacement of biennial bond borrowing with an increase in registration and license fees, along with Rhode Island Capital Plan (RICAP) funds to provide the state match for the annual federal transportation program;
- Refinance of existing general obligation bonds to soften the anticipated sharp peak in debt service payments; and

- Creation of the Rhode Island Highway Maintenance Account and a shift of future funding from transportation-related sources, such as registrations, title fees, gas tax indexing, and other accounts to establish a state-funded pool for critical transportation infrastructure projects.

While these changes are a positive step for the State, there is still a significant gap in the funding available and the funding needed to bring Rhode Island’s transportation infrastructure into acceptable condition.

## RIDOT TEN YEAR STRATEGIC PLAN AND THE TIP

As Rhode Island shifts towards asset management based planning, RIDOT has been working with transportation partner agencies to develop a Ten Year Strategic Plan to prioritize and streamline funding for overall operations, pavement and drainage and reach the federally mandated 90% structural sufficiency of bridges. RIDOT’s Ten Year Strategic Plan is available in its entirety at [http://www.dot.ri.gov/documents/news/TAC\\_Submission/RIDOT\\_2015\\_TAC\\_Submission.pdf](http://www.dot.ri.gov/documents/news/TAC_Submission/RIDOT_2015_TAC_Submission.pdf). This Strategic Plan outlines two financial paths towards improving the condition of Rhode Island’s infrastructure. The first path, the constrained scenario, would utilize existing transportation funding (federal funds and state funds as outlined above). The second path, the RhodeWorks proposal, would invest an additional investment above current funding in transportation infrastructure over the next decade.

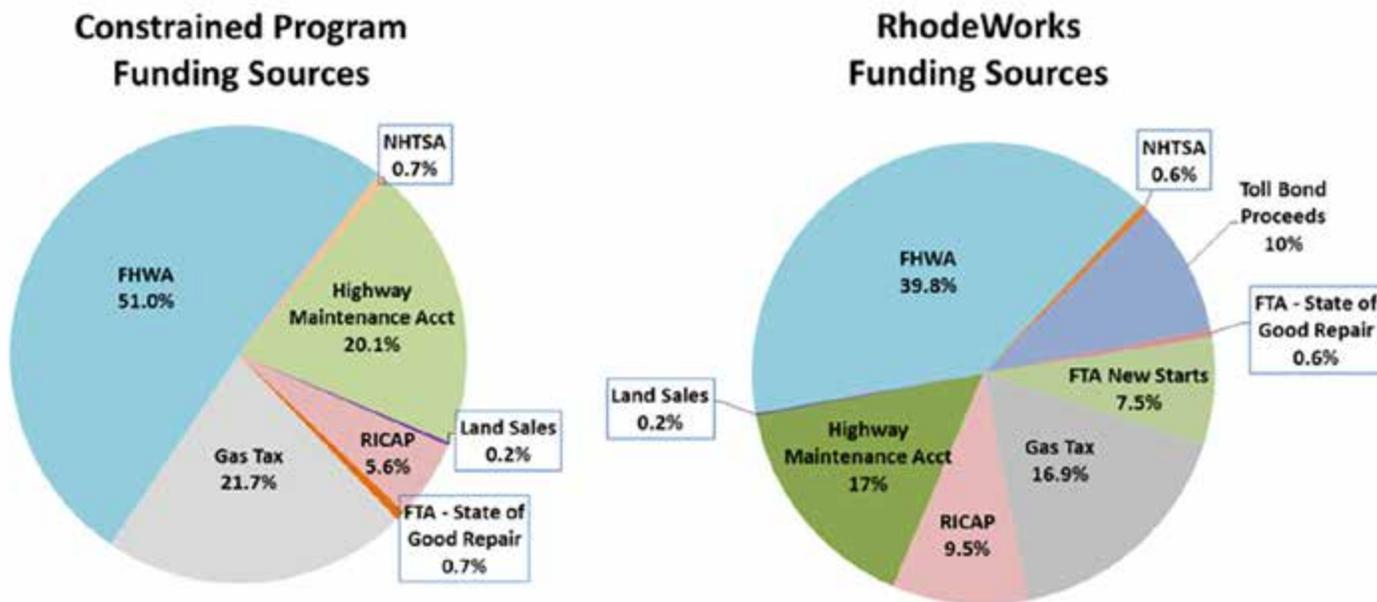


Image Source: RIDOT

More details on the proposed RhodeWorks plan is available at <http://www.dot.ri.gov/news/rhodeworks.php>

The main differences between the funding proposals are:

1. The RhodeWorks plan allocates 65% of \$1.2 billion in bridge funding to the first six years, while the Constrained Program allocates just 44% in the same time period. The result is that the Constrained Program takes seven years longer (2032 vs. 2025) and costs \$950 million more to meet the target 90% bridge sufficiency rating.
2. The RhodeWorks plan anticipates a new \$500 million revenue bond supported by a heavy truck toll. This bond is allocated to bridge reconstruction in the first four years of the plan (\$100 million) and the reconstruction of Routes 6/10 (\$400 million). There would be no bonding under the Constrained Program.
3. In the RhodeWorks scenario, delivery of a multi-modal reconstruction of the Route 6/10 Interchange

and a Bus Rapid Transit (BRT) facility would be accelerated by the investment of \$400 million in bond funds and a potential \$400 million in FTA New Starts discretionary funding. Under the Constrained Program option, the Route 6/10 Interchange would not be reconstructed and the potential for attracting FTA funding would be limited.

4. The RhodeWorks plan increases transit investment by \$80 million, increases transportation alternatives funding by \$37 million, and increases pavement funding by \$30 million. These additional investments are not possible in the Constrained Program.

	<b>RHODE WORKS (PLAN A)</b>	<b>CONSTRAINED (PLAN B)</b>
Program Funding	\$4.7 billion	\$3.8 billion
90% Bridge Sufficiency by 2025	Yes	No
GARVEE Refinancing	Yes - \$120 million	No
Bond	Yes - \$500 - million	No
6/10 Interchange	2017 - 2021	No
Increased Pavement	\$30 million	No
Increased Transit	\$80 million	No
Increased Transportation Alternatives	\$36 million	No

Source: RIDOT

The state and national transportation funding crisis and the continued declining condition of the State’s infrastructure makes it more important than ever to ensure that our scarce resources are focused on priority projects and strategic investments, particularly those assets on the NHS as required by MAP-21. It is important to note that RIDOT’s Ten Year Strategic plan is not the TIP; however the Ten Year Strategic Plan developed by RIDOT will become the foundation for outlining a program of investments through the TIP. Under both financial scenarios, the Ten Year Strategic Plan presents a recommended pool of projects and programmatic investment levels that RIDOT proposes will constitute the most efficient use of our limited transportation resources.

The funding categories of Bridge, Pavement, and Traffic present lists of projects which were developed using RIDOT’s asset management systems, optimizing the impact on the total investment in Rhode Island’s transportation network. This type of project selection is critical for integrating data driven decisions and asset management into the State’s transportation process. Other funding categories such as Transit Capital and Transportation Alternatives are shown as only a total budget per year. These projects are better suited for selection using a set of guiding principles which are outside of objective engineering criteria but take into consideration such things as mobility, connectivity, environmental impact, and economic development.

To better integrate transportation asset management principles into the overall transportation planning process, all the projects listed in the RIDOT’s Ten Year Strategic Plan (regardless of funding scenario) will become the basis for public input into the TIP project selection process. In addition, the MPO will initiate a review of the TIP and offer opportunities for public comment on an annual basis rather than every four years as has been done previously. For specific questions on the RIDOT Ten Year Strategic Plan, please contact Meredith Brady at (401) 222-6940 ext. 4530 or [meredith.brady@dot.ri.gov](mailto:meredith.brady@dot.ri.gov).

## RIPTA'S LONG RANGE PLANNING PROCESS AND THE TIP

Included in the RIDOT Ten year Strategic Plan, outlined above, are RIPTA's federal funding projections for the next ten years. Next month, RIPTA will be kicking off a long-range planning process in coordination with local governments, partner transportation agencies, and the general public that will establish a vision for the future of transit in our state for the next ten years and beyond.

As a first step in this process, RIPTA will host a Listening Session in December to invite input and kick-start a conversation with municipal officials and planners regarding existing transit service and facilities, as well as potential expansion and enhancements. This session will take place:

**TUESDAY, DECEMBER 15, 2015 AT 9:00 A.M.**

Rhode Island Public Transit Authority  
Transportation Conference Room  
269 Melrose Street, Providence, RI 02907

Concepts and priorities discussed during the Listening Session will inform the detailed TIP proposal to be submitted by RIPTA in early 2016 and RIPTA's ongoing long-range planning process that will unfold over the course of calendar year 2016. Cities and towns wishing to share with RIPTA their ideas, concerns, questions, and visions for improved transit service are strongly encouraged to attend the Listening Session.

## MUNICIPAL PROJECT PRIORITIZATION

Coordination with municipal partners is a crucial component of the TIP process. To assist in most effectively participating in this TIP process, the MPO together with our transportation partners at RIDOT and RIPTA have generated some useful resources and ask municipalities to provide specific input as outlined below.

A status report of projects listed in the FFY 13-16 TIP by municipality has been compiled. This report can be found at <http://www.planning.ri.gov/statewideplanning/transportation/tip.php>. Based on this report, municipalities will be able to identify those projects that have been completed, those that are proposed for completion as part of the FFY 13-16 TIP, those which are included in the RIDOT Ten Year Strategic Plan (under either funding scenario), and those projects that must be added to the Project Prioritization Cover Sheet for consideration. RIDOT's Ten Year Strategic Plan only identifies specific projects in the categories of bridge, pavement and traffic. All other types of projects, including but not limited to bicycle, pedestrian, enhancement and transit, which are not proposed for completion as part of the FFY 13-16 TIP are included in the "Must be added to the Project Prioritization Cover Sheet for consideration" category. Please direct questions on RIDOT projects in the status report to Amy Thibeault at (401) 222-6940, ext. 4255 or [amy.thibeault@dot.ri.gov](mailto:amy.thibeault@dot.ri.gov). Please direct any questions on RIPTA projects in the status report to Lillian Picchione at (401) 784-9500 ext. 124 or [lpicchione@ripta.com](mailto:lpicchione@ripta.com).

Although RIDOT's Ten Year Strategic Plan recommends a specific set of projects, direct municipal input into the project prioritization process remains an essential piece of the TIP development process. To assist with this effort, the State Planning Council/MPO is requesting that each municipality:

1. Review the projects listed in the "Must be added to Project Prioritization Cover Sheet for consideration" category of the FFY 13-16 TIP Status Report and decide if any of those projects are still relevant to the municipality's transportation goals.
2. Review the list of projects in RIDOT's Ten Year Strategic Plan to ensure that all projects listed in the Plan capture the municipality's most critical needs for bridge, pavement and traffic infrastructure improvements. RIDOT's Ten Year Strategic Plan is available at [http://www.dot.ri.gov/documents/news/TAC\\_Sub-](http://www.dot.ri.gov/documents/news/TAC_Sub-)

[mission/RIDOT\\_2015\\_TAC\\_Submission.pdf](#).

3. If there is a priority project that was not included in the FFY 13-16 TIP and is not listed in RIDOT's Ten Year Strategic Plan, it may be submitted for consideration by completing an Application for New Projects, which is available at <http://www.planning.ri.gov/statewideplanning/transportation/tip.php>.
4. Submit a single, prioritized list of projects on the Project Prioritization Cover Sheet that includes all municipal priority projects. The municipal Project Prioritization Cover Sheets are available at <http://www.planning.ri.gov/statewideplanning/transportation/tip.php>. For your convenience, the Project Prioritization Cover Sheet has already been populated with specific bridge, pavement and traffic projects with an exact location included in either funding scenario of RIDOT's Ten Year Strategic Plan. Any project, including new project submissions and projects listed in the TIP Status Report as "Must be added to Project Prioritization Cover Sheet for consideration," that are not already listed on the Project Prioritization Cover Sheet that a municipality would like considered for inclusion in the FFY 17-25 TIP must be manually added to the sheet on the blank lines provided. **No project from the FFY 13-16 TIP will be carried forward to the FFY 17-25 TIP unless it is specifically listed on the Project Prioritization Cover Sheet.**
5. Recognizing that some municipalities are being presented with a long list of projects to prioritize, a municipality may choose to either numerically rank each proposal (ex. 1, 2, 3, etc. with 1 being the highest priority) or provide a level of priority (high, medium, low). If a municipality chooses to rank projects using a level of priority, no more than 1/3 of the total project list may be included in a priority level (ex. 1/3 of total projects ranked as high, 1/3 of total projects ranked as medium, and 1/3 of total projects ranked as low).

**New project applications are not necessary for any project specifically listed in the FFY 13-16 TIP or in RIDOT's Ten Year Strategic Plan.** However, a modification to a project listed in the FFY 13-16 TIP or RIDOT's Ten Year Strategic Plan will be considered a new project and must follow the application instructions for new projects listed below. **Any project that an applicant would like to propose for inclusion in the FFY 2017-25 TIP must be included on the Project Prioritization Cover Sheet. No projects listed in the FFY 13-16 TIP will be automatically carried over into the FFY 17-25 TIP.**

## NEW PROJECT PROPOSALS

Municipalities, organizations and any member of the general public are allowed to submit new project proposals. There is a wide variety of projects that are eligible for listing in the TIP. These include but are not limited to:

Bike Path & Bike Lane Construction	Intermodal Centers	Turning Lanes
Sidewalk Construction	Ferry Landings	Railroad Crossings
Bridge Rehabilitation	Interstate Improvements	New Transit Initiatives
Projects that Benefit Air Quality	Resurfacing Projects	Rail Stations
Roadway Drainage Improvements	Corridor Studies	Recreation Trails
Park and Ride Lots	Intersection Improvements	Safe Routes to School
Highway Widening or Reconstruction	Signalization	Retrofit of Sidewalks to meet ADA requirements

Any resurfacing project must be proposed on Federal Aid System eligible roadways only. To see if a particular roadway is Federal Aid System eligible, please refer to municipal tables at <http://www.planning.ri.gov/statewideplanning/transportation/reclass.php>. Eligible criteria for alternative transportation projects, including bike, pedestrian, historic preservation of transportation facilities, and environmental mitigation, are outlined at

<https://www.fhwa.dot.gov/map21/factsheets/tap.cfm>.

We have strived to maintain a streamlined and simple application process for new project submissions. Follow the instructions outlined on the application form carefully. All projects submitted will be categorized by MPO, RIPTA and RIDOT staff and reviewed according to the process outlined below. Specific projects may be asked to complete a more detailed application for further review, if necessary.

All project proposals must be in conformance with the State Guide Plan, including the Land Use Plan, Land Use 2025 and the Long Range Transportation Plan, Transportation 2035. These plans are available at <http://www.planning.ri.gov/planning/>. Projects must also be consistent with the applicable Local Comprehensive Plan.

New project proposals must be submitted on the application forms available at <http://www.planning.ri.gov/statewideplanning/transportation/tip.php>. These forms may be completed using Adobe Acrobat, which can be downloaded at <http://get.adobe.com/reader/otherversions/>. All application forms must be complete to be considered for funding. Additional pages beyond the required documents will not be considered during the initial project evaluation and should not be submitted. For any application submitted by a Regional Planning Agency, Non-Profit Organization, or member of the public, the application must include the signature of the Chief Executive Official of the municipality in which the project is located or a separate letter acknowledging notice of the project. Each project must also include an 8 ½" x 11" map, clearly indicating the project location with street names and/or route numbers.

Municipalities or any entity submitting any projects, must complete a Project Prioritization Cover Sheet and include it with the full TIP submittal. All projects must be assigned a priority ranking on this sheet.

**Submissions that are not accompanied by the Project Prioritization Cover Sheet will not be reviewed.**

Municipalities are urged to involve the public in the preparation of their TIP recommendations through advisory committees, public meetings, and other methods. **At a minimum, city and town governments shall hold a public hearing allowing the general public an opportunity to comment on the municipality's full TIP submission.** Local Planning Boards and Commissions, Joint Municipal Planning Commissions established under Chapter 45-22.1 of the General Laws, Regional Councils of Local Governments established under Chapter 45-43 of the General Laws, and municipal and regional committees may also propose projects. Non-municipal organizations are urged to involve the public in their recommendations through direct interaction with member municipalities, advisory committees, and public meetings. A submission must include evidence that the chief elected official of the city or town in which the project is located was notified.

All required public hearings shall be held in compliance with Rhode Island General Laws 42-46-6 and 42-46-7, Title VI/Nondiscrimination statutes and regulations, and held prior to the proposal submission deadline of January 8, 2016. Applications with public hearing dates after January 8, 2016 will not be accepted.

## FINAL PROJECT APPLICATION SUBMISSION

The following information constitutes a complete TIP submission package:

Three (3) collated copies of all completed application forms and supporting materials including:

- Project Prioritization Cover Sheet, including a ranking of all projects proposed by the applicant
- Application for New Projects for each new project proposed, completed and signed by Chief Executive Official (or including a letter of acknowledgement of application for non-municipal organizations).
- Electronic file of the complete application (provided via e-mail to Kimberly Crabill at [Kimberly.crabill@doa.ri.gov](mailto:Kimberly.crabill@doa.ri.gov) or on a CD to Kimberly Crabill, Rhode Island Statewide Planning Program, One Capitol Hill, Providence, RI 02908)

This information must be received by the Statewide Planning Program, to the attention of Kimberly Crabill by **FRIDAY, JANUARY 8, 2016 AT 3:00 P.M.** Incomplete applications and applications submitted after the deadline will not be reviewed.

## TIP PREPARATION WORKSHOPS

The MPO, RIDOT, and RIPTA will host two (2) workshops outlining the application process for the FFY 17-25 TIP. The workshops are being held to assist cities and towns, and other groups and individuals in developing TIP project proposals. These workshops will be held on:

### THURSDAY, DECEMBER 3, 2015 AT 6:00 P.M.

Department of Admiration  
William E. Powers Building  
Conference Room A, 2nd Floor  
One Capitol Hill, Providence, RI

### FRIDAY, DECEMBER 4, 2015 AT 1:30 P.M.

Department of Administration  
William E. Powers Building  
Conference Room A, 2nd Floor  
One Capitol Hill, Providence, RI

## PROJECT APPLICATION PRESENTATIONS

All applications may be presented at one (1) of four (4) regional public meetings to be conducted by the Transportation Advisory Council (TAC). These public meetings will be held in the following locations:

### JANUARY 11, 2016 at 6:00PM

RI Department of Administration  
William E. Powers Building  
Conference Room A, Second Floor  
One Capitol Hill, Providence, RI

### JANUARY 13, 2016 at 6:00PM

John H. Chaffee Blackstone River Valley Corridor  
Commission Office  
One Depot Square, Woonsocket, RI

### JANUARY 12, 2016 at 6:00PM

Middletown Town Hall  
350 East Main Road, Middletown, RI

### JANUARY 14, 2016 at 6:00PM

South Kingstown Town Hall  
180 High Street, Wakefield, RI

Presentation of an application can be done through an oral or written statement for the record, delivered at one of the meetings. It is recommended that a presentation clearly identify the proposal and briefly describe the project in terms of location and scope of work requested. Although the public meeting dates are confirmed, if there are any changes due to a weather event or any other unforeseen circumstances, information will be posted <http://www.planning.ri.gov/statewideplanning/transportation/tip.php>.

## PROJECT SELECTION CRITERIA

As outlined previously, a key focus of the FFY 17-25 TIP is to better integrate transportation asset management principles into the overall transportation planning process. Projects in the categories of Bridge, Pavement, Traffic and Drainage will be primarily selected using data driven management systems, optimizing the impact of the total investment in Rhode Island's transportation network.

Bridge Projects will be chosen by using the American Association of State Highway and Transportation Officials (AASHTO) BrM (Bridge Management) system, which combines inspection, inventory data collection, and analysis to result in performance-driven project recommendations. The recommendations developed through the use of BrM will be adjusted according to available funding. Any bridge projects submitted through the public process of the TIP will be analyzed to determine whether inclusion of alternate project selections would

maintain or delay target years for attainment of the 90% bridge sufficiency requirement under either funding alternative.

Pavement Projects will be chosen through a method that uses 2014 Pavement Structural Health Index (PSHI) data (ride of the road and structural deficiencies), in conjunction with Average Daily Traffic (ADT) and applies a pavement preservation approach: the right treatment, to the right pavement, at the right time will reduce costs and improve overall pavement conditions. Any pavement projects submitted through the public process of the TIP will be analyzed to determine whether inclusion of alternate project selections would allow the state to maintain target PSHI levels (80%), would fit pavement preservation criteria, and could be included under either funding alternative.

Traffic Projects will be chosen with three primary types of projects as a focus: intersection improvements, corridor improvements, and signal optimization. A cost-benefit analysis will be undertaken for projects, with the target of improving mobility and enhancing safety in a cost effective and efficient manner. Projects submitted through the public process of the TIP will be reviewed to determine whether inclusion would provide similar or improved safety and mobility outcomes under either funding alternative.

Drainage projects will be chosen once a full inventory of the state's drainage structures and associated infrastructure is completed. The state is responsible for an estimated 25,000 stormwater catch basins, 2,000 outfalls, and 100 structural best management practices (stormwater treatment systems). The inventory results will drive development of a plan to invest in critical drainage infrastructure and will allow the state to meet the requirements of the Federal consent decree over the next decade.

Other funding categories, such as Transit Capital and Transportation Alternatives (which may include but are not limited to projects focused on bicycle or pedestrian access, scenic overlooks, historic preservation of transportation facilities, environmental mitigation, recreational trails, etc.), are better suited for selection using a defined set of guiding principles which are outside of objective engineering criteria and take into consideration such things as mobility, cost effectiveness, environmental impact, and economic development. The guiding principles that will be applied to these projects are available at <http://www.planning.ri.gov/statewideplanning/transportation/tip.php>. These projects will be evaluated according to the guiding principles by a subcommittee comprised of staff of the MPO, RIDOT, RIDEM, RIPTA and members of the Transportation Advisory Committee. Although the projects will not be scored using a numeric scoring process, the subcommittee will use guiding principles in their decision making.

## **PREPARATION OF THE DRAFT TIP**

After all of the final recommendations of projects have been compiled using the process outlined above, staff of RIDOT, RIPTA and the MPO will work together to prepare a draft TIP document. This document will include text outlining policies and themes of the TIP, the transportation planning process, and the organization of transportation planning in Rhode Island. In addition to the text, the document will also contain detailed tables listing projects eligible for federal funding by category. For most projects, a description, location, and estimated cost will be provided. Also shown, for most projects, are the phases for which federal funding authorization is anticipated. Once this draft document is prepared, it will be presented to the TAC and a public hearing will be conducted. Following the public hearing, there will be an additional 30 day notice period during which public comment will be accepted. At the close of the public comment period, MPO staff will prepare a summary of all input, which will be presented to the Transportation Advisory Committee and the State Planning Council.

## ADOPTION OF THE TIP

After careful consideration of all public input received, staff of the MPO, RIDOT and RIPTA will work together to prepare a second draft of the TIP to present to the TAC and the State Planning Council acting as the MPO, will adopt the TIP at a public meeting. Once the final draft TIP is approved by the State Planning Council, the document will be forwarded to the Governor for approval and transmitted to the Federal Highway Administration and Federal Transit Agency for final approval.

## ADDITIONAL INFORMATION

The MPO will be providing announcements, updates, and reminders through the Statewide Planning Program's electronic newsletter (subscribe at <http://www.planning.ri.gov/newsletter/index.php>) and on the Division of Planning website at <http://www.planning.ri.gov/>.

The MPO, RIDOT and RIPTA look forward to working cooperatively with municipalities, transportation providers, area non-profit organization and members of the general public in preparing a TIP which results in a program of projects that will optimally invest the State's limited resources resulting in a more multimodal, interconnected transportation network. If you have any questions about the TIP process, please contact Karen Scott, Assistant Chief of the Statewide Planning Program at 401-222-4411 or [karen.scott@doa.ri.gov](mailto:karen.scott@doa.ri.gov).

# Overview of STORMTOOLS Initiatives

Malcolm L. Spaulding et al

Ocean Engineering, University of RI, Narragansett, RI

RI State Planning Council  
Department of Administration Office

November 12, 2015

# Overview of Presentation

- *STORMTOOLS*™ vision
- **Developments completed or in progress**
  - *Flooding Maps for RI*
  - FIRMS for Washington County(including Block Island)
  - Return period analyses for water levels and waves to support design of structure and infra structure in flood impacted areas
  - Artificial Intelligence Neural Network (AINN) based prediction tool for storm surge
  - High resolution forecasting system for RI coastal waters including flooding
  - Hydrological model for Pawtuxet River watershed

# Overview (cont'd)

- **Planned**

  - Development of Coastal Environmental Risk Index (CERI), application to Charlestown and Warren/Barrington, as case examples.

  - Assess risk coastal areas face from flooding and waves, sea level rise, and shoreline erosion/accretion

- **Proposals or white papers**

  - Extension of hydrological model of Pawtuxet River watershed to include effects of climate change
  - Extension of CERI to Washington County
  - **STORMTOOLS** *Flood Risk* app

# STORMTOOLS

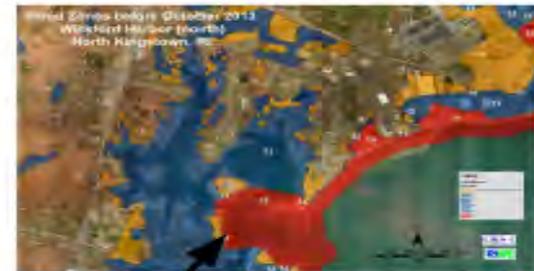
## StormTools Model Setup



Web Interface for Users

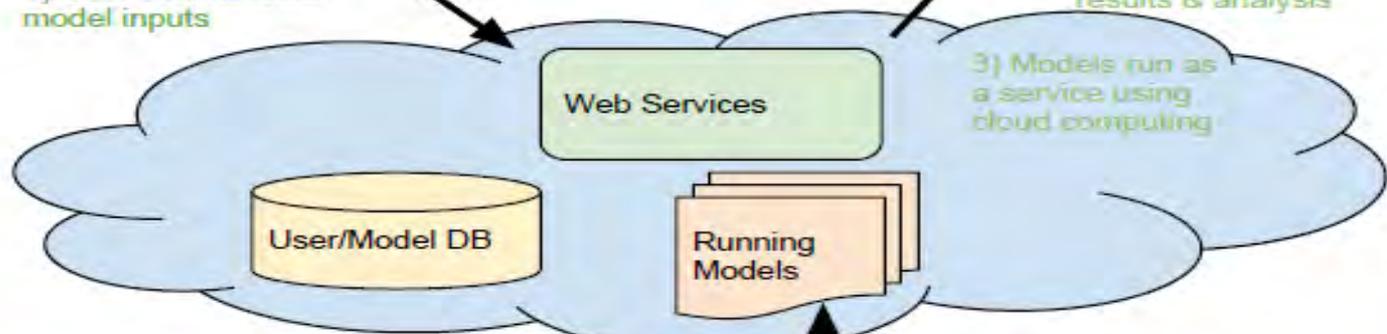
1) User selects local model inputs

## StormTools Model Analysis



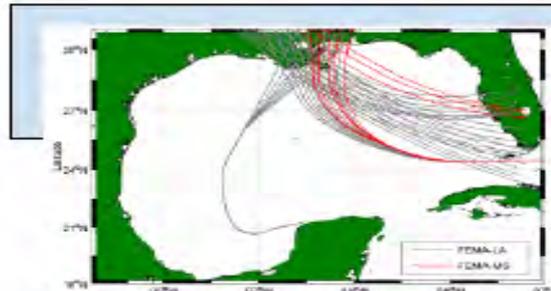
4) User reviews results & analysis

Model Services Hosted in the Cloud

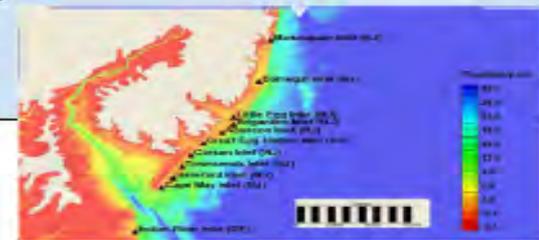


2) NACCS Storm scenarios and CSTORM Save Points force model water level, waves and winds

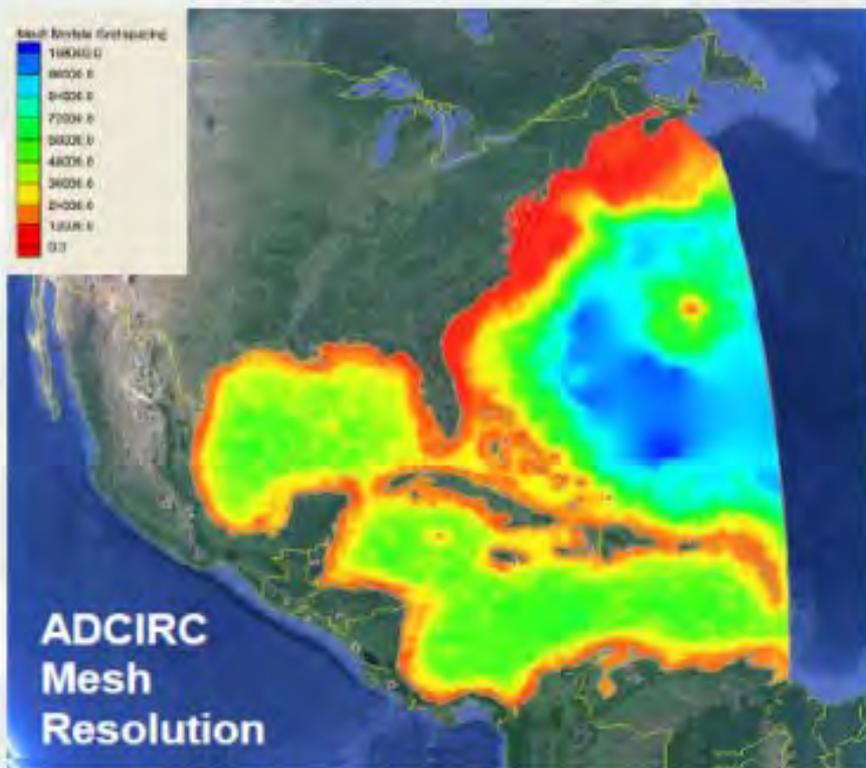
ERDC NACCS Results\*



CSTORM DB



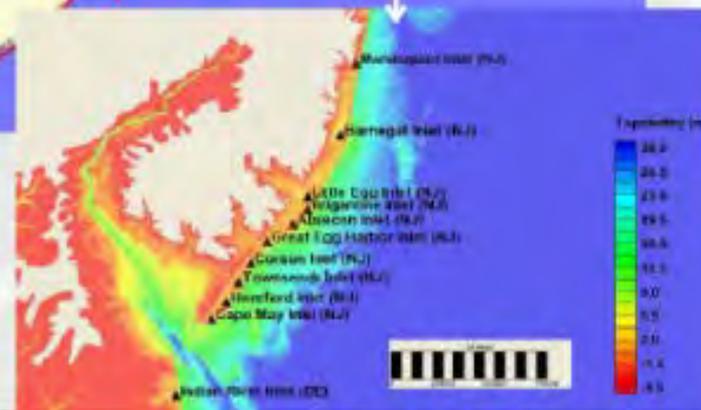
# Grids and Save Points



~ 6.2 million nodes  
Resolution from 10 m to 100 km

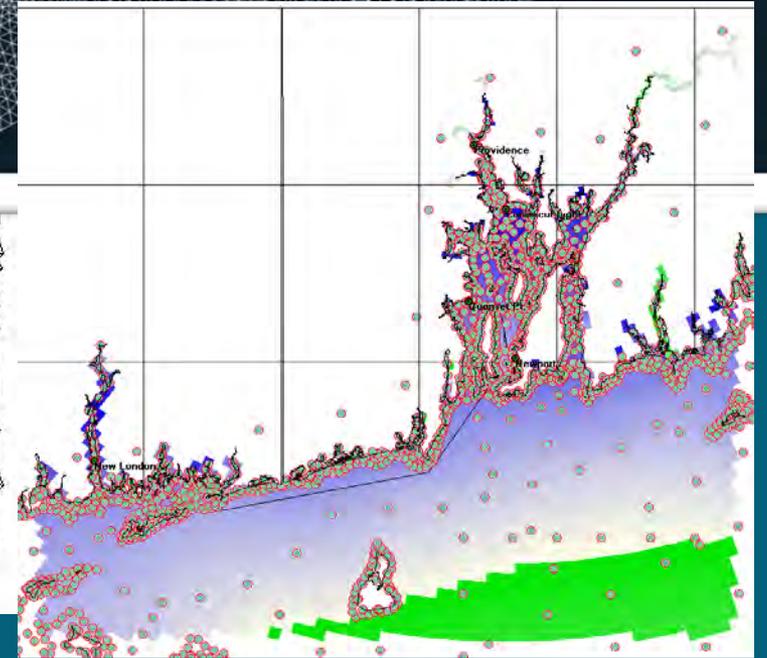
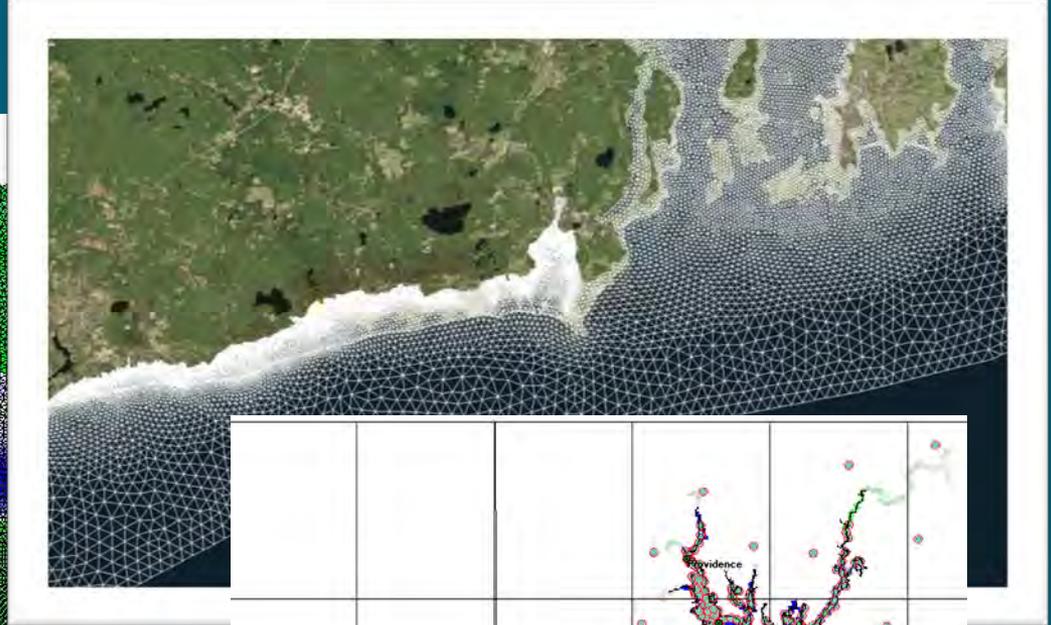
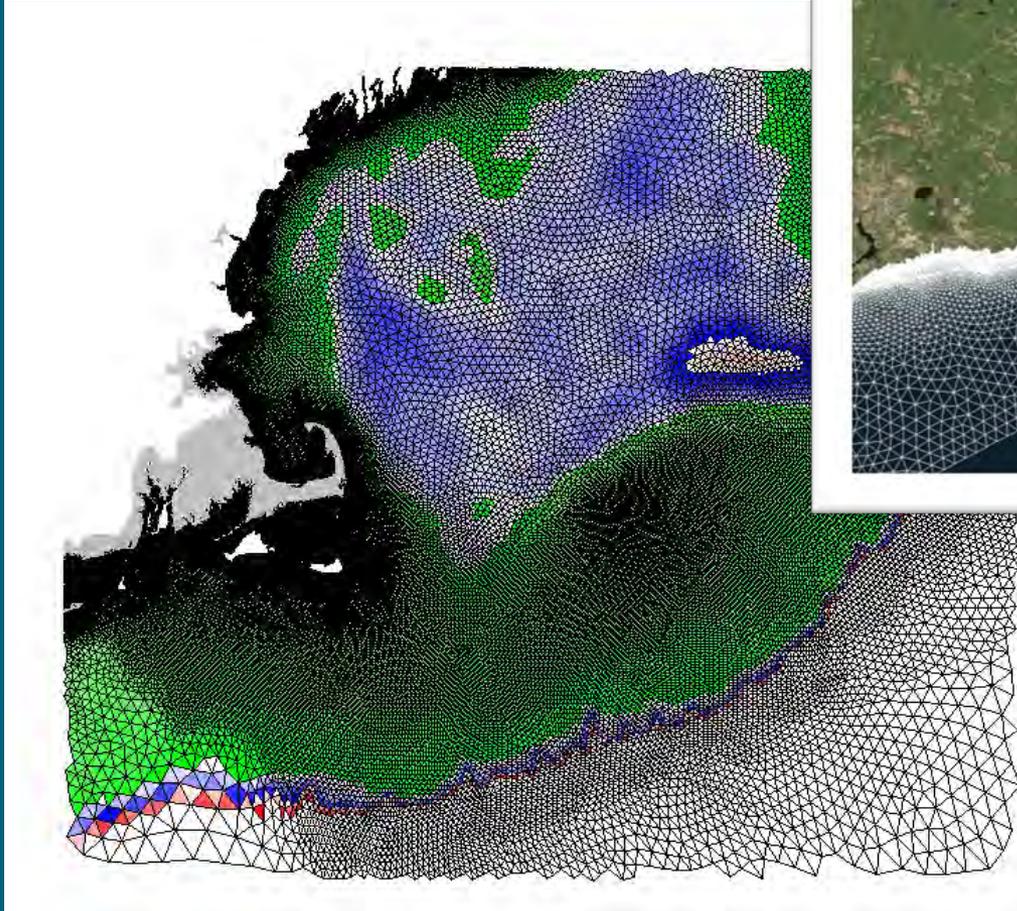


BUILDING STRONG



*Innovative solutions for a safer, better world*

# Army Corps of Engineers (ACOE), NACCS grid and save point for Northeast & southern RI coast



41.46

41.44

41.42

41.4

41.38

41.36

41.34

41.32

3000

2000

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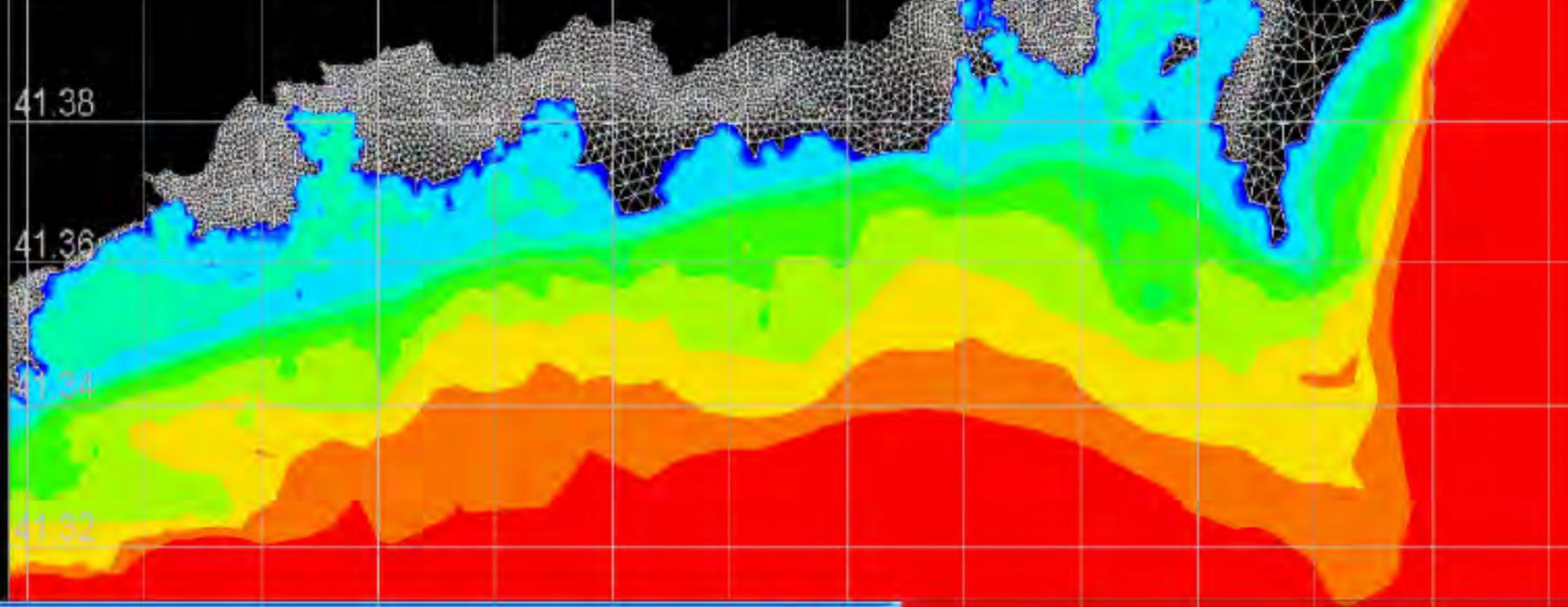
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Animation of  
storm surge  
event with  
coastal  
flooding



00:12



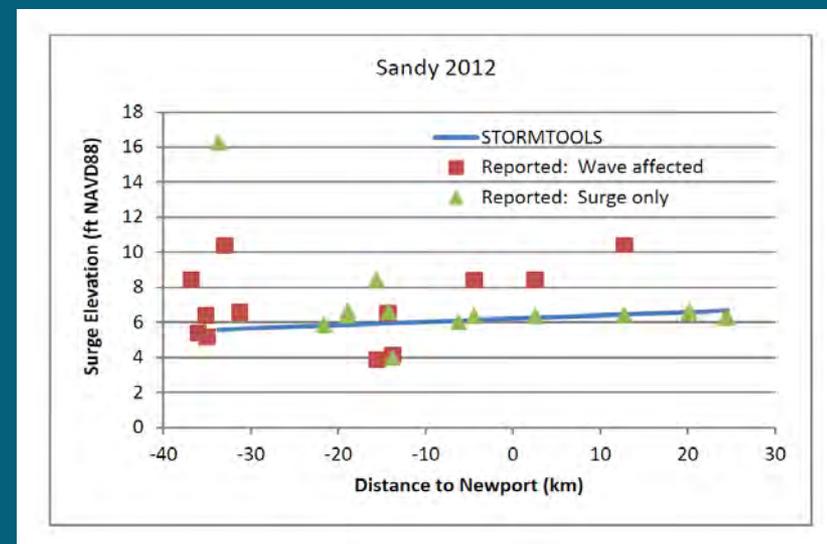
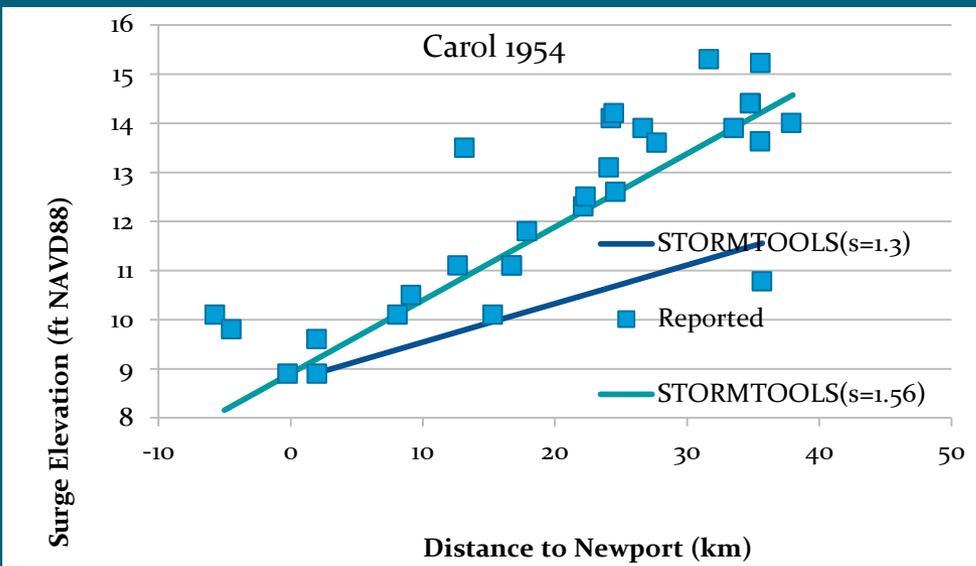
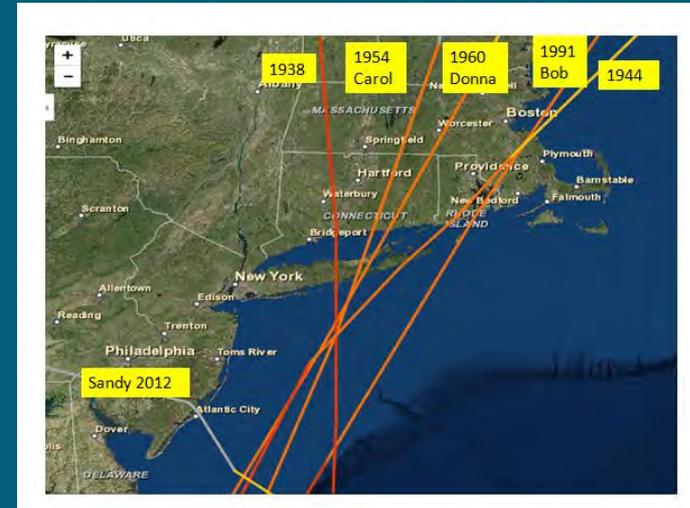
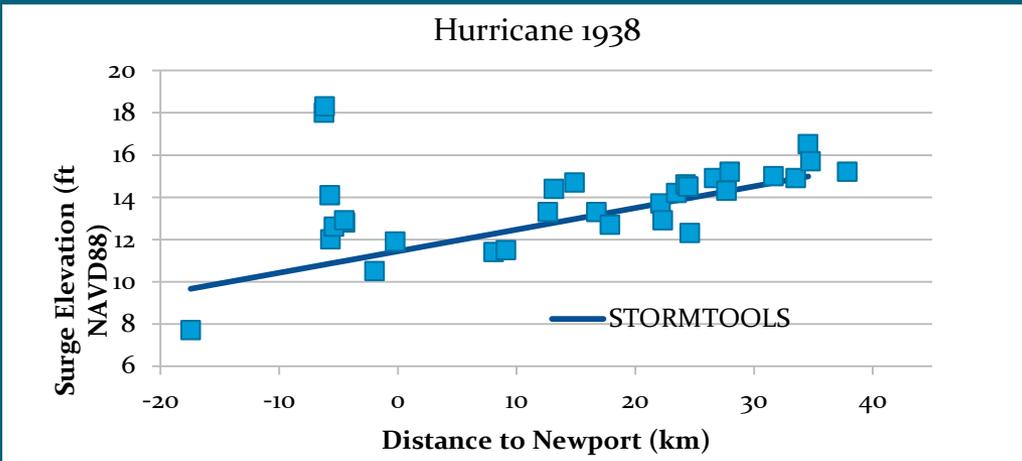
# Flooding Maps for RI

*Goal:* Develop simplified flooding maps for RI, with and without sea level rise, to assist in coastal planning

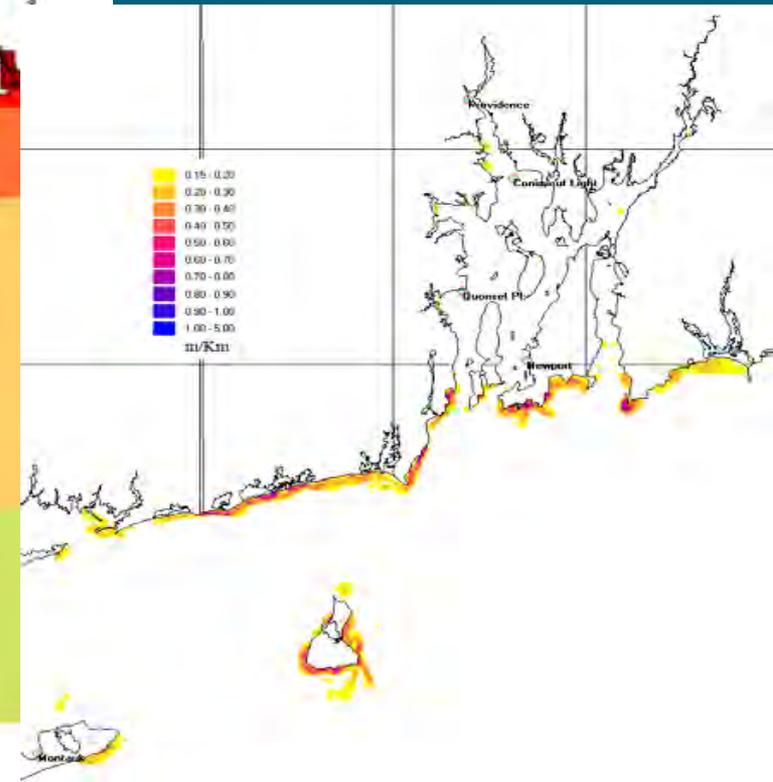
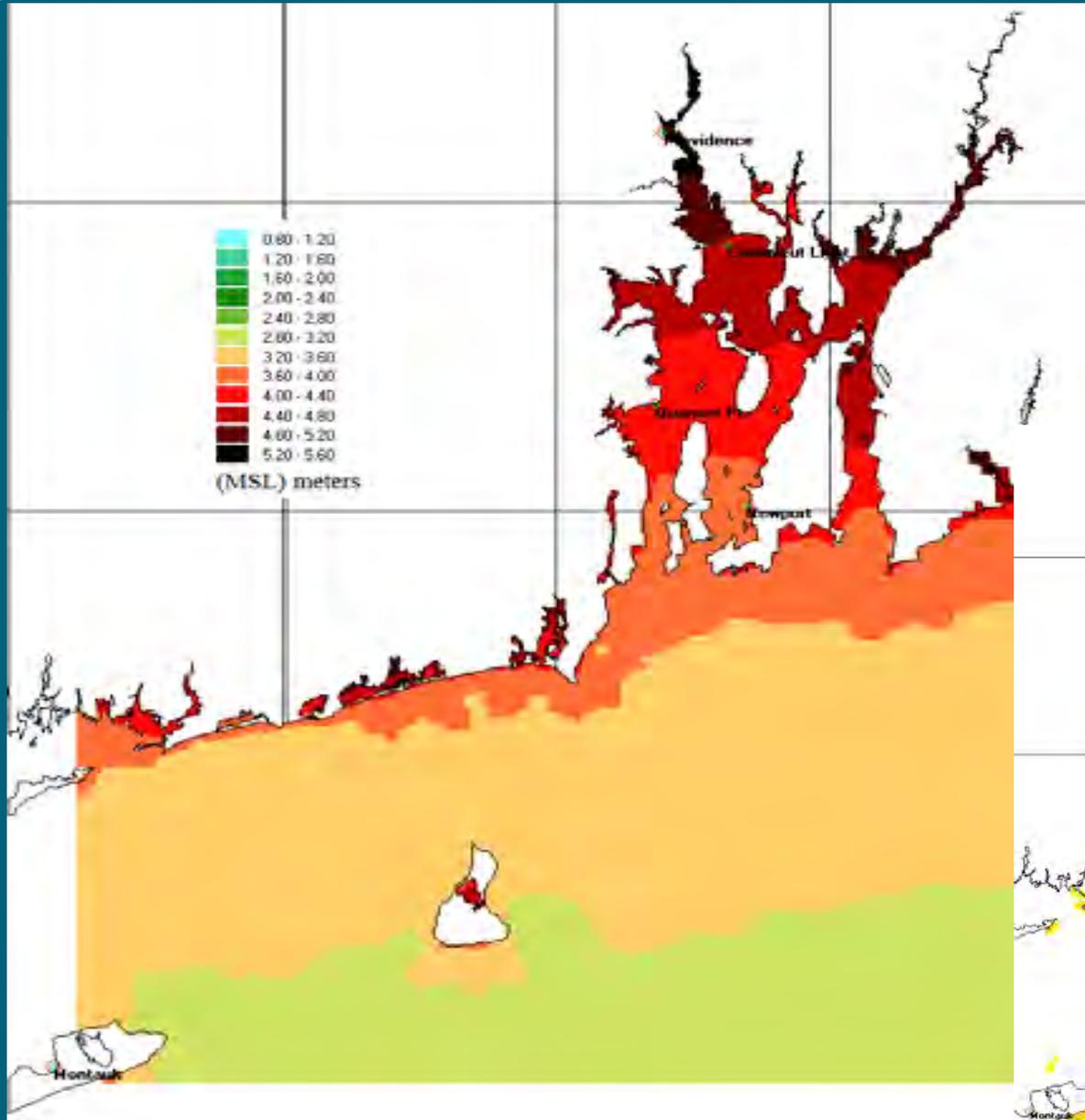
*Method:*

- Use NACCS synthetic tropical storms to scale water levels
- NOAA NOS/ACOE return period analyses
- Make maps accessible via web based, map viewer

# Validation with 1938, 1954, and 2012 hurricanes



# 100 yr water level for upper 95% confidence limit for surge plus tide case NACCS





# Sea Level Rise Estimates for Newport, RI

8452660, Newport, RI

NOAA's Published Rate: 0.00846 feet/yr

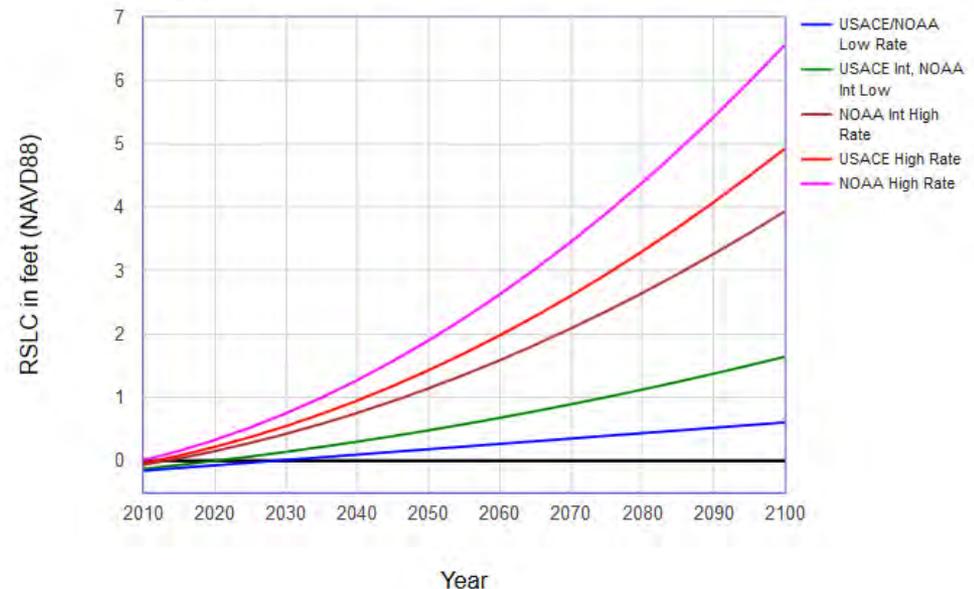
All values are expressed in feet relative to NAVD88

Year	USACE Low NOAA Low	USACE Int NOAA Int Low	NOAA Int High	USACE High	NOAA High
2010	-0.16	-0.13	-0.07	-0.04	0.01
2015	-0.12	-0.07	0.04	0.08	0.16
2020	-0.07	-0.00	0.15	0.22	0.33
2025	-0.03	0.07	0.28	0.37	0.53
2030	0.01	0.14	0.42	0.55	0.75
2035	0.05	0.22	0.58	0.74	1.00
2040	0.10	0.30	0.76	0.95	1.27
2045	0.14	0.39	0.94	1.18	1.57
2050	0.18	0.48	1.14	1.43	1.90
2055	0.22	0.58	1.36	1.70	2.25
2060	0.27	0.68	1.59	1.98	2.63
2065	0.31	0.78	1.83	2.28	3.03
2070	0.35	0.89	2.09	2.61	3.46
2075	0.39	1.00	2.36	2.95	3.91
2080	0.44	1.12	2.65	3.31	4.39
2085	0.48	1.25	2.95	3.68	4.89
2090	0.52	1.37	3.26	4.08	5.43
2095	0.56	1.51	3.59	4.50	5.98
2100	0.60	1.64	3.94	4.93	6.56

Print Table

8452660, Newport, RI  
NOAA's Published Rate: 0.00846 feet/yr

Relative Sea Level Change Projections - Gauge: 8452660, Newport, RI  
(05/01/2014)



# Summary of STORMTOOLS Flooding Maps Available for Rhode Island

## Return period(yrs) and sea level rise (ft)

Return period (yrs)	Sea level rise(ft)					In land Flooding
	None	1	2	3	5	
0	X	X	X	X	X	
25	X	X	X	X		
50	X			X		
100	X	X	X	X	X	
100	X	X	X	X	X	X

## Nuisance Flooding Return periods(yrs)

1      3      5      10

## Historical Storms (NOAA top ranked for RI, hurricanes)

1938    1954    1991    2012

## Matched Pairs, flooding return period and corresponding sea level rise

Return Period (yrs)	25	50	100
Sea level rise (ft)	1	2	5

# Conclusions

- Predictions of flooding with SLR rise available at high resolution (1 m) based on state of the art storm surge modeling (NACCS, 2015)
- Employ extremal analysis methods in conjunction with maps to determine values for various return period
- Maps available via web based map viewer for use by planners and the public.
- Tools available to support coastal engineering (water level and wave height vs return period, on line AI based water level and wave height prediction system)
- Extensions in progress (CERI and STORMTOOLS Flood Risk app)

# STORMTOOLS Web Based Mapping Viewer Access

*Web address:*

<http://www.beachsamp.org/resources/understand-risk/>

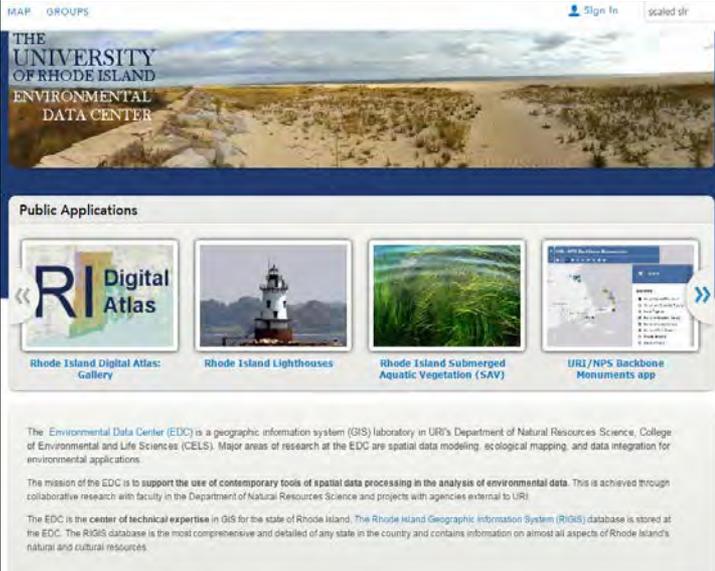
*Contacts:*

Teresa Crean, URI CRC,

[tcrean@crc.uri.edu](mailto:tcrean@crc.uri.edu)

Chris Damon, URI Environmental  
Data Center, [cdamon@edc.uri.edu](mailto:cdamon@edc.uri.edu)

Malcolm Spaulding, URI Ocean  
Engineering, [spaulding@egr.uri.edu](mailto:spaulding@egr.uri.edu)



MAP GROUPS Sign In scaled dr

THE UNIVERSITY OF RHODE ISLAND ENVIRONMENTAL DATA CENTER

Public Applications

RI Digital Atlas Gallery

Rhode Island Lighthouses

Rhode Island Submerged Aquatic Vegetation (SAV)

URI/NPS Backbone Monuments app

The Environmental Data Center (EDC) is a geographic information system (GIS) laboratory in URI's Department of Natural Resources Science, College of Environmental and Life Sciences (CELS). Major areas of research at the EDC are spatial data modeling, ecological mapping, and data integration for environmental applications.

The mission of the EDC is to support the use of contemporary tools of spatial data processing in the analysis of environmental data. This is achieved through collaborative research with faculty in the Department of Natural Resources Science and projects with agencies external to URI.

The EDC is the center of technical expertise in GIS for the state of Rhode Island. The Rhode Island Geographic Information System (RIGIS) database is stored at the EDC. The RIGIS database is the most comprehensive and detailed of any state in the country and contains information on almost all aspects of Rhode Island's natural and cultural resources.



## Using STORMTOOLS to Assess Coastal Risk In Rhode Island

RI State Planning Council– November 12, 2015

*Teresa A. Crean, AICP, URI Coastal Resources Center / RI Sea Grant*



# STORMTOOLS:

## Maps of Storms + Sea Level Rise



100 Year Base Flood Level



Base Flood Plus 1' SLR



Base Flood Plus 2' SLR



Base Flood Plus 3' SLR



Base Flood Plus 5' SLR



## VISUALIZATIONS

Maps flooding from a  
10, 25, 50, 100-year storm  
PLUS Sea Level Rise on most  
recent LiDAR / Digital Elevation  
Models of Rhode Island

*Provide accurate depiction of  
future flooding risk*

## APPLICATIONS

Day-to-Day operations

Long term planning/financing



TO: Municipal Planners; Planning Boards; Municipal Administrators; Public Works Officials; Emergency Managers; and Floodplain Coordinators  
FROM: CRMC Rhode Island Shoreline Change Special Area Management Plan (Beach SAMP) Team  
DATE: June 3, 2015  
RE: Tools and Resources to Assist in Natural Hazard and Climate Change Planning

## INTRODUCTION

The purpose of this memo to coastal municipalities is to share resources and tools that may assist coastal cities and towns in planning for the impacts of natural hazards and climate change. Some of these tools are new or recently adopted by the Rhode Island Coastal Resources Management Council (CRMC), and others are existing planning maps that have been made easier to locate and use.

These tools and resources will aid in planning for natural hazards and climate change in municipal comprehensive plans as required by the *Rhode Island Comprehensive Planning and Land Use Act* (RIGL 45-22.2). In particular, these resources will help to assess the impacts of:

- Storm surge and sea level rise;
- Salt marsh migration in response to sea level rise; and
- Shoreline change and erosion.

## TOOLS & RESOURCES

### RESILIENT COMMUNITIES: Natural Hazards and Climate Change

**Adaptation:** *A how-to guide on incorporating natural hazards planning and climate change adaptation into local comprehensive plans.*

[www.beachsamp.org](http://www.beachsamp.org)

By 2016, Rhode Island cities and towns will need to plan for natural hazards and the impacts of climate change within their community's local comprehensive plan. This how-to guide and presentation was created as a resource for coastal municipalities on how to conduct a preliminary vulnerability assessment and adopt climate change adaptation strategies into the local comprehensive plan. While every community is different and will follow a unique planning process, this

# Current Beach SAMP Tools & Resources

- Memo to municipalities
  - Planners
  - Council Presidents
  - Emergency Managers
  - Boards/Commissions
- Series of memos to share Beach SAMP tools/resources, findings and recommendations

# www.beachsamp.org

[About](#) [Project Partners](#) [Contact Us](#)

## RI CRMC Shoreline Change Special Area Management Plan

[Home](#) [News](#) [Events](#) [Resources & Tools](#) [Coastal Property Guide](#) [Management Plan](#) [Get Involved](#)

### STORMTOOLS

[Understand Risk](#)  
[Plan and Act](#)  
[Meeting Videos](#)

#### STORMTOOLS For Beginners

STORMTOOLS for Beginners is a one-map stop for all residents of Rhode Island to better understand their risk from coastal inundation. This map allows you to enter an address in Rhode Island, and get answers to 3 questions about your property:



1. Is my property vulnerable to STORM SURGE?;
2. How DEEP will the water be on my property during a 100-year (1% chance) coastal storm?; and
3. Will projected SEA LEVEL RISE affect my property?

**Step-by-Step Quick Guide to accessing STORMTOOLS Mapping:**

Search ...



#### Recent Posts

- o Elevation Drowning Salt Marshes October 22, 2015
- o Rhode Island Working to Adapt to Climate Change October 16, 2015
- o Documentary takes dire look at sea level October 8, 2015
- o NOAA Fisheries Celebrates Aquaculture Week September 28, 2015
- o SEPTEMBER 29: Film Shored-up and Panel Discussion September 4, 2015
- o OCTOBER 2: Salt Marsh Tour September 4, 2015
- o SEPTEMBER 25: South Kingstown Coastal Erosion Walking Tour September 4, 2015
- o Tracking changes to our shoreline August 26, 2015
- o Nature or Nurture for Storm-Damaged Coastlines? August 7, 2015

## RI CRMC Shoreline Change Special Area Management Plan

### The Science Behind STORMTOOLS

#### Information about the maps:

A simplified method to map storm inundation with and without sea level rise for varying return periods has been developed and implemented for RI coastal waters. The method, described in [Spaulding and Isaji \(2014\)](#), is based on using the water level vs return periods at the NOAA gauging station at Newport, RI and scaling the values, based on the prediction of high resolution storm simulations performed by NOAA using their Sea, Lake and Overland Surges from Hurricanes (SLOSH) model, to estimate inundation levels for varying return periods for the coastal waters of the state. Predictions are provided for once in 25, 50, and 100 yr return periods (at the upper 95% confidence level), with sea level rises of 1, 2, 3, and 5 ft (0.3, 0.6, 0.9, and 1.52 m).

STORMTOOLS: Web tools to support coastal resilience analysis and planning for storms and sea level rise

#### STORMTOOLS Overview

The vision of this effort is to develop a system called STORMTOOLS that provides access to a suite of coastal planning tools (numerical models and others) available as a web service. This allows the Rhode Island user to select a coastal area of interest to access, use and apply high resolution model information. The initial suite of tools would include those used in existing operational models (e.g. Northeast Coastal Ocean Forecasting System, NECOFS) or hindcasts planned under the U.S. Army Corps of Engineers', North Atlantic Coast Comprehensive Study (NACCS)- CSTORM initiative to predict winds, waves, and currents. The models will link directly to the forecast or hindcast fields provided by these large scale models. The models and associated databases will reside on the web server site and run remotely via the web. Our goal is to pilot STORMTOOLS in Rhode Island, and then make it available to the rest of the Northeast, as the tools can be easily adapted to others in the region.

The system will either be hosted by a government agency, a regional collaborative organization (one of the recently formed Regional Ocean Councils, IOOS Regional Association), or reside on the cloud (cloud to coast). The system would allow new high resolution study domains to be developed and pre-established, high resolution grids could be made available for areas of particular interest.

Search ...



#### Recent Posts

- [New tools give coastal communities a leg up on adaptation planning](#)
- [Start thinking now: Public comment period for Beach SAMP document opens](#)
- [Have a say in state guidance to help coastal communities adapt to climate change](#)
- [2015 Lecture Series!](#)
- [DEM SEEK NOMINATIONS](#)
- [Adaptation Report Online: Newport Resilience Assessment Tour \(NRAT\)](#)
- [Adaptation Information: Guidance for Municipalities Powerpoint](#)
- [Visual Summary of Adaptation Practices](#)
- [Rescheduled Coastal State Discussion Series for April 28th, 2015](#)
- [New Pilot Projects in Rhode Island](#)

# STORMTOOLS

## 25-year Storm Event + sea level rise

## Police / Fire / EMA

- Service areas cutoff or limited by flooding?
- Facilities at risk of being offline from flooding?

ArcGIS - Individual Inundation Layers for a 25-Year Storm Event Plus Sea Level Rise



# STORMTOOLS

## 25-year Storm Event + sea level rise

- Police / Fire / EMA
- First responders
- Recovery efforts

ArcGIS - Individual Inundation Layers for a 25-Year Storm Event Plus Sea Level Rise

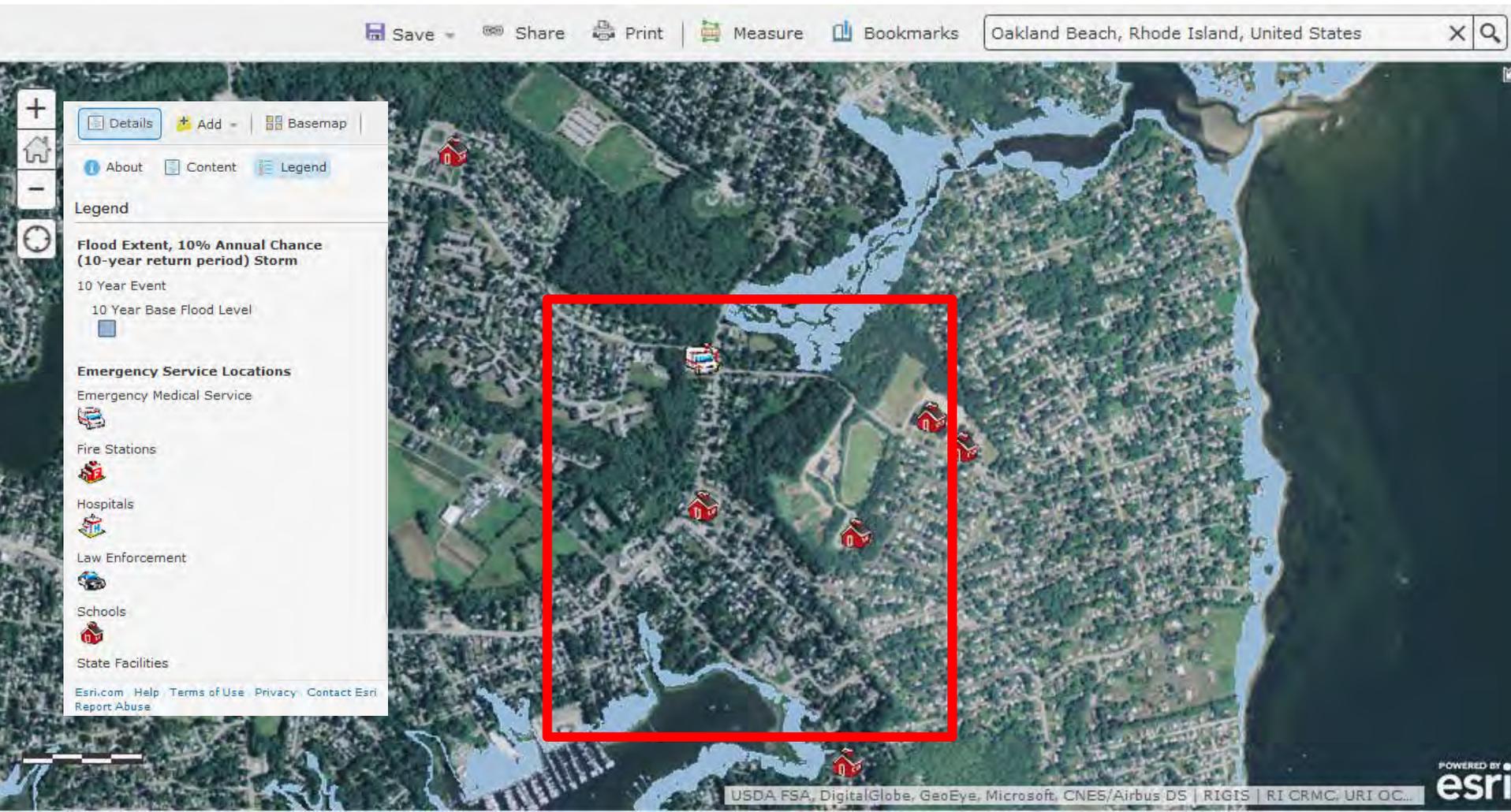


# STORMTOOLS

## 10-year “nuisance flooding”

## Police / Fire / EMA

- Service areas cutoff or limited by flooding?
- Facilities at risk of being offline from flooding?



# STORMTOOLS

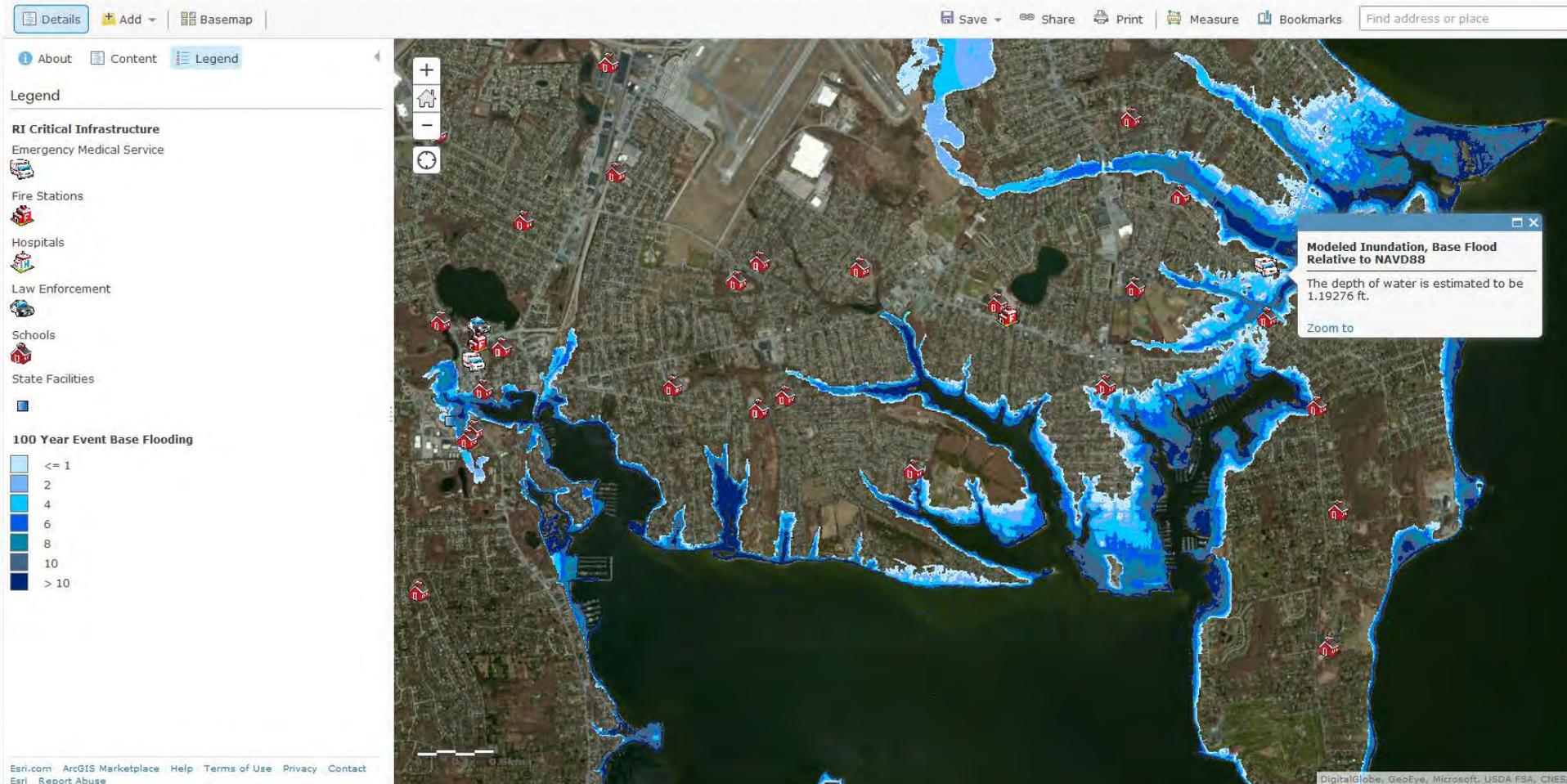
## 100-year Storm Event, water depths

## Police / Fire / EMA

- Service areas cutoff or limited by flooding?
- Facilities at risk of being offline from flooding?

ArcGIS Water Depths for a 100 Year Storm Event Plus the Influence of 1', 2', 3' and 5' of Sea Level Rise

NEW



# STORMTOOLS

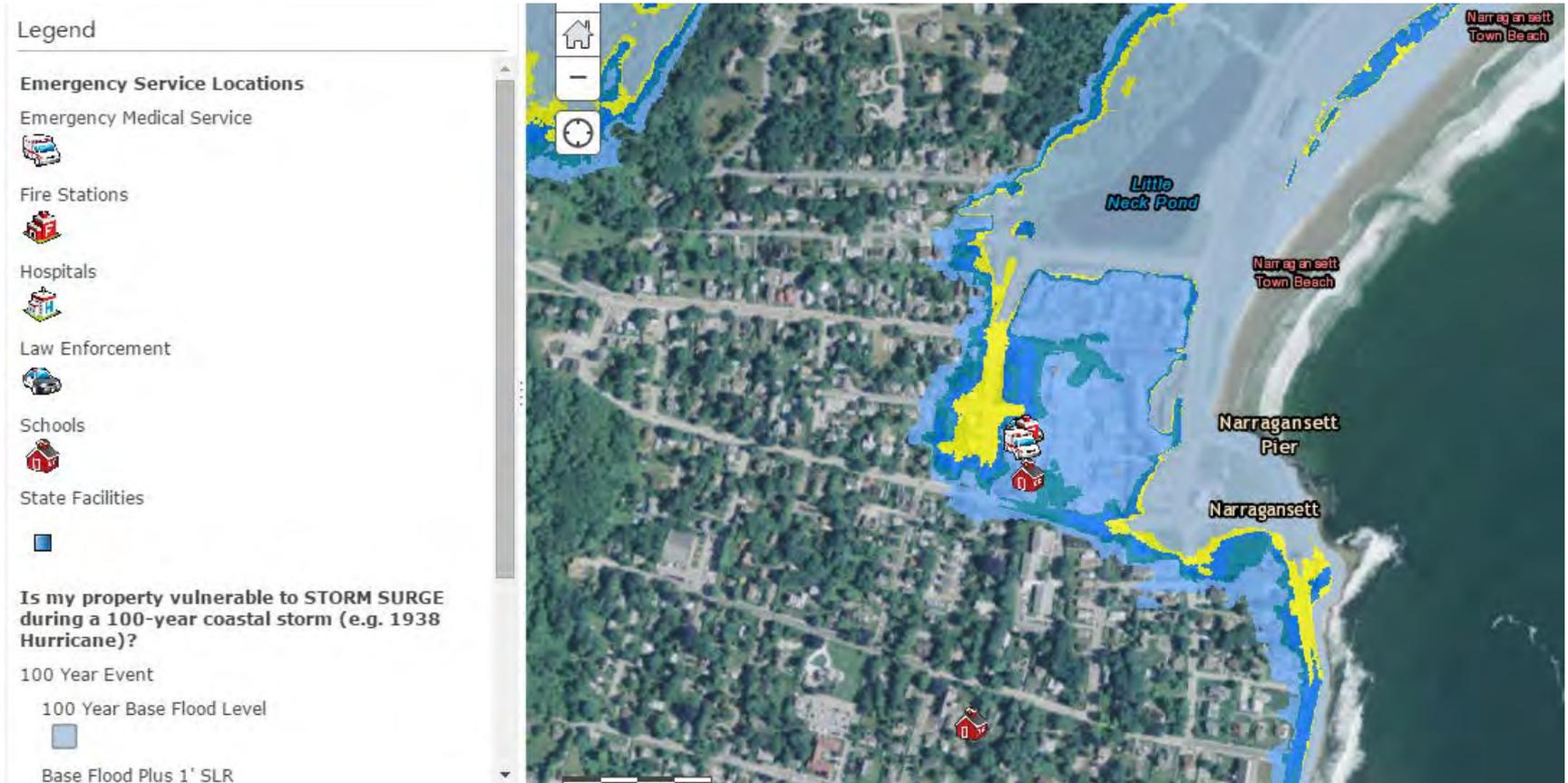
## 100-year Storm Event +SLR

### Police / Fire / EMA

- Service areas cutoff or limited by flooding?
- Facilities at risk of being offline from flooding?

### - Transportation

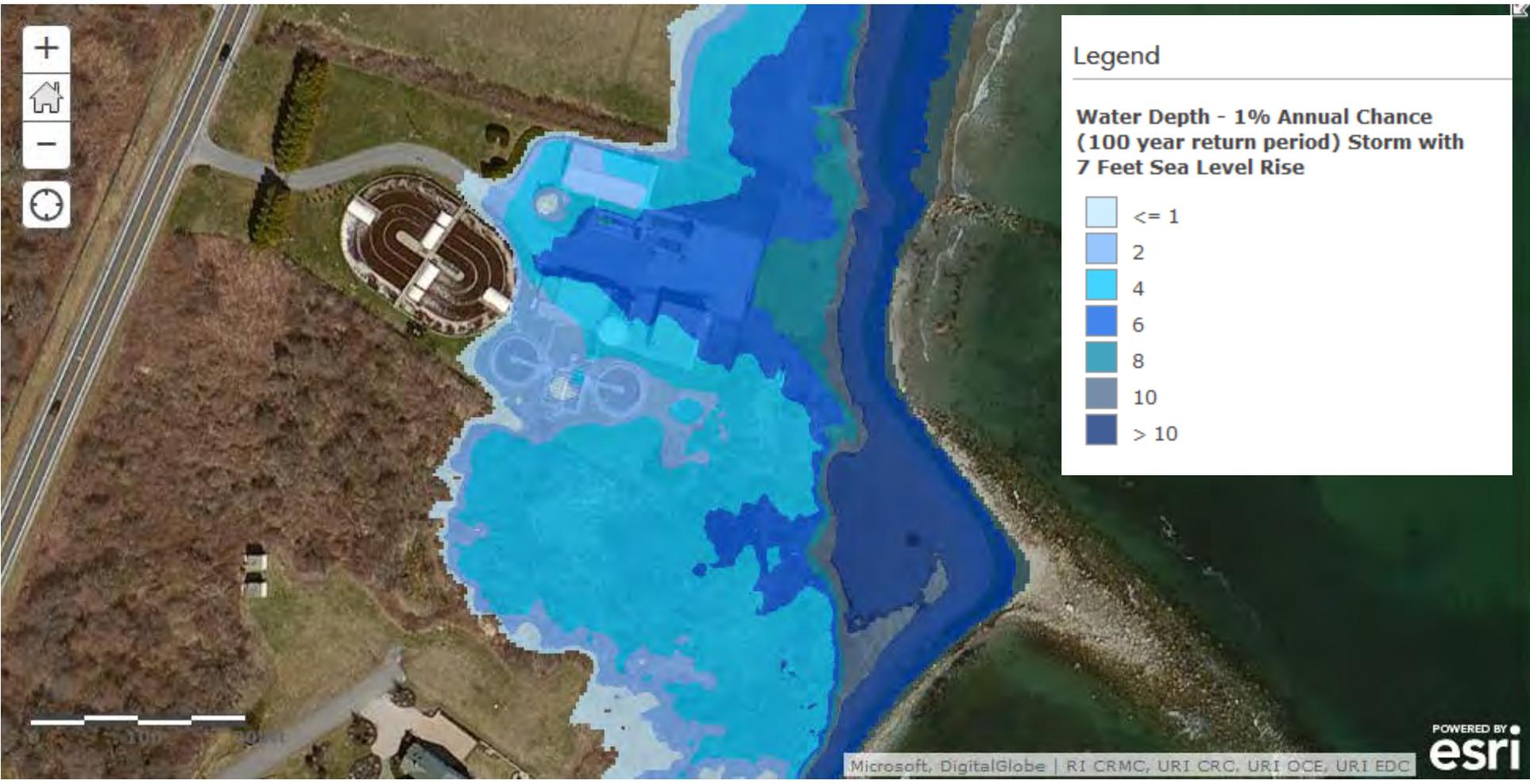
- Evacuation routes
- Functionality and service areas
- Alternate routes / road relocations
- Design life of infrastructure/assets



# STORMTOOLS

100-year Storm Event +  
7 feet SLR

Critical Infrastructure  
-Wastewater Treatment  
Facilities



# STORMTOOLS

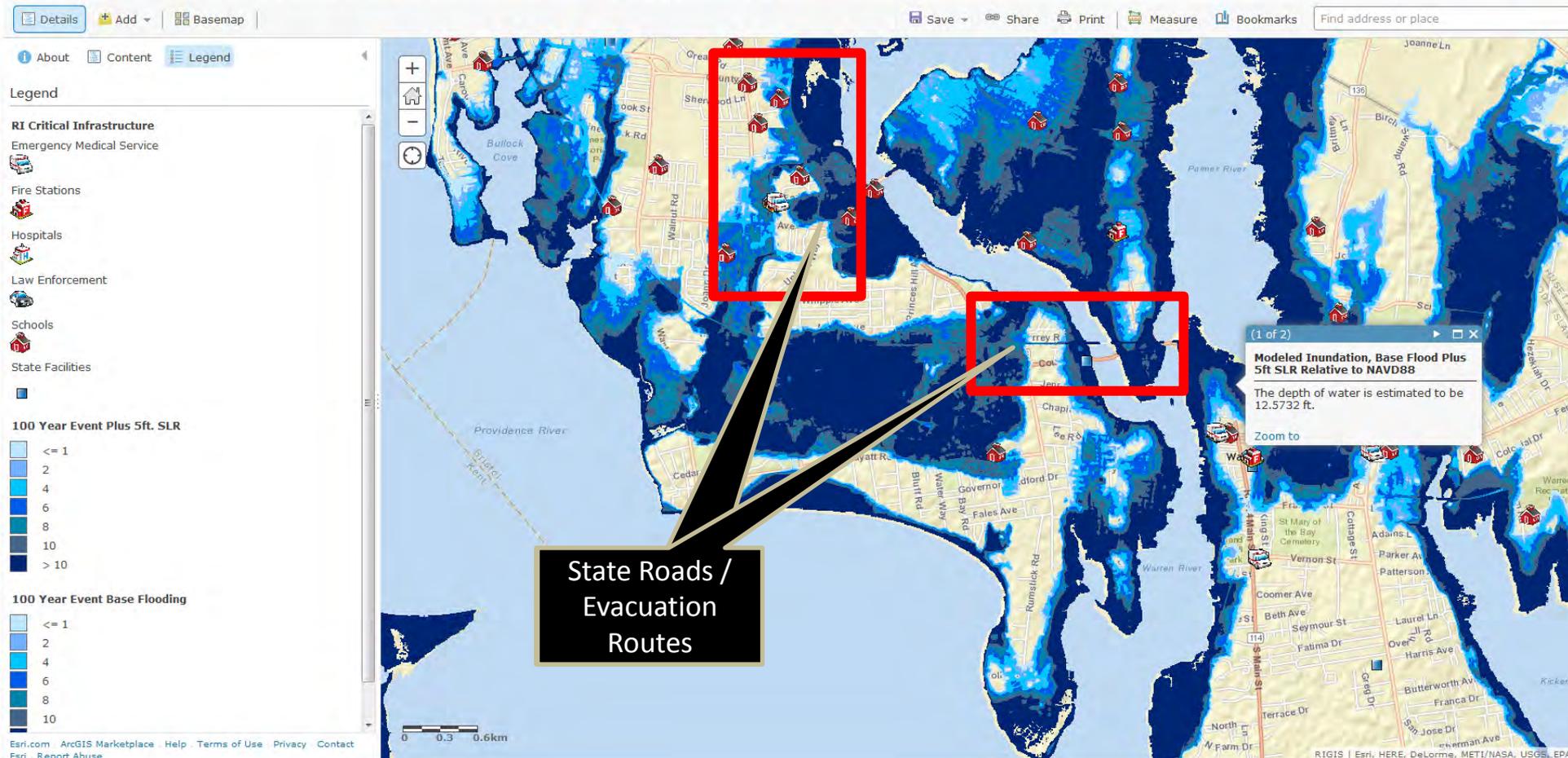
## 100-year Storm Event + 5-feet SLR, water depths

## BARRINGTON / WARREN - Transportation

- Evacuation routes
- Functionality and service areas
- Alternate routes / road relocations
- Design life of infrastructure/assets

ArcGIS - Water Depths for a 100 Year Storm Event Plus the Influence of 1', 2', 3' and 5' of Sea Level Rise

NEW MAP





## RIE911: Statewide Roads (20131231)



State of Rhode Island: E 9-1-1 Uniform Emergency Telephone System: Statewide Roads

Feature Layer by DOA\_S.White\_RIState

Source: Feature Service

Last Modified: January 20, 2014

(0 ratings, 1,208 views)

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### Description

#### Mapping



The RI E 9-1-1 mapping project captures GIS (Geographic Information Systems) data consisting of information such as site location of buildings, streets, fire hydrants, public places, public telephones and driveway access points. In collecting the necessary data, employees drive a Jeep Grand Cherokee with lettering which identifies its 9-1-1 function. They drive every street and road in Rhode Island, stopping at each structure to obtain or verify an address, capture the latitude and longitude of each structure, and take a digital photograph of it. All of this information is displayed on a digital map at the RI E 9-1-1 Telecommunicator's console, enabling the call taker to assist emergency response agencies find locations of callers more quickly, whether it be a wireline or wireless call.

#### The GIS Data Development Project

Rhode Island was the first statewide 9-1-1 system in the United States to be capable of receiving "Phase II" 9-1-1 wireless call location information. The system's GIS Data Development Project commenced in FY 2001. RI E 9-1-1 field-captures GIS data and this data is then integrated with other data layers on maps.

RI E 9-1-1 GIS data collection offers other benefits to State and local governments: the development or enhancement of databases that can be utilized for area-wide emergency notification, for



**Legend**

**RIE911: Statewide Roads (20131231)**

—

**25 Year Event Plus 1ft. SLR**

Lightest Blue	<= 1
Light Blue	2
Medium Blue	4
Dark Blue	6
Teal	8
Dark Teal	10
Dark Blue	> 10

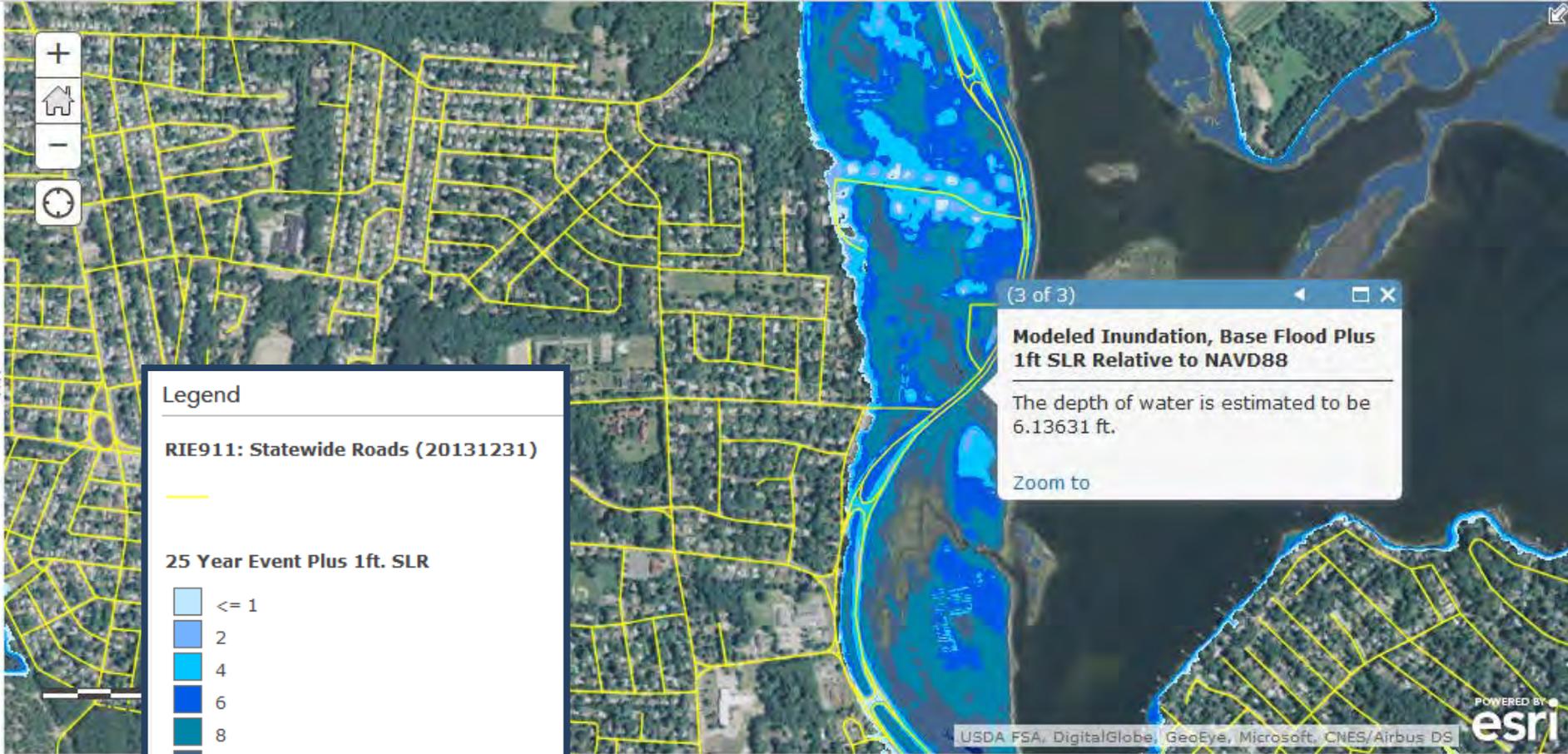
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(1 of 3) ▶ □ ✕

**e911Roads13q4**

FID	66,820
UpdateDate	September 29, 2013
Comments	
StreetID	156,152.00
RouteNumbe	114
StreetClas	30
SurfaceTyp	1
Miles	0.00
Oneway	N
RouteInclu	1.00
PrimaryNam	WAMPANOAG TRL
ALIName	WAMPANOAG TRL

Zoom to



### Legend

RIE911: Statewide Roads (20131231)

25 Year Event Plus 1ft. SLR

- <= 1
- 2
- 4
- 6
- 8
- 10
- > 10

(3 of 3)

**Modeled Inundation, Base Flood Plus 1ft SLR Relative to NAVD88**

The depth of water is estimated to be 6.13631 ft.

Zoom to

# “STORMTOOLS FOR BEGINNERS”

STEP 1: Enter an address

STEP 2: Click on the question you want to answer

The screenshot shows the ArcGIS web interface for 'STORMTOOLS for Beginners'. The browser address bar displays the URL: [www.arcgis.com/home/webmap/viewer.html?webmap=a54ede99a2704409a320183de01766b68&extent=-72.3165,41.1025,-70.2881,41.968](http://www.arcgis.com/home/webmap/viewer.html?webmap=a54ede99a2704409a320183de01766b68&extent=-72.3165,41.1025,-70.2881,41.968). The page title is 'ArcGIS - STORMTOOLS for Beginners'. The search bar, containing the text 'Find address or place', is circled in pink. The 'Contents' panel on the left is circled in green and lists several questions:

- Emergency Service Location
- Rhode Island Addressed Structures
- Will future SEA LEVEL RISE affect my property?
- Is my property vulnerable to STORM SURGE during a 100-year coastal storm (e.g. 1938 Hurricane)?
- How DEEP will the water be during a 100-year coastal storm on my property?
- Is my property in a FEMA Flood Zone?

The main map area shows a satellite view of a coastal region with yellow and blue overlays. The bottom right corner features the 'POWERED BY' logo for 'Earthstar Geographics' and 'esri'.

# “STORMTOOLS FOR BEGINNERS”

Step 1: Enter an address

Step 2: Click on the question you want to answer

***“Is my property vulnerable to STORM SURGE during a 100-year coastal storm (e.g. 1938 Hurricane)?”***

**(flood extent map)**

ArcGIS - STORMTOOLS for Beginners

NEW MAP CREATE PRESENTATION Teresa

Details Add Basemap

Save Share Print Measure Bookmarks

55 Brown St, North Kingstown, Rhode Island, USA

About Content Legend

Legend

Emergency Service Locations

Emergency Medical Service

Fire Stations

Hospitals

Law Enforcement

Schools

State Facilities

Is my property vulnerable to STORM SURGE during a 100-year coastal storm (e.g. 1938 Hurricane)?

100 Year Event

100 Year Base Flood Level

Base Flood Plus 1' SLR

Base Flood Plus 2' SLR

Base Flood Plus 3' SLR

Base Flood Plus 5' SLR



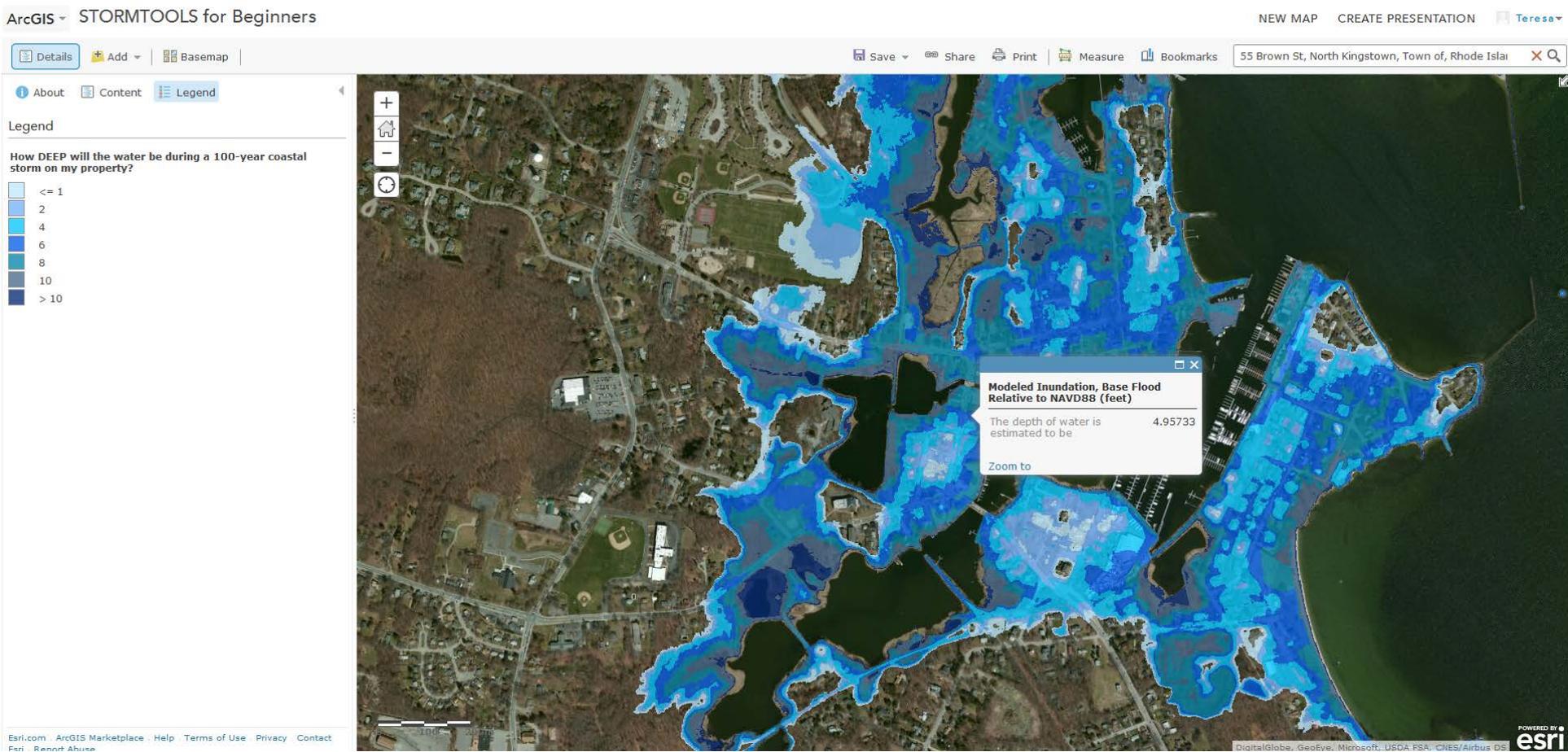
# “STORMTOOLS FOR BEGINNERS”

Step 1: Enter an address

Step 2: Click on the question you want to answer

*“How DEEP will the water be during a 100-year coastal storm on my property?”*

(water depth map)



# “STORMTOOLS FOR BEGINNERS”

Step 1: Enter an address

Step 2: Click on the question you want to answer

***“Will future SEA LEVEL RISE affect my property  
(with 2 tides per day, every day)?”***

**(sea level rise scenario map)**

The screenshot displays the ArcGIS STORMTOOLS for Beginners web application interface. The top navigation bar includes the title "ArcGIS - STORMTOOLS for Beginners" on the left and "NEW MAP CREATE PRESENTATION Teresa" on the right. Below the navigation bar is a toolbar with icons for "Details", "Add", "Basemap", "Save", "Share", "Print", "Measure", and "Bookmarks". The search bar contains the address "55 Brown St, North Kingstown, Town of, Rhode Islai".

On the left side, there is a legend panel titled "Legend" with a sub-heading "Will future SEA LEVEL RISE affect my property?". Underneath, it lists "Sea Level Rise Scenarios" with four color-coded categories: "MHHW Plus 1' SLR" (yellow), "MHHW Plus 2' SLR" (blue), "MHHW Plus 3' SLR" (teal), and "MHHW Plus 5' SLR" (light blue). The main map area shows an aerial view of a residential area with these sea level rise scenarios overlaid. A location popup window is visible over the map, displaying the address "55 Brown St, North Kingstown, Town of, Rhode Island, 02852" and the text "Not what you wanted?".

At the bottom of the page, there is a footer with links for "Esri.com", "ArcGIS Marketplace", "Help", "Terms of Use", "Privacy", "Contact", and "Esri Report Abuse". On the right side of the footer, it says "POWERED BY esri" and "DigitalGlobe, GeoEye, Microsoft, USDA FSA, CNES/Airbus DS".

# "STORMTOOLS FOR BEGINNERS"

## E911 Addressed Structures & Water Depth

Legend

### Rhode Island Addressed Structures

#### Rhode Island E911 Sites

- Miscellaneous
- Airport
- Campground
- Commercial
- Development Site
- Public Telephone
- Industrial
- Public Service
- Residential
- Utility

How DEEP will the water be during a 100-year coastal storm on my property?

<= 1

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Modify Map Sign In

Share Print Measure

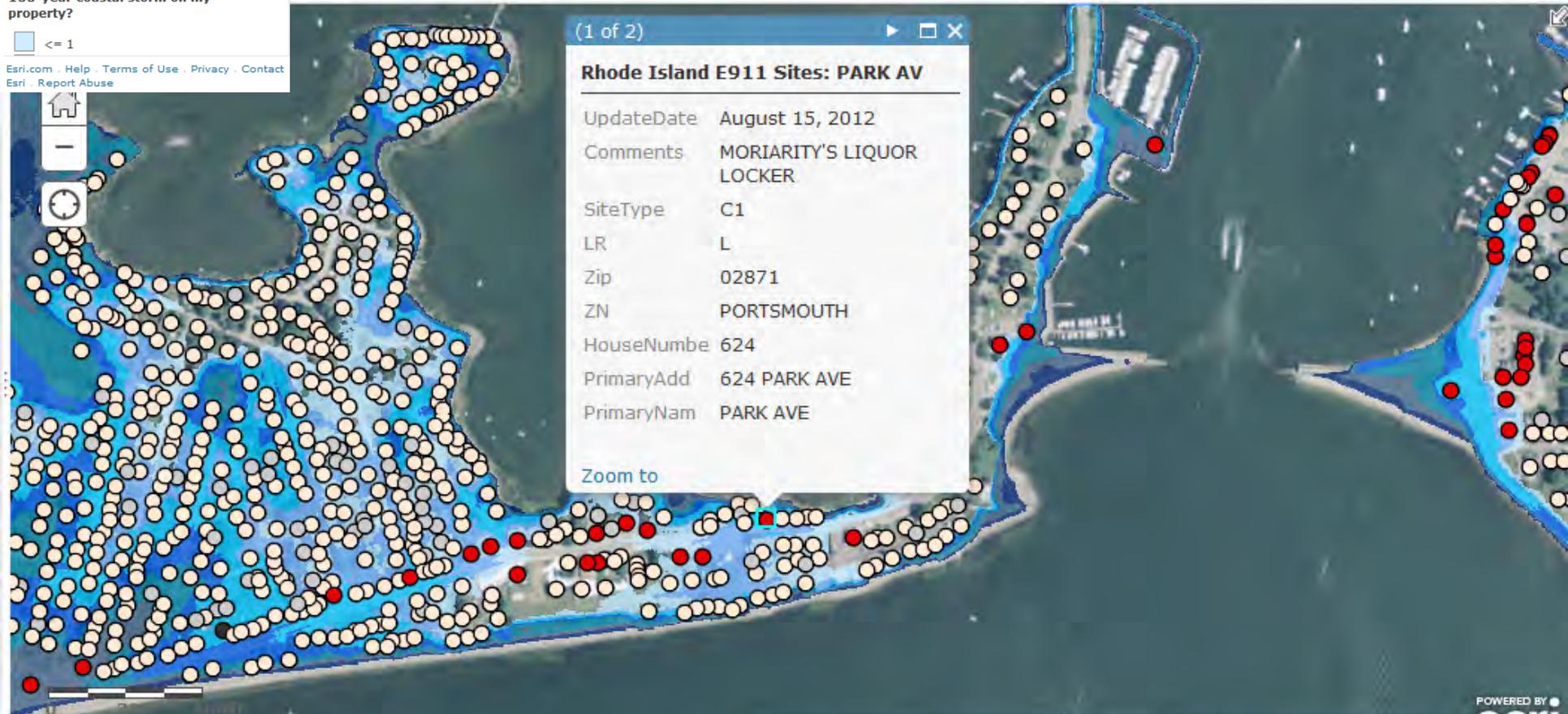
Find address or place

(1 of 2)

**Rhode Island E911 Sites: PARK AV**

UpdateDate	August 15, 2012
Comments	MORIARITY'S LIQUOR LOCKER
SiteType	C1
LR	L
Zip	02871
ZN	PORTSMOUTH
HouseNumbe	624
PrimaryAdd	624 PARK AVE
PrimaryNam	PARK AVE

Zoom to



# "STORMTOOLS FOR BEGINNERS"

## E911 Addressed Structures & Water Depth

Legend

### Rhode Island Addressed Structures

#### Rhode Island E911 Sites

- Miscellaneous
- Airport
- Campground
- Commercial
- Development Site
- Public Telephone
- Industrial
- Public Service
- Residential
- Utility

How DEEP will the water be during a 100-year coastal storm on my property?

<= 1

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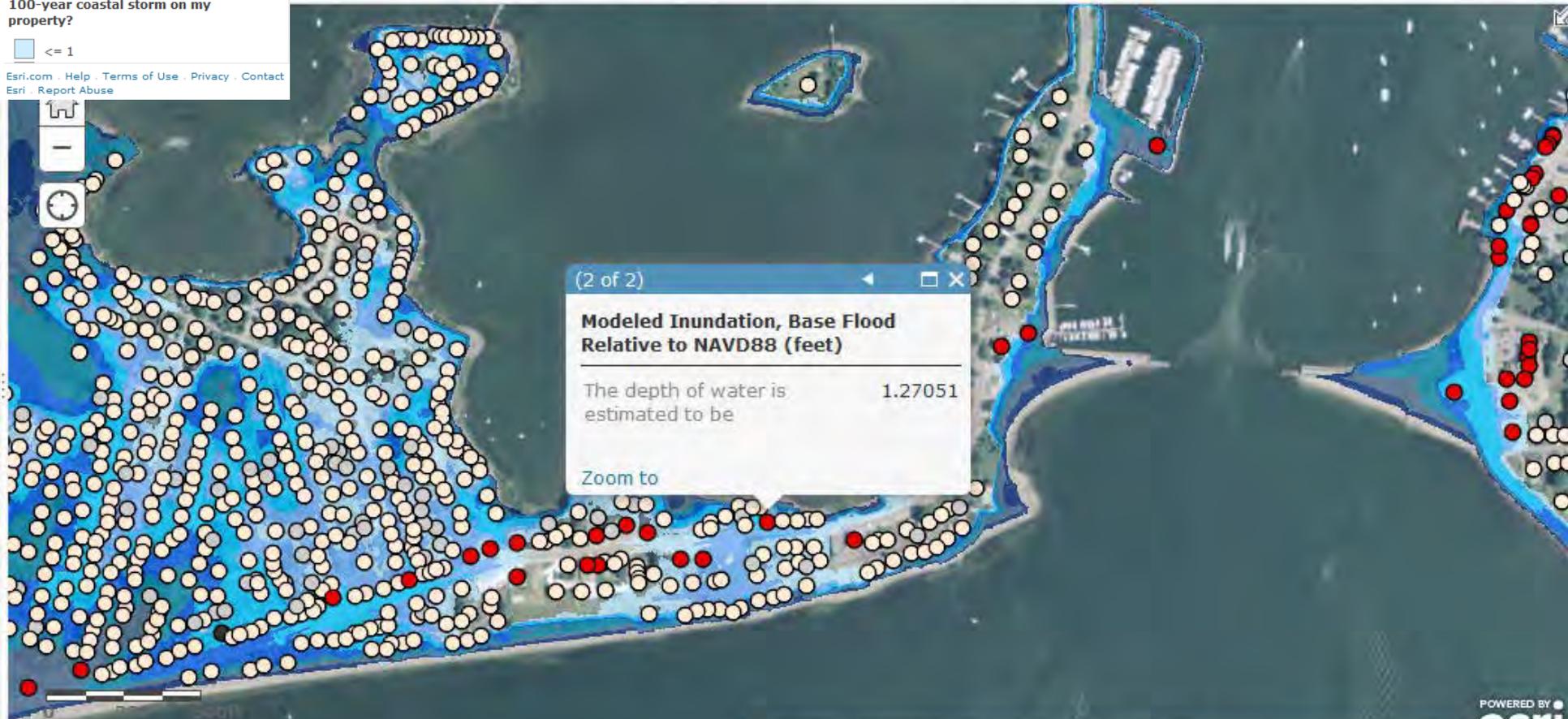
Modify Map  Sign In

 Share

 Print

 Measure

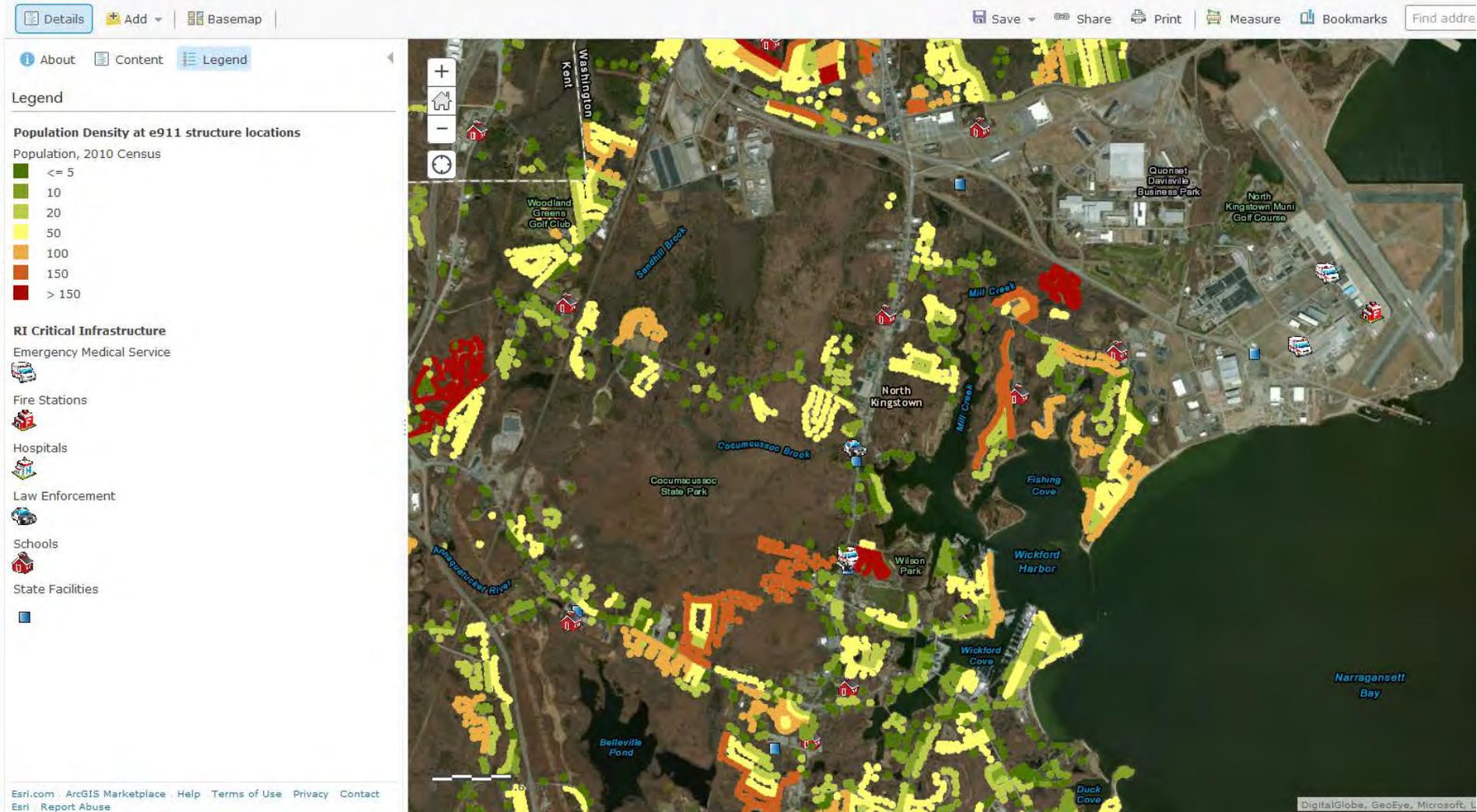
Find address or place



# “STORMTOOLS FOR MUNICIPALITIES”

Train professionals who will use the tool to access and import data sets for more advanced analysis

ArcGIS Stormtools for Practitioners

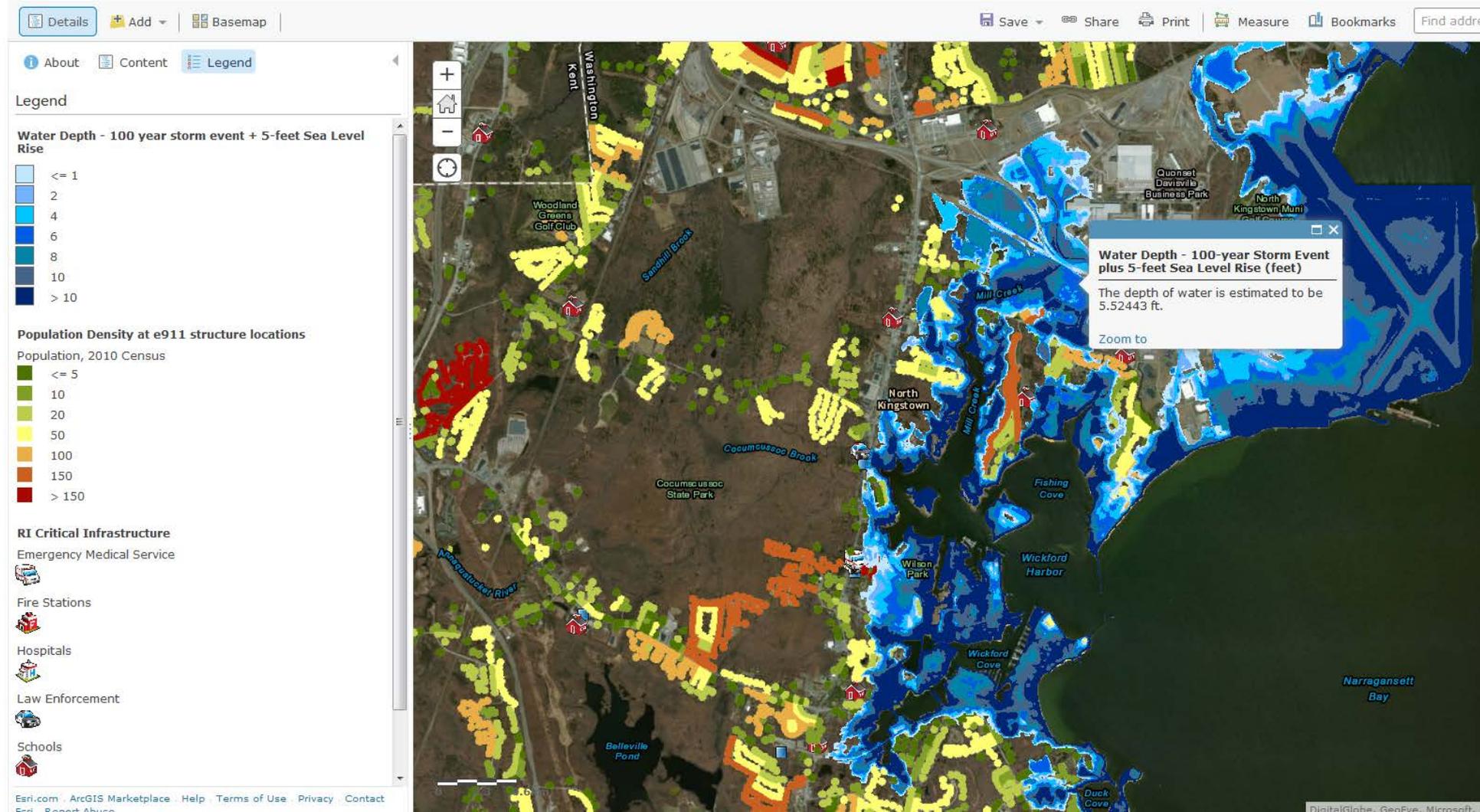


# “STORMTOOLS FOR MUNICIPALITIES”

Train professionals who will use the tool to access and import data sets for more advanced analysis

ArcGIS Stormtools for Practitioners

NEW



# Using STORMTOOLS for Projects: Green & Resilient Infrastructure Program (GRIP)

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grip warwick



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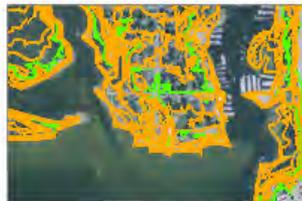
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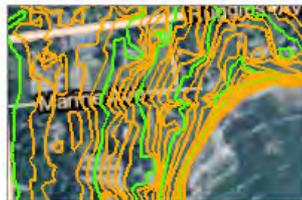
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DOI GRIP maps - Warwick  
Web Map by tcrean  
Last Modified: October 8, 2015  
(0 ratings, 0 comments, 110 views)



Open Details

GRIP - Newport/Marine Ave  
DOI GRIP maps - Warwick  
Web Map by tcrean  
Last Modified: September 18, 2015  
(0 ratings, 0 comments, 30 views)



GRIP - North Kingstown  
DOI GRIP maps - Warwick

What types of items can I find here?

Advanced search options

Finding layer packages and other ArcGIS desktop content.

# Using STORMTOOLS for Projects: Green & Resilient Infrastructure Program (GRIP)

ArcGIS - GRIP - Warwick/Oakland Beach

Modify Map  Sign In

 Details  Basemap

 Share  Print  Measure  

 About  Content  Legend

**Legend**

**Flood Extent, 4% chance storm (25 yr return)**

25 Year Event

- 25 Year Base Flood Level
- Base Flood Plus 1' SLR
- Base Flood Plus 2' SLR
- Base Flood Plus 3' SLR
- Base Flood Plus 5' SLR
- Mean Higher High Water (MHHW)



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# Using STORMTOOLS for Projects: Green & Resilient Infrastructure Program (GRIP)

ArcGIS - GRIP - Warwick/Oakland Beach

Modify Map Sign In

Details Basemap

Share Print Measure Find address or place

About Content Legend

**Legend**

**RI\_E911\_Site\_Types**

- Miscellaneous
- Airport
- Campground
- Commercial
- Development Site
- Public Telephone
- Industrial
- Public Service
- Residential
- Utility

**Flood Extent, "Nuisance Storm" 10% Annual Chance (10-Year) Storm**

10 Year Event

10 Year Base Flood Level

**Rhode Island E911 Sites: OAKLAND BEACH AV**

UpdateDate	January 9, 2011
Comments	IGGY'S DOUGHBOYS & CHOWDERHOUSE
ESiteID	330,548
MCode	134
PSiteID	-999
SiteType	C1
LR	R
Zip	02889
ESN	350
Measure	1.61
ParcelNum	
Zoom to	

Stender Blvd

Sea View Dr

4.00

2.00

0 50 100

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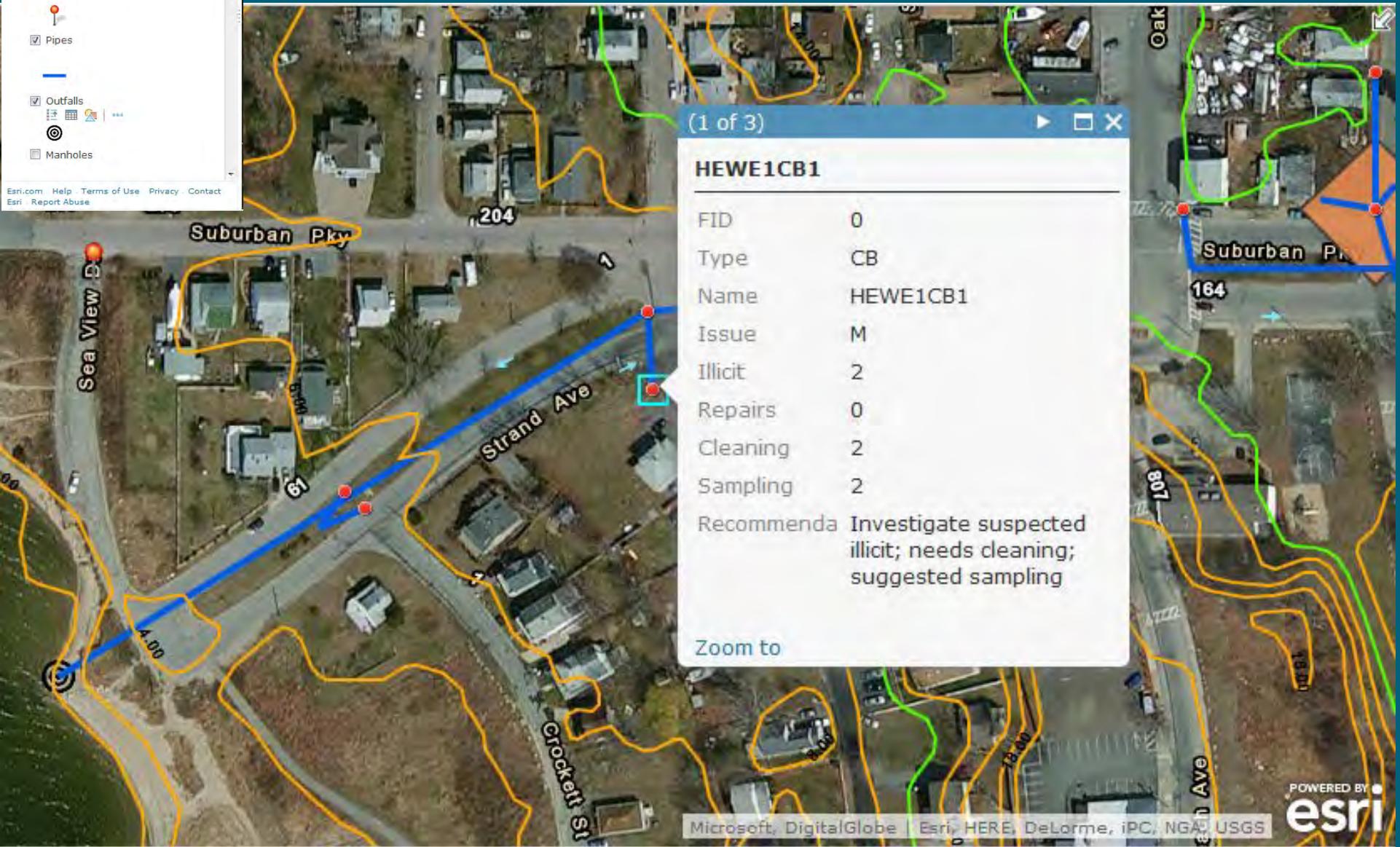
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# Using STORMTOOLS for Projects: Green & Resilient Infrastructure Program (GRIP)



(1 of 3)

**HEWE1CB1**

FID	0
Type	CB
Name	HEWE1CB1
Issue	M
Illicit	2
Repairs	0
Cleaning	2
Sampling	2
Recommendations	Investigate suspected illicit; needs cleaning; suggested sampling

Zoom to

# Coastal Environmental Risk Index (CERI)

**Goal:** Develop a Coastal Environment Risk Index (CERI) - summary of the risk coastal areas face from storm included flooding and the associated wave environment, sea level rise, and shoreline erosion/accretion.

**Uses:** Assess current risk (damage and costs) to structures and infrastructure; evaluate impact of alternate development/management/resilience strategies on risk.

## ***Building Blocks***

- STORMTOOLS flood inundation and wave height maps.
- RI Shoreline Change Maps (erosion/accretion) and transects.

## Damage vs depth function (ACOE, NACCS, 2015)

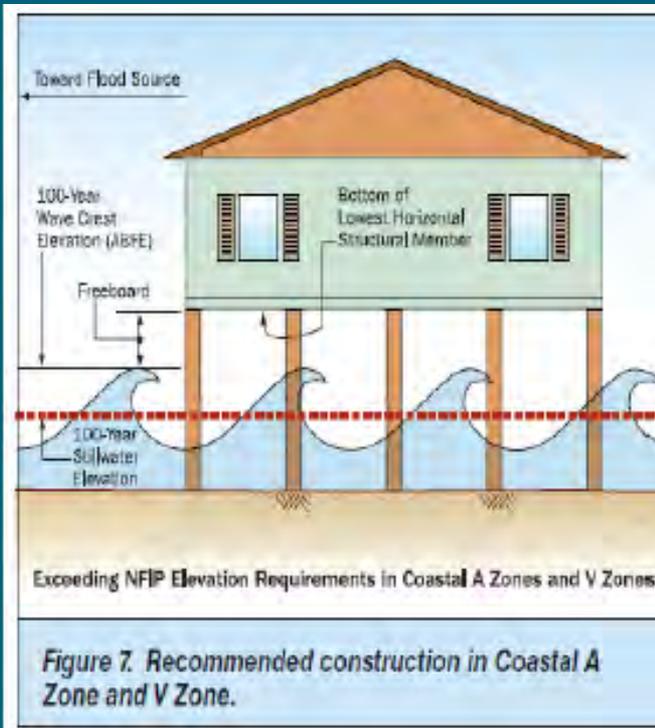


Figure 7. Recommended construction in Coastal A Zone and V Zone.

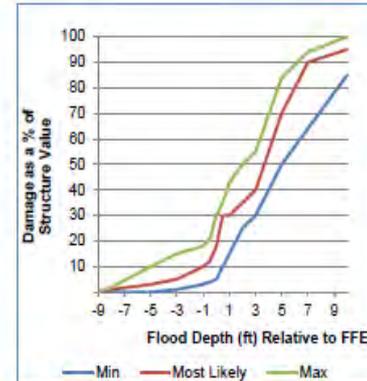


Figure 93. Prototype 6A: Single-Story Residence with Basement, Inundation Damage - Structure

Table 75. Prototype 6A: Single-Story Residence with Basement, Inundation Damage - Structure

Flood Depth	Min	Most Likely	Max
-9	0	0	0
-8	0	1	2
-5	0	3	10
-3	1	5	15
-1	3	10	18
-0.5	4	12	21
0	5	18	30
0.5	10	30	35
1	15	30	43
2	25	35	50
3	30	40	55
5	50	70	84
7	64	90	94
10	85	95	100

## Waves

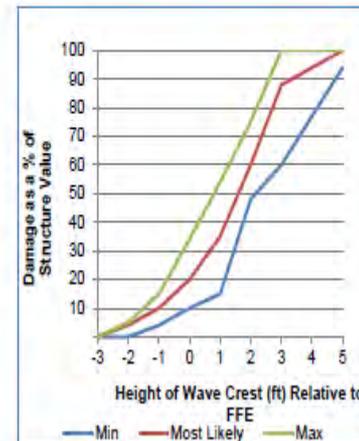


Table 79. Prototype 6A: Single-Story Residence with Basement, Wave Damage - Structure

Wave Crest	Min	Most Likely	Max
-3	0	0	0
-2	0	4	5
-1	4	10	15
0	10	20	34
1	15	35	54
2	48	60	75
3	60	88	100
5	94	100	100

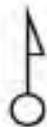
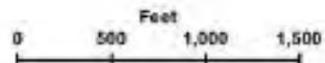
# Inundation Extent for a 100yr Event With 5' Sea Level Rise

## Inundation Extent Water Depths (ft)



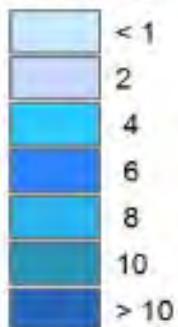
## Structure Type

- Commercial/Industrial
- Emergency Service
- Public Gathering Location
- Residential Housing
- Utility



# Inundation Extent for a 100yr Event With 5' Sea Level Rise

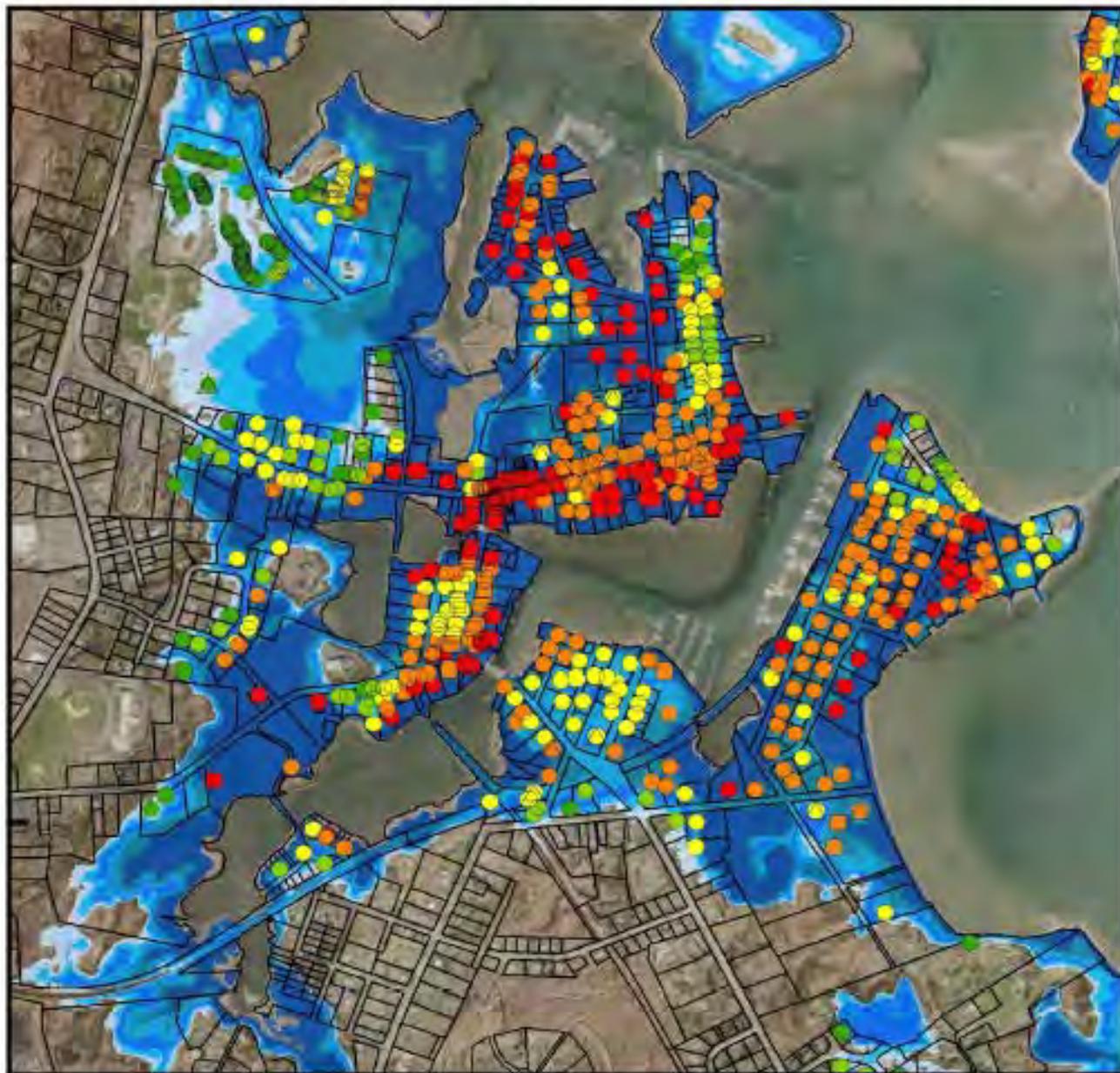
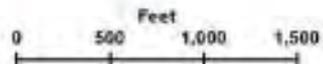
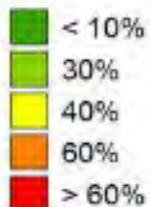
## Inundation Extent Water Depths (ft)



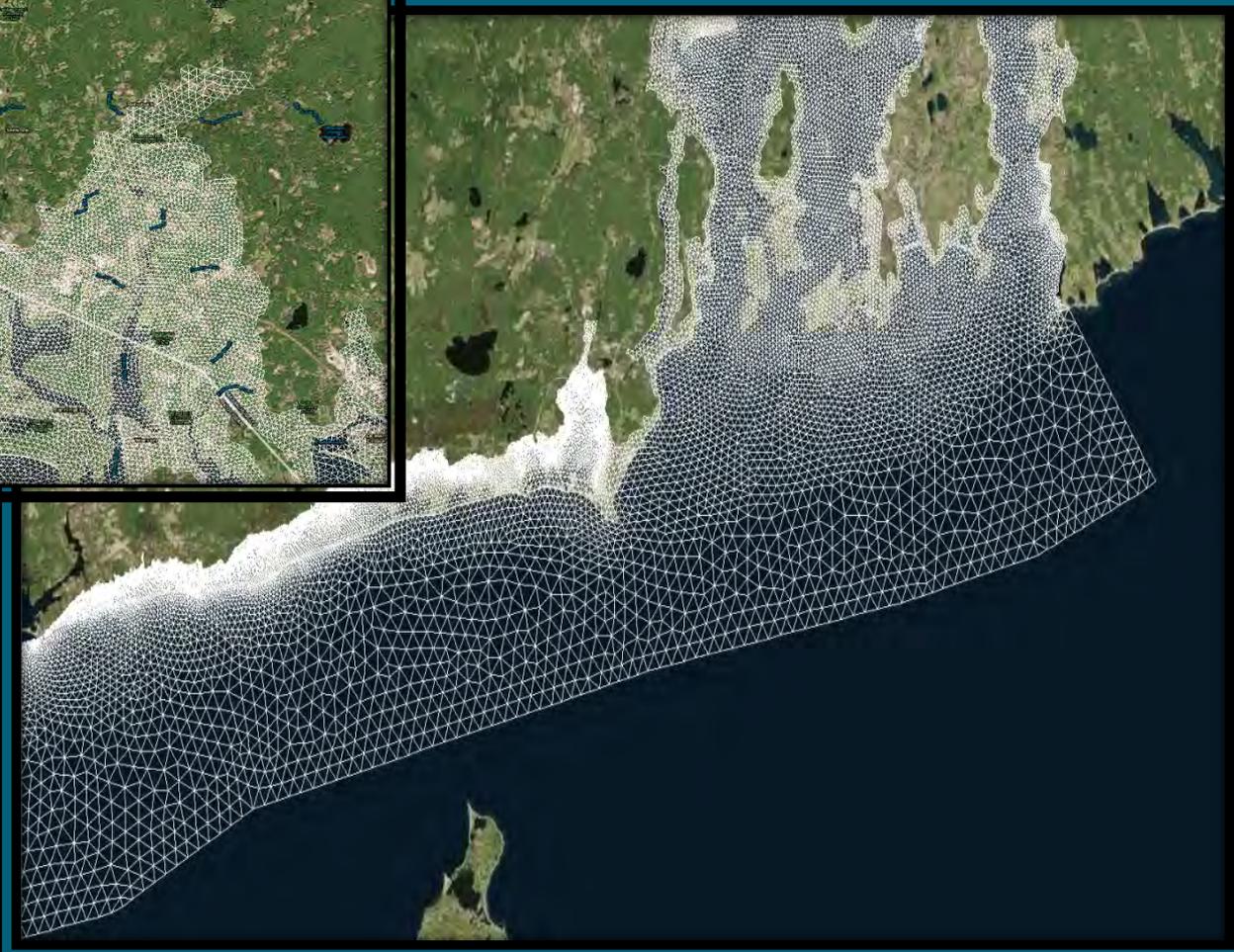
## Structure Type

- Commercial/Industrial
- ☆ Emergency Service
- △ Public Gathering Location
- Residential Housing
- ◇ Utility

## Percent Damage



# STORMTOOLS Future Phase – Real time flood forecasting system for RI



# QUESTIONS?

**Using STORMTOOLS to Assess Coastal Risk In Rhode Island**

**RI State Planning Council– November 12, 2015**

***Teresa A. Crean, AICP, URI Coastal Resources Center / RI Sea Grant***

