Table 5. Land Use and Parcel Data: exposed assets considering storm and sea level rise simulations created using a GIS-based bathtub model.

Land Use	Coastal Storm Scenario (single event)	Future Sea Level Rise Scenarios (Daily tides)		
Scenario	*1938 Hurricane Flood Levels: Mean Higher High Water (MHHW) + 9.5ft*	*Sea level rise (SLR) at 1 foot above MHHW*	*SLR at 3 feet above MHHW*	*SLR at 5 feet above MHHW*
Exposed Assets (Properties)*	**1564** properties are within or adjacent to the boundary of the storm surge	**500** properties are within or adjacent to the boundary of MHHW +1 foot	**772** properties are within or adjacent to the boundary of MHHW +3 feet	**1041** properties are within or adjacent to the boundary of MHHW +5 feet
Property Categories By Parcel Tax Code*	**72%** Residential **6%** Business **9%** Civic **12%** Undeveloped **2%** Other	**63%** Residential **7%** Business **14%** Civic **14%** Undeveloped **2%** Other	**69%** Residential **6%** Business **10%** Civic **13%** Undeveloped **2%** Other	**70%** Residential **6%** Business **10%** Civic **12%** Undeveloped **2%** Other
Owned by	**Publicly Owned Properties***			
Federal	9	6	8	9
State	65	25	28	37
Municipality	27	17	19	21
Total	**101**	**48**	**55**	**67**
	Historic District Properties Among Exposed Assets*			
Historic District Properties	**87**	**38**	**64**	**86**

**Refer to Appendix E for property and parcel data for North Kingstown.*

W3. Incorporate sea level rise projections and salt marsh migration data into criteria for acquisition, easements, protection and restoration. In coordination with state agencies, NGOs, and local conservation groups, establish targets for defining natural buffers around wetland complexes, promote and advance use of appropriate vegetation for transition zones, encourage use of native species and control of invasive species in and around wetland complexes, and protect migration corridors for wildlife.

W4. Work with state and non-governmental organization (NGO) partners to develop management plans which could include easements, acquisition, preservation, restoration, or management for tidal wetlands to preserve the ecological integrity and functionality of the natural systems. Work with state agencies and NGO partners to identify restoration opportunities to ensure long term viable habitats, including the local Land Conservancy, The Nature Conservancy, North Kingstown's Conservation Commission, Save the Bay, and the Narragansett Bay Estuarine Research Reserve.

W5. Identify new areas for conservation in North Kingstown that provide an ecosystem services function. Evaluate ecosystem services to reduce impacts from flooding and increase habitat function, terrestrial and aquatic, for marine fisheries and water quality and implement conservation actions.

W6. Create a checkbox on development plan/site plan review applications for wetlands when property owners submit an application to develop, redevelop, or propose additions to their parcel. Require owners to verify if: (1) Wetlands exist on their property; and (2) if there property intersects a projected salt marsh migration area as indicated in CRMC's SLAMM maps.

5.11. HISTORIC & CULTURAL RESOURCES

What are the concerns with historic and cultural resources and natural hazards in North Kingstown?

- North Kingstown's historic district is concentrated in Wickford, and the majority of the district is within the SFHA. With the threat of increased coastal flooding and projected sea level rise scenarios, this district will continue to be in harm's way.
- Owners of historic properties are in need of guidance to assist them with the long-term management of their property, balancing the preservation of the structure's historic integrity with protection of the property from future flood damage.

Potential historic and cultural resource-related adaptation strategies for consideration:

HC1. Maintain a database of parcels within North Kingstown's Historic District, the SFHA, and within the projected sea level rise areas to monitor impacts to these areas and coordinate with property owners on potential strategies to protect historic assets in town.

HC2. Coordinate with the State Historic Preservation Officer (SHPO), the Rhode Island Historic Preservation and Heritage Commission (RIHPHC) and the municipal Historic District Commission (HDC) to identify funding and resources to assist owners of historic buildings to

flood-proof or elevate their property while preserving the historic integrity of the property and district.

HC3. Establish local incentives and guidelines for historic property owners who voluntarily propose to elevate a structure above BFE or otherwise flood-proof their property so as to not unfairly penalize owners of historically-significant properties who are actively working to meet the goals of climate resilience in North Kingstown. These incentives could include waiving fee(s) at the time of application/approval, up to providing clearly-defined tax credits at the time of improvement to allow owners to be credited for their investment in their property as the value of the property increases after improvements are made. Require the tax assessor to define an assessment process that incentivizes historic property owners to make improvements, and credits these actions over a defined time period.

5.12. CONTAMINATED SITES

What are the concerns with contaminated sites and natural hazards in North Kingstown?

- The stability of capped landfills located in Allen's Harbor and Calf Pasture Point may be compromised with future storm events and projected sea level rise, thereby risking release of waste materials into Narragansett Bay.

Potential contaminated site-related adaptation strategies for consideration:

CS1. Coordinate with state and federal agencies to monitor the stability of the landfills at Allen's Harbor and Calf Pasture Point and work with state and NGO partners to assess short-term risk from storm events and long-term risk from projected sea level rise.

5.13. OPEN SPACE, RECREATION, & PUBLIC ACCESS

What are the concerns with open space/recreation/public access and natural hazards in North Kingstown?

- Public access to North Kingstown's shoreline may be impeded with future sea level rise scenarios.
- Recreational facilities, including public parks, boat launches, moorings, and support facilities may be altered by flooding from storm surge events or future sea level rise scenarios.
- Acquisition of properties within the special flood hazard area could serve a dual purpose to preserve open space within coastal flood zones while providing recreational opportunities for residents.

Potential open space/recreation/public access-related adaptation strategies for consideration:

OS1. Maintain a database of open space parcels, public parks, boat launches, and beaches within the SFHA and projected sea level rise areas to monitor impacts to these areas from storm events and incremental sea level rise, and develop strategies to preserve the availability of these areas for continued public use in town.

6.2. PRIORITIZATION OF NEIGHBORHOODS

For each of the study areas described above, the tax assessment information was compiled for the parcels that are expected to intersect with the sea level scenarios outlined in Chapters 3 and 4. The parcels included within each of the 12 study areas were identified through a conversation with the town planning staff, and are meant to offer a broad snapshot of the relative values of property within each area of North Kingstown that is expected to be inundated with salt water twice a day, every day, under future sea rise scenarios. The following table provides the property values within each neighborhood study area:

Table 13.Assessed property value of parcels exposed to sea level rise.

Assessed property value of parcels exposed to projected sea level rise scenarios by Study Area *Source: 2009 North Kingstown Property Tax Assessment data from GIS Parcel Database*							
Study Area #	Study Area Name	Sea level rise (SLR) at 1 foot above MHHW (linear feet)		SLR at 3 feet above MHHW (linear feet)		SLR at 5 feet above MHHW (linear feet)	
		QTY	Assess Value ($)	QTY	Assess Value ($)	QTY	Assess Value ($)
1	Pojac Point / Mount View	48	$ 82,658,725.00	54	$ 86,258,625.00	68	$ 91,474,625.00
2	Quonset / Davisville	32	$ 124,344,720.00	39	$ 142,729,920.00	57	$ 177,176,620.00
3	Mill Cove / Shore Acres	84	$ 64,846,660.00	138	$ 101,968,230.00	181	$ 127,382,480.00
4	Intrepid Drive	1	$ 3,420,900.00	2	$ 3,442,100.00	4	$ 3,696,200.00
5	Wickford Historic	58	$ 40,331,500.00	95	$ 61,017,400.00	129	$ 78,383,000.00
6	Wickford Commercial	47	$ 27,375,900.00	63	$ 34,335,500.00	107	$ 54,474,000.00
7	Phillips / Loop	39	$ 13,117,100.00	49	$ 16,715,100.00	54	$ 17,949,800.00
8	Poplar Point	39	$ 44,462,700.00	67	$ 69,956,200.00	103	$ 87,454,200.00
9	Duck Cove / Earle Drive	46	$ 25,814,600.00	98	$ 54,106,800.00	150	$ 74,003,000.00
10	Hamilton / Bissell Cove	46	$ 19,998,670.00	69	$ 28,947,370.00	79	$ 32,666,270.00
11	Plum Point / Plum Beach	24	$ 40,862,870.00	56	$ 69,327,470.00	14	$ 81,525,270.00
12	Gilbert Stuart / Walmsley Lane	32	$ 19,052,790.00	38	$ 22,747,990.00	65	$ 23,428,490.00
TOTAL		**496**	**$ 506,287,135.00**	**768**	**$ 691,552,705.00**	**1011**	**$ 849,613,955.00**

These values represent a snapshot of the study area values and can be multiplied by the property tax rates to further understand how much the town of North Kingstown collects from these areas in

property taxes. The costs of municipal services to these areas can also be evaluated by the town staff and decision makers to better understand if long term investment in these neighborhoods makes fiscal sense in the municipal capital improvement plan, or if special tax districts may be needed long term to support infrastructure to high hazard areas.

Using a similar approach, the roadway segments that intersect the sea level rise scenarios were identified and quantified for each of the neighborhood study areas to begin understanding the relationship of future sea water patterns to the coastal transportation network in North Kingstown. These roadway segments are illustrated in the Study Area maps contained in Appendix D.

Table 14.Roadway segments exposed to sea level rise.

Roadway segments exposed to projected sea level rise scenarios (linear feet) by Study Area					
Study Area #	Study Area Name	TOTAL (linear feet)	Sea level rise (SLR) at 1 foot above MHHW (linear feet)	SLR at 3 feet above MHHW (linear feet)	SLR at 5 feet above MHHW (linear feet)
1	Pojac Point / Mount View	1,332.57	-	-	1,332.57
2	Quonset / Davisville	2,994.53	-	-	2,994.53
3	Mill Cove / Shore Acres	227.78	5.08	48.27	227.78
4	Intrepid Drive	281.70	-	0.33	281.70
5	Wickford Historic	4,863.48	-	977.00	4,863.48
6	Wickford Commercial	2,720.78	32.95	515.35	2,720.78
7	Phillips / Loop	1,793.31	-	482.62	1,793.31
8	Poplar Point	3,860.26	-	969.90	3,860.26
9	Duck Cove / Earle Drive	2,895.16	-	849.38	2,895.16
10	Hamilton / Bissell Cove	899.92	-	521.14	899.92
11	Plum Point / Plum Beach	180.45	48.00	69.03	180.45
12	Gilbert Stuart / Walmsley Lane	53.92	4.56	29.76	53.92
TOTAL		**22,103.87**	**90.59**	**4,462.78**	**22,103.87**

The linear feet of road segments identified above were then analyzed to determine all state and municipal transportation infrastructure exposed to sea level rise in each of the 12 Study Areas, summarized in Table 14.

Table 15. Transportation infrastructure impacted by sea level rise in each study area.

Study Area #	Study Area Name	Streets w/Parcels w/in SLR areas	Transportation Network Within SLR areas STATE INFRASTRUCTURE	Transportation Network Within SLR areas MUNICIPAL INFRASTRUCTURE
1	Pojac Point / Mount View	Atlantic Ave Davisville Rd N. Quidnessett Rd Sunnybrook Dr	*No state infrastructure affected by SLR scenarios in this area.*	Bike Path from Davisville to Calf Pasture Point/ Mount View neighborhood Southwest corner of Mount View neighborhood
2	Quonset / Davisville	Camp Ave Davisville Rd Macnaught St Roger Williams Way	Roger Williams Way & Zarbo Avenue – serving businesses at southernmost point in Quonset Development Park Quonset Airport Railroad corridors	Patrol Road at northernmost point at Davisville / Little Allens Harbor
3	Mill Cove / Shore Acres	Camp Ave Fishing Cove Road Richard Smith Dr Sauga Ave Seabreeze Dr Shore Acres Ave Walnut Rd Wickford Point Rd	*No state infrastructure affected by SLR scenarios in this area.*	Rogers Street to the west of Shore Acres Ave, serving fewer than six residential parcels
4	Intrepid Drive	Intrepid Drive	*No state infrastructure affected by SLR scenarios in this area.*	Intrepid Drive Boat Launch
5	Wickford Historic	Bay St Church Lane Enfield Ave Esmond Ave Fowler St Main St Ocean Ave Pleasant St Washington St	Intersection of West Main Street / Brown Street / Main Street provides the only ingress/egress to this neighborhood. No alternate routes are available into or out of this area.	Fowler Street provides only access to properties at Esmond and Enfield Avenues. Washington Street and its connectors to Main Street are almost completely inundated under the 5-foot sea level rise scenario.

value of one, and the study area with the largest total score was given the greatest priority. Moreover, because the impact to evacuation routes, ingress/egress and public facilities was determined to be especially important, these 3 questions were given double weight compared to the other questions within the list, therefore an answer of 'yes' to any of these questions would receive a score of 2 instead of 1.

Table 16. Evaluation criteria used to prioritize study areas by transportation vulnerability.

NORTH KINGSTOWN STUDY AREA PRIORITIZATION EXERCISE EVALUATION CRITERIA DESCRIPTIONS Each Category is structured for a yes/no response – YES receives a value of (1), NO receives a value of (0)
(1) Evacuation Route Impacted by Sea Level Rise (SLR) scenario. Does any part of a documented evacuation route intersect a sea level rise scenario? ****received double weight due to importance****
(2) State Roads impacted by 1' OR 3' SLR. Do any segments of state roadways intersect the 1-foot or 3-foot sea level rise scenario?
(3) State Roads impacted by 5' SLR. Do any segments of state roadways intersect the 4-foot or 5-foot sea level rise scenario?
(4) Local Roads impacted by 1' OR 3' SLR >0.1mi. Are more than 0.1 miles of local roads in a given study area intersected by the 1-foot or 3-foot sea level rise scenario?
(5) Local Roads impacted by 5' SLR >0.1mi. Are more than 0.1 miles of local roads in a given study area intersected by the 4-foot or 5-foot sea level rise scenario?
(6) Barrier to Ingress/Egress. Do any sea level rise scenarios intersect with roadways and cause blocked access to that area without an alternate route available? ****received double weight due to importance****
(7) Historic District Impacted. Is there a historic district designated in this study area?
(8) Public Facilities Impacted. Are there publicly owned facilities in this study area? ****received double weight due to importance****

The full results of this prioritization are summarized in Appendix C and illustrate that the highest priority areas based on transportation system vulnerability are:

Table 17. Results: Priority study areas by transportation vulnerability.

SCORE	North Kingstown neighborhood study areas
10	Wickford Commercial – Study Area 6
7	Wickford Historic – Study Area 5 Phillips Street / Loop Drive – Study Area 7
4	Poplar Point – Study Area 8 Duck Cove / Earle Drive – Study Area 9
1	Pojac Point / Mount View – Study Area 1 Quonset / Davisville – Study Area 2 Hamilton / Bissell Cove – Study Area 10
0	Mill Cove / Shore Acres – Study Area 3 Intrepid Drive – Study Area 4 Plum Point / Plum Beach – Study Area 11 Gilbert Stuart / Walmsley Lane – Study Area 12

6.3. TRANSPORTATION PRIORITIES

Using the prioritization described in Section 6.2, the following transportation improvement projects related to state roads were identified for recommendation to the Rhode Island Department of Transportation- Transportation Improvement Program (see Table 18).

Table 18. Recommended Transportation Projects for the State Transportation Improvement Program

Study Area	Recommended Projects for the State Transportation Improvement Program
Wickford Commercial-Study Area 6	• West Main Street is an evacuation route and one of three routes providing access into Wickford Village. • Brown Street Bridge is exposed within the 1-foot sea level rise scenario and was overtopped during Superstorm Sandy in 2012. • Intersection of West Main Street / Brown Street / Main Street provides the only ingress/egress to the Wickford Historic neighborhood. No alternate routes are available into or out of this area. • Intersection of Phillips Street / Route 1A and the Hussey Bridge are exposed at the 5-foot sea level rise scenario.
Wickford Historic-Study Area 5	• Intersection of West Main Street / Brown Street / Main Street provides the only ingress/egress to this neighborhood. No alternate routes are available into or out of this area.
Phillips/Loop-Study Area 7	• Phillips Street is an evacuation route and one of three routes providing access into Wickford Village. Phillips Street is exposed to the 3-foot sea level rise scenario in several locations from the intersection of Loop Drive eastward to the Hussey Bridge.
Quonset/Davisville-Study Area 2	• Roger Williams Way & Zarbo Avenue – serving businesses at southernmost point in Quonset Development Park. • Evaluate all critical infrastructure for the operations of Quonset Airport. • Study railroad corridors within Quonset to withstand flooding from stormwater runoff and ensure protection from flooding from future sea level rise or storm events.

6.4. CAPITAL IMPROVEMENT CONSIDERATIONS

Using the prioritization described in Section 6.2, the following transportation improvement projects related to local roads were identified for recommendation for consideration through the North Kingstown Capital Improvement Program (see Table 19).

Table 19. Recommended transportation projects for the Town of North Kingstown Capital Improvement Program.

Study Area	Recommended Projects for the Town of North Kingstown Capital Improvement Program
Wickford Commercial-Study Area 6	• Newtown Street provides access approximately 10 parcels, and the intersection of Newtown and West Main Street is inundated in the 3-foot sea level rise scenario.
Wickford Historic-Study Area 5	• Fowler Street provides only access to properties at Esmond and Enfield Avenues. • Washington Street and its connectors to Main Street are almost completely inundated under the 5-foot sea level rise scenario.
Duck Cove / Earle Drive-Study Area 9	• Earle Drive provides access to 64 residences along Narragansett Bay. Access to these residences will be exposed in the 3-foot sea level rise scenario. No alternate route is available for these residents. • Intersection of Waldron Avenue and Clinton Drive is exposed in the 5-foot sea level rise scenario. Access to the residences to the east of this intersection will potentially be affected. No alternate route is available for these residents.
Poplar Point-Study Area 8	• The intersection of Steamboat Avenue and Wright Lane provides the only access into and out of the Poplar point neighborhood. This intersection is exposed in the 5-foot scenario. • Local roads in the northeastern section of Poplar Point are exposed to 3-feet of sea level rise at the intersection of Lexington and Concord Avenues.
Phillips/Loop-Study Area 7	• Loop Drive provides access to fewer than 20 residences across Wickford Cove. Ingress/egress to these residences will be exposed in the 3-foot sea level rise scenario. No alternate route is available for these residents. • Boone Street provides access to the North Kingstown Free Library and the neighborhood to the north of Phillips Street. An

7.7. NATURAL & CULTURAL RESOURCES – ADAPTATION TO NATURAL HAZARDS & CLIMATE CHANGE

Vision Statement, Natural & Cultural Resources Element

> "The Town of North Kingstown holds a wide variety of natural and cultural resources that provide both environmental and socio-economic benefits to its residents. ***Identifying those resources for preservation, management, and restoration will be informed by the impacts posed by climate change including projected future tidal inundation, coastal erosion, storm surge, and flooding.***"

Goals & Objectives, Natural & Cultural Resources Element

Natural and Cultural Resources, Goal: Identify, expand, protect, preserve, and where possible, restore the natural and cultural resources in North Kingstown to promote resilience and adaptation to a changing climate.

- Natural and Cultural Resources, Objective 1. Preserve and protect existing salt marsh complexes and floodplains, and accommodate migration of wetlands with future sea level rise projections.
- Natural and Cultural Resources, Objective 2. Ensure new construction or upgrade of stormwater management systems considers updated climate trend data and projected sea level rise scenarios.
- Natural and Cultural Resources, Objective 3. Protect the integrity of groundwater resources from increased sea levels along the coastline.
- Natural and Cultural Resources, Objective 4. Evaluate historic districts, landscapes and properties for exposure to current and future tidal inundation, coastal erosion, storm surge and flooding.

Table 27. Action pertaining to Natural and Cultural Resources and anticipated timeframes

Action	Strategy Code from Ch. 5	Timeframe	Responsible Agent
Groundwater			
Compile data from local OWTS permits to better understand susceptibility of groundwater systems within the SFHA to changing coastal conditions and salt water intrusion	GW1	0- 5 years	Building Official
Maintain a record of properties within the SFHA or projected sea level rise areas that report groundwater seepage into their basements	GW2	0- 5 years	Building Official
Coordinate with state and academic entities to support research into groundwater dynamics of coastal areas, including the SFHA and projected sea level rise areas	GW3	0- 5 years	Planning/ Water Department/ Conservation Commission
Wetlands			
Define policies, regulations and strategies for municipal operations to manage salt marsh migration areas	W1	0- 5 years	Planning/ Conservation Commission
Prioritize focus areas within salt marsh migration paths for further study and monitoring	W2	0- 5 years	Planning/ Conservation Commission
Include projections for salt marsh migration and future sea level rise areas into criteria for acquisitions, easements, protection, and restoration	W3	0- 5 years	Planning/ Conservation Commission
Work with state and NGO partners to establish management plans for areas exposed to storm surge, projected sea level rise, and salt marsh migration	W4	0- 5 years	Planning/ Conservation Commission
Work with state and NGO partners to identify new areas for conservation based on the need for ecosystem services that reduce impacts from flooding and increase habitat function, as well as other defined criteria	W5	0- 5 years	Planning/ Conservation Commission
Require all future development proposals within the SFHA to show how projected wetland migration will be addressed on their property	W6	0- 5 years	Planning

Action	Strategy Code from Ch. 5	Timeframe	Responsible Agent
Historic and Cultural			
Maintain a database of properties within the SFHA or projected sea level rise areas with historic designation and keep record of storm damage or adaptation-related improvements	HC1	0- 5 years	Planning/HDC
Coordinate with SHPO/RIHPHC and municipal historic district commission (HDC) to identify funding and resources to assist owners of historic assets within identified hazard areas	HC2	0- 5 years	Planning/HDC
Establish financial incentives for owners of historic properties who voluntarily invest in adaptation strategies to flood-proof or otherwise protect vulnerable assets	HC3	0- 5 years	Planning/HDC

7.8. OPEN SPACE & RECREATION – ADAPTATION TO NATURAL HAZARDS & CLIMATE CHANGE

Vision Statement, Open Space & Recreation Element

> "The Town recognizes that growth must be managed to preserve the rural and scenic heritage of North Kingstown through the preservation of open spaces, such as woodlands, wetlands, freshwater areas, groundwater resources, undeveloped waterfront, wildlife, wildlife habitats (especially rare and endangered species habitats), nesting areas, farmlands and areas of geological and archaeological significance. ***Coastal areas at risk from the impacts of natural hazards and sea level rise will be assessed for potential acquisition in order to preserve public access and also to minimize the risk posed to lives, infrastructure and property. Monitoring of climate impacts from projected future tidal inundation, coastal erosion, storm surge, and flooding will be integrated into the management of open space.***"

Open Space and Recreation, Goal: Preserve open space in areas exposed to coastal hazards and promote resilient coastal recreation activities that contribute to quality of life and the public health, safety and welfare of North Kingstown's residents.

- Open Space and Recreation, Objective 1. Preserve and protect existing beaches, harbors, boat launches, marina infrastructure and public access to the coastline.