

# Tiverton, RI

## COASTAL SEA LEVEL RISE AND STORM SURGE: TRANSPORTATION FACT SHEET



## PLANNING FOR SEA LEVEL RISE ON YOUR ROADS

This fact sheet aims to provide municipal leaders and practitioners with a survey of Tiverton's transportation infrastructure elements that may be affected by sea level rise and storm surge. In addition to explaining and presenting the data, this fact sheet will outline strategies that may help in adapting to these conditions, and point towards resources that will enable further investigation.

## Relevance

The impacts of Sea Level Rise (SLR) are often perceived as distant, but the assets being built today will still be within their design life when future effects of sea level rise are felt. In addition, sea level rise will magnify the impacts of 100-year storm surge events by raising the water level. Though current federal guidelines only require federally funded assets be built to survive a 100-year storm event, what the impact of a 100-year storm event entails is likely to change during the design life of the assets currently under consideration around Rhode Island.

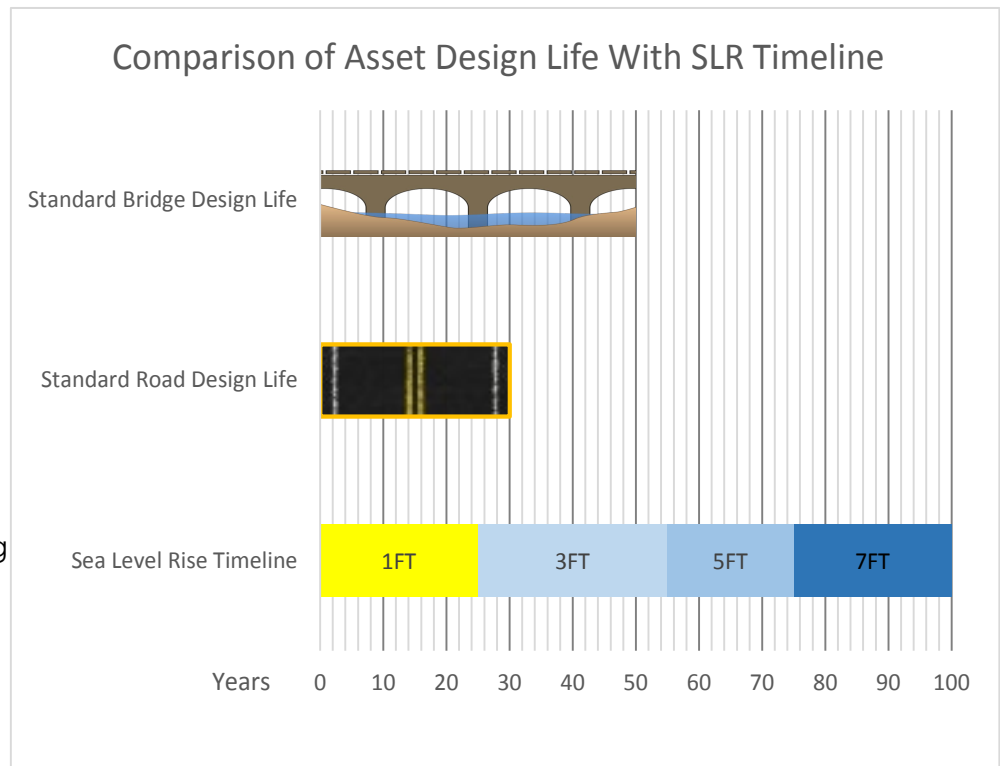


Figure 1

## Data and Methodology



Figure 2: Flooding near Sauchest Point: June 2013

To help Rhode Island's cities and towns prepare for these changing conditions, the Statewide Planning Program (SPP) has engaged in an effort to analyze the potential impacts created by the sea level rise and storm surge. Using data developed under the name "STORMTOOLS" by the Coastal Resources Management Council and the University of Rhode Island, SPP identified the assets that could be impacted (exposure), and their vulnerability. As a result of this analysis, SPP identified the roads and bridges most likely to be impacted by Sea Level Rise, and scored their relative vulnerability based on the severity of the hazard they faced and the potential impact of asset damage on the transportation system as a whole.

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## Tiverton Roads Exposed to Sea Level Rise

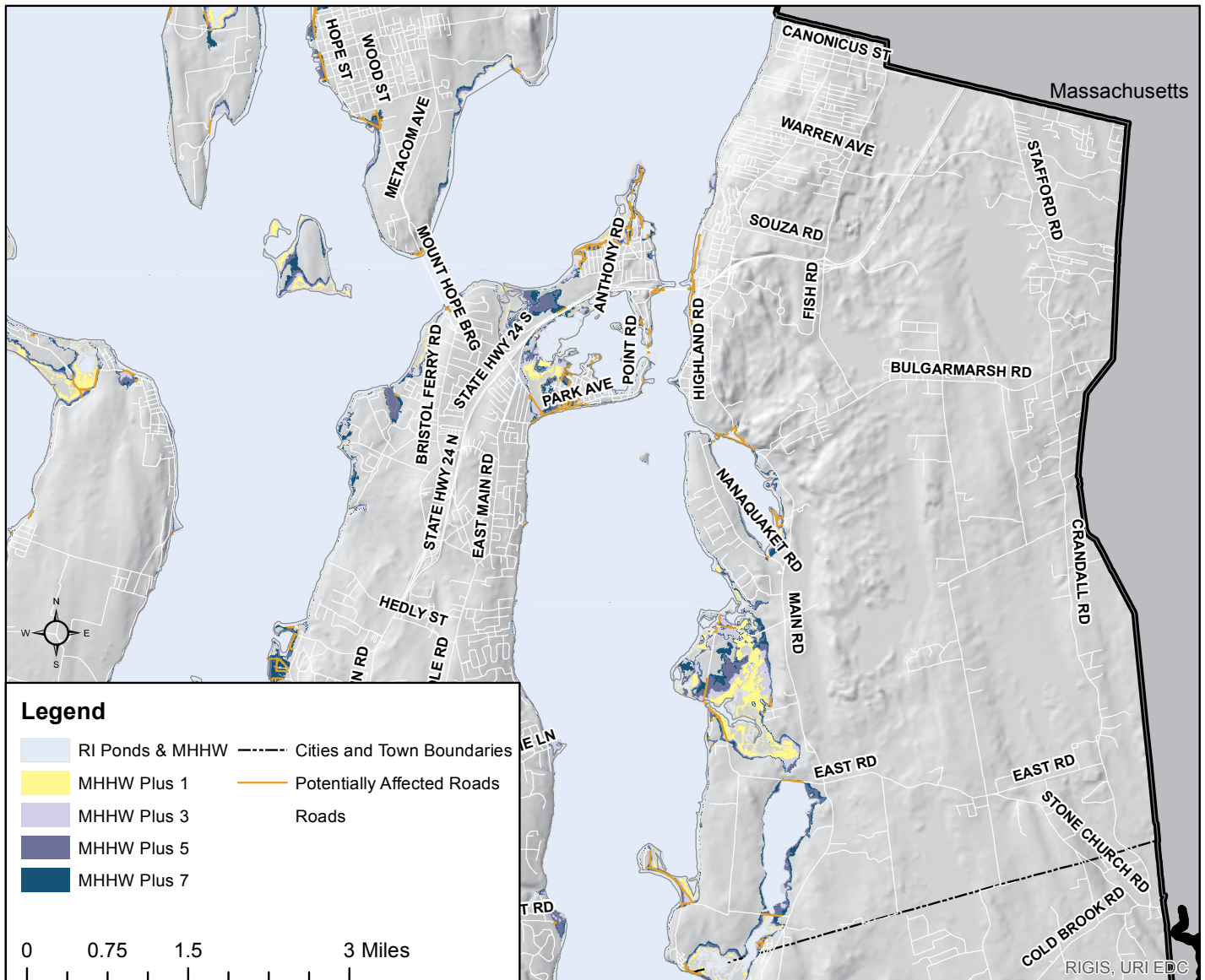


Figure 3

Given seven feet of sea level rise, a total of 156 miles of road in Rhode Island could be exposed to inundation, 70% of which would occur on local roads. For Tiverton five miles of roadway inundation can be expected. Of this, 78% (3.78 miles) are local. Tiverton's roads (state and local) are the 13th most vulnerable in the state of Rhode Island to sea level rise.

Figure 4

Top 10 Road Assets in Tiverton Vulnerable to Sea Level Rise (SLR)											
Mun. Rank	Road Name	1 Ft of SLR	3 Ft of SLR	5 Ft of SLR	7 Ft of SLR	Total Linear Feet	Evac. Route	Intermodal Facility	Functional Classification	Vuln. Score	State Rank
1	STATE HWY 24 S	308	217	138	20	683	No	Yes	Freeways	7.42	10
2	STATE HWY 24 N	279	233	168	10	690	No	Yes	Freeways	7.29	12
3	OLD MAIN RD	0	789	222	96	1,107	Yes	No	Major Coll.	5.13	92
4	RIVERSIDE DR	0	468	3,074	808	4,349	No	No	Local	4.79	126
5	THREE ROD WAY	0	1,368	1,685	487	3,540	No	No	Local	4.01	220
6	HIGHLAND RD	0	0	0	55	55	No	Yes	Major Coll.	3.70	283
7	MAIN RD	0	24	646	1,339	2,010	No	No	Minor Art.	3.66	291
8	BRIDGEPORT RD	0	0	158	363	521	No	Yes	Major Coll.	3.46	332
9	NANAQUAKET RD	5	13	84	181	283	No	Yes	Major Coll.	3.34	352
10	LAWRENCE CT	0	575	420	80	1,075	No	No	Local	3.17	392

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## Tiverton Bridges Exposed to Sea Level Rise

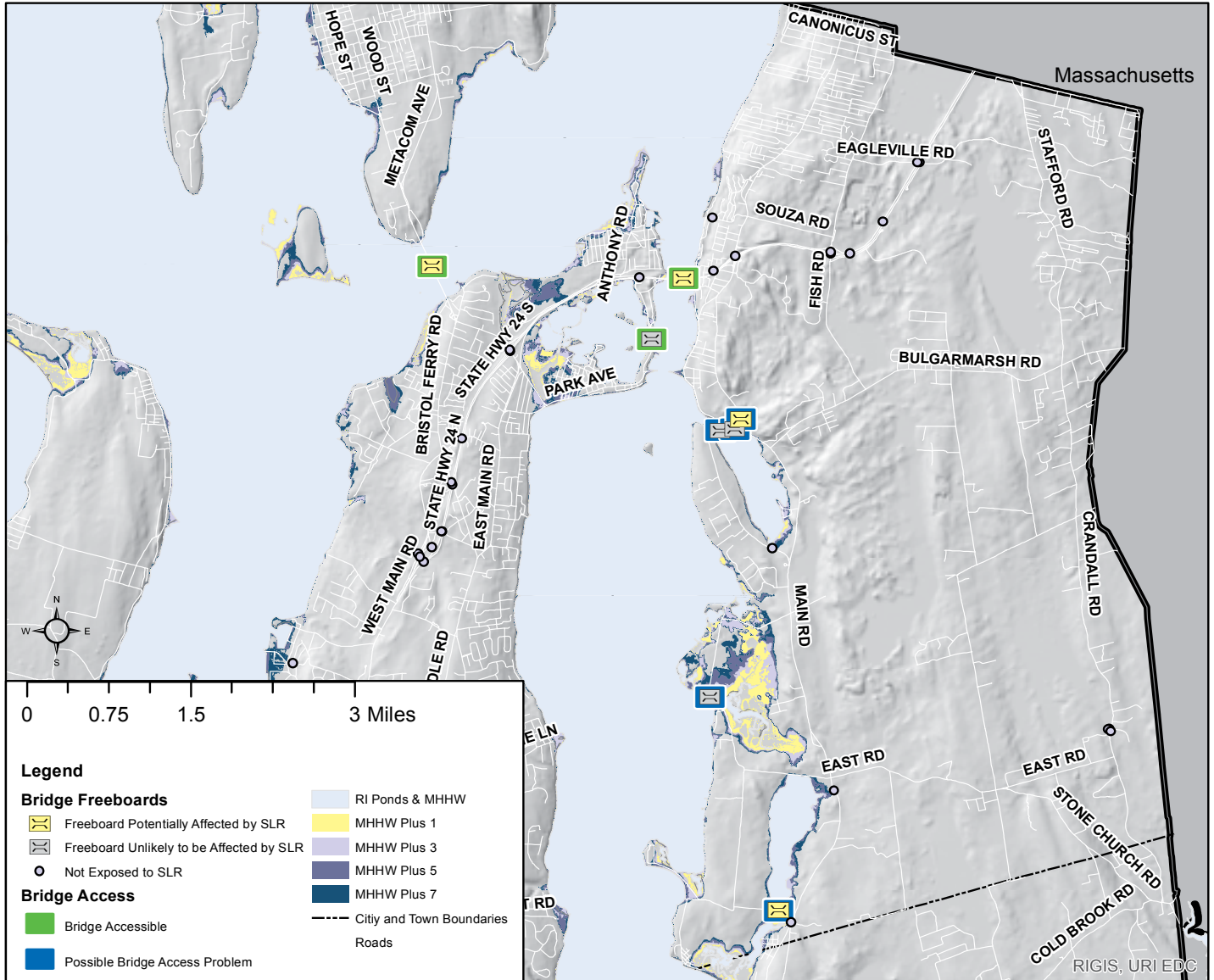


Figure 5

Given seven feet of sea level rise, a total of 90 bridges in Rhode Island cause concern either due to potential freeboard height or accessibility problems. In Tiverton there are four bridges of concern, two of which are small facilities that may not be eligible for federal aid. Tiverton's bridge infrastructure is the seventh most vulnerable in the state of Rhode Island to sea level rise. Please note: The Sakonnet River Bridge freeboard was not included in the data sets used, and so was flagged as having a freeboard height that required further investigation.

Figure 6

Top 10 Tiverton Bridge Assets Vulnerable to Sea Level Rise												
Mun. Rank	Bridge Name	Facility Carried	Feature Intersected	Inches of Freeboard Relative to 7FtSLR	Terrain Crossed	Landing Access	Intermodal Facility	Evac. Route	AADT	Vuln. Score	State Rank	
1	Sin & Flesh	OLD MAIN RD	SIN & FLESH BROOK	-24	Water	Problem	No	Yes	900	7.00	29	
2	Nonquit Pond	POND BRIDGE RD	NONQUIT POND	-33	MHHW	Problem	No	No	500	6.50	38	
3	Nannaquaket	NANNAQUAKET RD	NANNAQUAKET R	90	MHHW	Problem	Yes	No	822	5.50	64	
4	Sapowet	SEAPOWET AV	TIDAL INLET	51	MHHW	Problem	Yes	No	480	5.50	65	
5	Nannaquaket Pond	RI 77 MAIN RD	NANNAQUAKET POND	27	Water	Problem	No	No	6,868	5.40	67	



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## Tiverton Roads Exposed to 100-Year Storm Surge Events

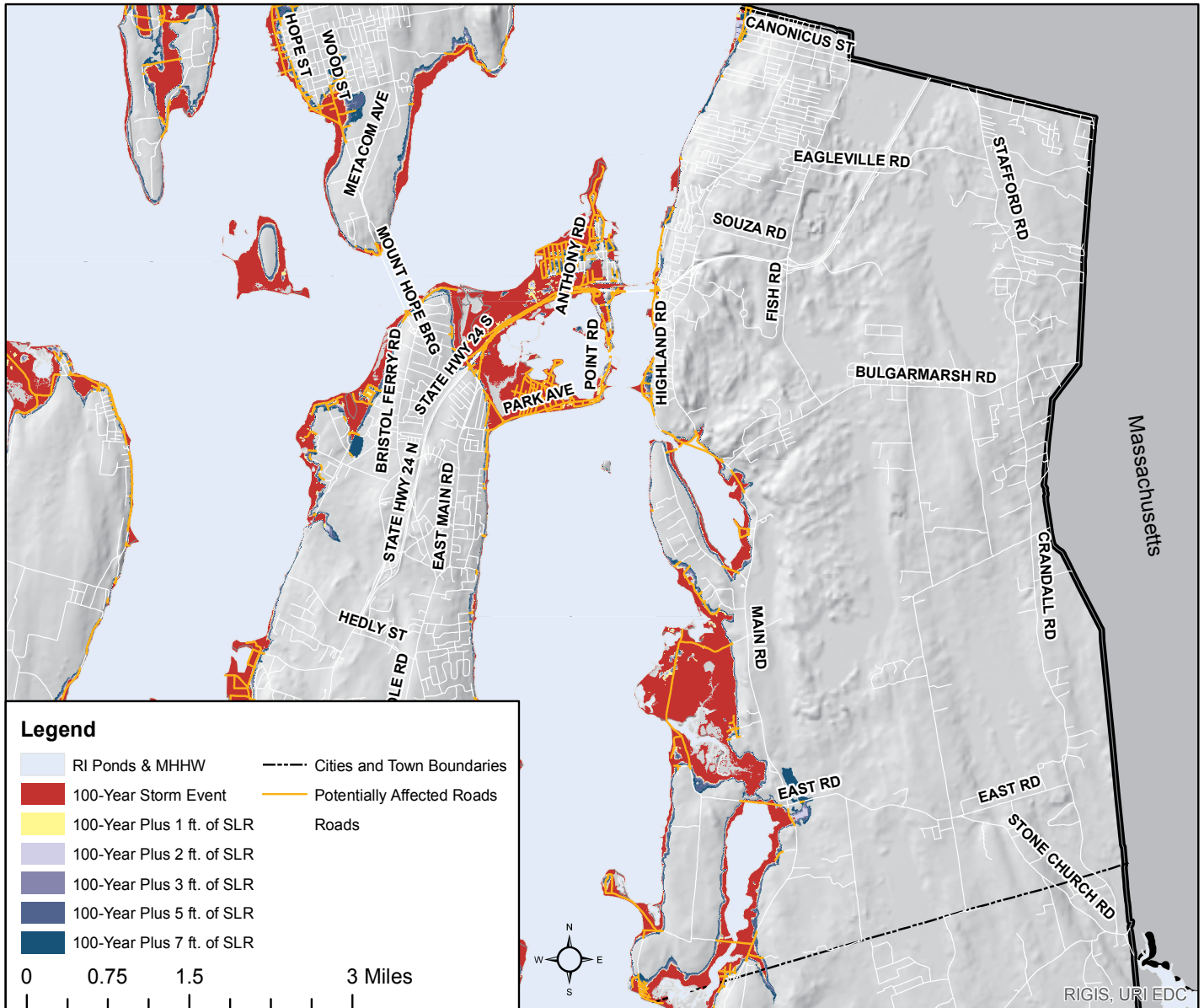


Figure 7

Given seven feet of sea level rise and a 100-year storm surge event, a total of 573 miles of road in Rhode Island will potentially be exposed to inundation, 73% of which will occur on local roads. For Tiverton, 13 miles of roadway inundation can be expected, 76% (~10 miles) of which are local. Tiverton's roads are the 14th most vulnerable in the state of Rhode Island to storm surge.

Figure 8

Top 10 Road Assets in Tiverton Vulnerable to 100-Year Surge Events												
Mun. Rank	NAME	No SLR	1 Foot of SLR	3 Feet of SLR	5 Feet of SLR	7 Feet of SLR	Total Linear Feet	Evac. Route	Intermodal Facility	Functional Classification	Vuln. Score	State Rank
1	STATE HWY 24 N	792	3	3	3	0	802	No	No	Freeways	7.66	40
2	STATE HWY 24 S	795	16	13	10	10	844	No	No	Freeways	7.53	47
3	HIGHLAND RD	1,364	13	27	27	20	1,452	Yes	No	Major Coll.	7.04	75
4	BRIDGEPORT RD	747	0	0	0	0	747	No	Yes	Major Coll.	7.03	77
5	HART ST	147	0	0	0	0	147	No	Yes	Local	6.60	113
6	THREE ROD WAY	3,602	0	0	0	0	3,602	No	Yes	Local	6.60	114
7	MAIN RD	6,007	662	1,305	1,052	936	9,962	No	No	Minor Art.	6.58	117
8	SEAPOWET AVE	7,791	316	646	222	169	9,144	No	Yes	Local	6.34	139
9	NANAQUAKET RD	1,143	71	137	133	153	1,638	No	Yes	Major Coll.	6.22	155
10	BARBARA ST	135	0	0	0	0	135	No	No	Local	5.60	752

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## Tiverton Bridges Exposed to 100-Year Storm Surge Events

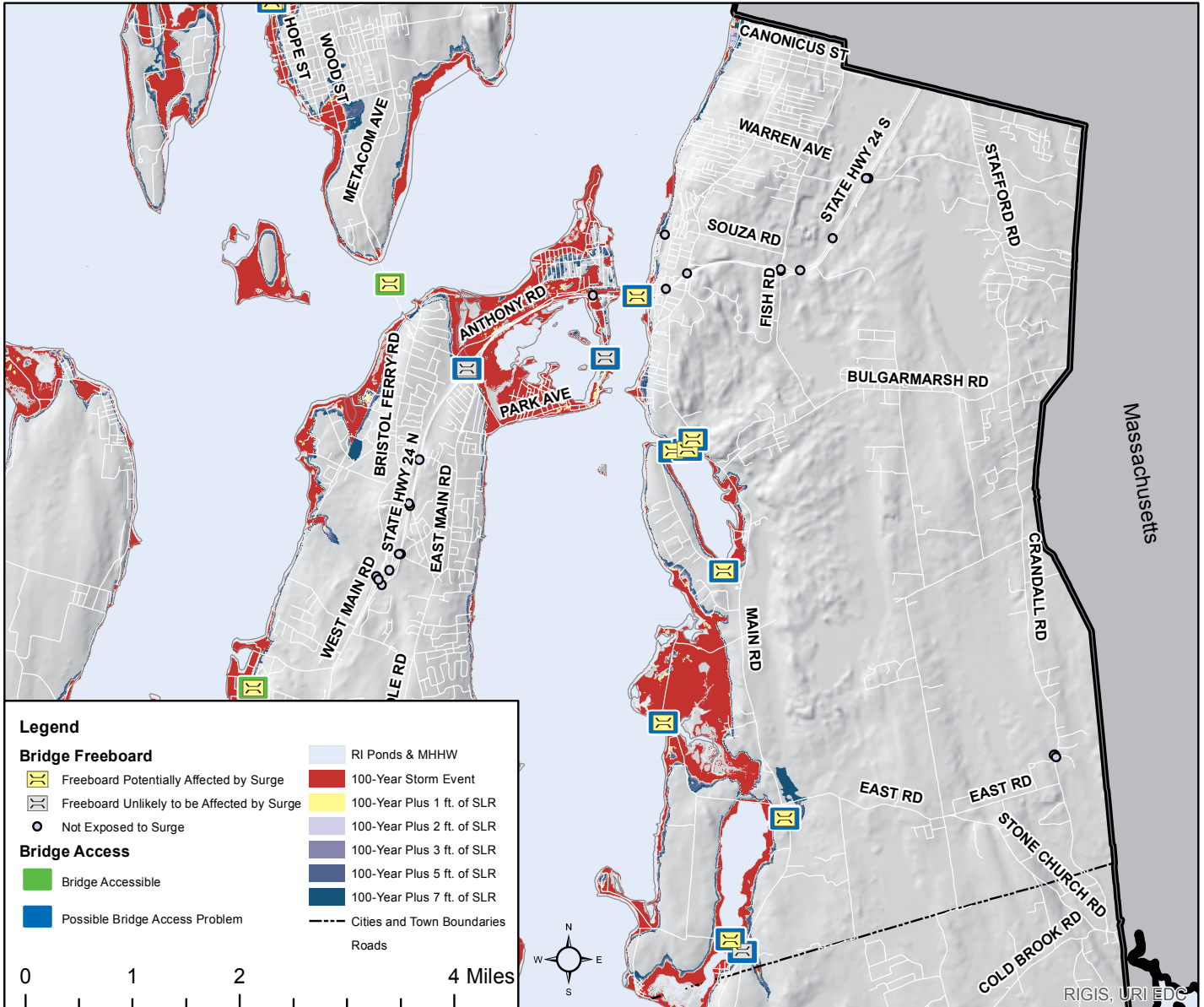


Figure 9

Given seven feet of sea level rise plus a 100-year storm surge event, a total of 148 bridges statewide cause concern either because of potential free-board height or accessibility problems. In Tiverton there are eight bridges of concern, two of which are smaller facilities that may not be eligible for federal aid. Tiverton's bridge infrastructure is the sixth most vulnerable to storm surge in the state of Rhode Island. Please note: The Sakonnet River Bridge freeboard was not included in the data sets used, and so the bridge was flagged as having a freeboard height that required further investigation.

Figure 10

Top 10 Tiverton Bridge Assets Vulnerable to Sea Level Rise Plus a 100-Year Storm Surge Event												
Mun. Rank	Bridge Name	Facility Carried	Feature Intersected	Inches of Freeboard Relative to 7FtSLR	Terrain Crossed	Landing Access	Intermodal Facility	Evac. Route	AADT	Vuln. Score	State Rank	
1	Tiverton Four Corners	RI 77 WEST MAIN RD	BORDEN BROOK	-47	Water	Problem	No	Yes	6,300	7.30	34	
2	Nannaquaket	NANNAQUAKET RD	NANNAQUAKET R	-54	MHHW	Problem	Yes	No	822	6.60	54	
3	Sapowet	SEAPOWET AV	TIDAL INLET	-93	MHHW	Problem	Yes	No	480	6.60	55	
4	Nannaquaket Pond	RI 77 MAIN RD	NANNAQUAKET POND	-127	Water	Problem	No	No	6,868	6.30	61	
5	Beattie	NANNAQUAKET ROAD	BEATTIE BROOK	-90	Water	Problem	Yes	No	600	6.10	70	
6	Sin & Flesh	OLD MAIN RD	SIN & FLESH BROOK	-210	Water	Problem	No	Yes	900	6.10	71	
7	Pachet Brook	RI 77 WEST MAIN RD	PACHET BROOK	22	Water	Problem	No	Yes	3,600	5.70	87	
8	Nonquit Pond	POND BRIDGE RD	NONQUIT POND	-177	MHHW	Problem	No	No	500	5.60	97	



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## Next Steps

Given the potential scale of the impacts of sea level rise and storm surge on local transportation infrastructure, local communities will need to find a way to prepare. A variety of approaches are available, and programs exist to help communities execute these strategies. Finding preparedness strategies will require undertaking further analysis, formulating a clear adaptation strategy, and then taking advantage of planning opportunities that may present themselves.

## Further Analysis

The most important step is the pursuit of further analysis. The data contained in this factsheet serves as introduction to municipal level transportation issues associated with sea level rise and storm surge. The data contained here and in Technical Paper #167: Vulnerability of Municipal Transportation Assets to Sea Level Rise and Storm Surge (published by SPP and available at <http://www.planning.ri.gov/geodeminfo/data/slr.php>) should allow local decision makers to prioritize the assets that may require an engineering analysis. Decision makers would also be advised to consult The methodology for STORMTOOLS, a key source of data for this project, which is available on-line at <http://www.beachsamp.org/the-science-behind-stormtools/>.

Figure 11: Consideration of Sea Level Rise can be included in regular planning activities



## Adaptation

Once the nature of the ongoing changes are understood, a policy should be developed to prepare for the changes holistically. The specific policies to be implemented will vary widely based on the community, the assets under threat, and the resources available. The policies can broadly be described as Protect, Accommodate, Retreat, and Do Nothing.

**Protect:** Though often popular, this is the most financially expensive option. A municipality can seek to safeguard an asset by building sea walls, or take a slightly more green approach by attempting to artificially recreate the types of dune or wetland structures that naturally stabilize a shoreline. These approaches offer short term security if well designed and implemented, but their effectiveness in the long term may be limited by further changing conditions and the resources required for maintenance.

Figure 12



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**Accommodate:** Accommodation can imply a number of built solutions that take into account the new conditions. An engineering oriented solution would be to elevate the assets in question above the new waterline, while another option would be to rebuild the asset in a way that suits the new conditions better, for example by rebuilding a road using a new alignment on higher ground.

**Retreat:** If built solutions are infeasible, a community may decide to simply abandon the asset. Private stakeholders may take over responsibility for the asset, or the need for its maintenance may diminish as users of the asset leave the area. Though undoubtedly the most efficient solution from a fiscal perspective, there are complex legal issues involved that remain unresolved.

**Do Nothing:** Communities may choose to take no action in response to rising sea levels. In effect this would consist of maintaining the status quo infrastructure, regardless of risk and the increasingly common inundations. In practice this approach may closely resemble retreat, as assets are incapacitated with increasing regularity until all those served by the assets move away. The financial strain of repeated maintenance could have significant fiscal effects on communities.

## Planning Opportunities

Once the subject of sea level rise and storm surge have been adequately researched, and an overall municipal adaptation strategy has been decided upon, decision makers should attempt to take advantage of planning opportunities that may allow the city or town to begin implementation of their planning goals. A key first step to this process will be building awareness amongst staff and constituents, either by direct outreach or simply through informal discussions.

As awareness grows, the community would be well served simply by keeping their readiness policy goals in mind when conducting their regular planning activities, such as comprehensive planning, or zoning compliance review. More concrete policies like overlay zones and rolling easements may become important tools for communities seeking a way to realize their policy goals.

Communities that are critically threatened by sea level rise and storm surge may seek to directly invest in readiness measures using municipal funds. Additional funding may be available to aid in this process from state and federal sources. Placing eligible projects for consideration in the State Transportation Improvement Plan, or other sources of Federal and State funding, is a good way to leverage local funding.

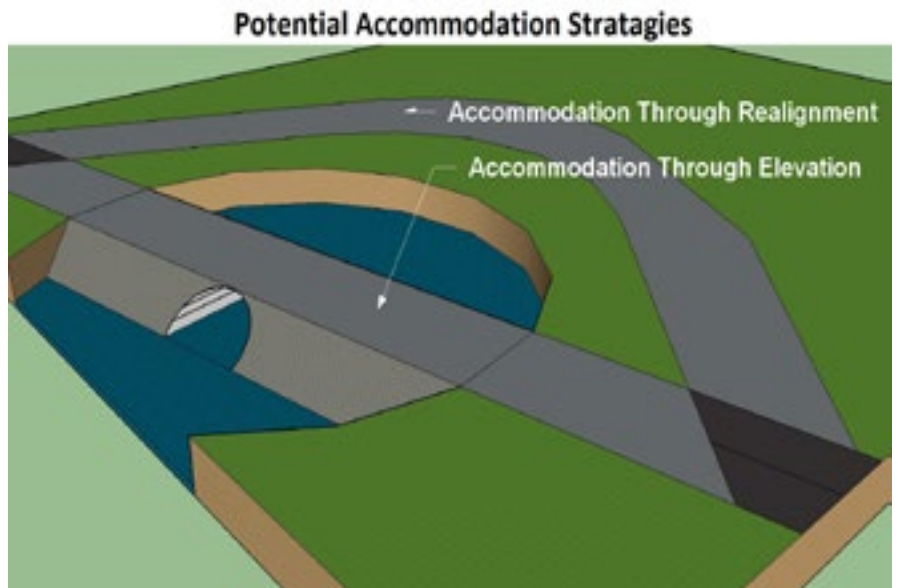


Figure 13

Figure 14

