Municipal Vulnerability Preparedness Program Action Grant Case Study

Municipality: Town of Salisbury, Massachusetts
Project Title: Resilient Ring's Island: Preventing a Neighborhood from Being Stranded by Flooding
Award Year (FY): 21-22
Grant Award: $ 250,000 original plus Amendment of $90,000 for Dune Nourishment
Match: $ 109,543.90
Match Source: Town of Salisbury
One or Two Year Project: Two Year Project
Municipal Department Leading Project: Planning & Engineering
Project Website URL: https://www.salisburyma.gov/planning-and-development/pages/resilient-ring%E2%80%99s-island-road-improvement-project

Community Overview:

The Town of Salisbury, Massachusetts borders the Atlantic Ocean and is bounded between the Merrimack River and the Massachusetts-New Hampshire state line. Amesbury borders Salisbury on the West and Newburyport to the south. Salisbury is located in Essex County and has a total area of approximately 17.9 square miles. The Town is primarily land based with 15.4 square miles of land and 2.4 square miles of water. The Town's land is made up of forest, salt marsh and wetlands, and residential development. The population of Salisbury based on the 2020 census is 9,465. Due to the proximity to the Ocean, Merrimack River and abundance of low-lying areas the Salisbury is considerably vulnerable to climate change.

Salisbury Demographic Characteristics		
Population	**Salisbury**	**Massachusetts**
2019	9,534 residents	6,892,503
2010	8,283	6,547,629
Age		
Residents under 18 years	17.7%	19.8%
Residents 65 years and over	19.8%	16.5%
Households		
Owner-occupied housing rate, 2014-2018	79.0%	62.3%
Median household income, 2014-2018	$78,112	$77,378
Language other than English spoken at home	4.5%	23.6%
Additional Information		
Residents with disability, under age 65	10.7%	7.9%
Residents in poverty	7.3%	10.0%

All data from the United States Census Bureau

Census.gov/quickfacts/fact/table/salisburytownessexcountymassachusetts,US/PST045218

The median household income in Salisbury is $78,112, slightly above the median statewide income of $77,378 (2014-2018 American Community Survey 5-Year Estimates), 7.3% of the Town's residents live below the poverty level, and 36.5% are low- to moderate-income.

Project Description & Climate Impact:

Salisbury is a coastal town located on the North bank of the Merrimack River with 3.8 miles of coastal beach and dunes backed by a salt marsh. Away from the beachfront and coastal erosion, coastal flooding presents challenges to developed areas, including the Ring's Island area, during storms and extreme high tides when roadways at low elevations and undersized culverts force floodwaters onto roads and cause damage to homes and businesses. Approximately 8 to 10 times per year, flooding occurs at the Ring Island neighborhood's southwest evacuation route – at the intersection of 1st Street and March Road – leaving only the northern evacuation route, along Ferry Road, open. The Ferry Road evacuation route floods during King Tides and significant storms, stranding residents of the neighborhood and causing municipal resources, such as staff and emergency vehicles, to be diverted from other flooded areas so they can provide assistance to the neighborhood.

There are approximately 75 residential units and 15 businesses in the affected project area. The Town Pier and Harbormaster are headquartered on Ring's Island, the Town's only historic district. Ring's Island becomes completely closed off during storm events when the area roads are flooded due to the failure of the culverts and the low elevations of the roadways. Also, due to undersized culverts, tidal flow to the upstream marsh is severely restricted. This limits proper flushing of the marsh and has resulted in the invasive Phragmites overtaking a large portion of the marsh, reducing ecological diversity, water quality and overall habitat health. Tidal restrictions can alter water levels and chemistry, diminish sources of ocean nutrients, and degrade entire upstream aquatic systems.

Flooding in this area is becoming less of an inconvenience and more of an urgent problem demanding solutions. According to the Massachusetts Climate Change Projections (Northeast Climate Adaption Science Center 2018), sea level rise in Boston Harbor could be as much as 4.0 to 10.2 feet in 2100. This is in addition to the nearly one foot of sea level rise that has occurred over the past century. With climate change causing sea levels to rise and storms and surge to increase, the flooding of roadways and properties in Ring's Island will happen more frequently and damages to infrastructure, buildings and the environment, as well as threats to public safety will increase.

The Town of Salisbury proposed to increase the resilience of the coastal neighborhood of Ring's Island by raising its access/egress roads and by improving tidal flushing through culvert replacements at both 1st Street/March Road and Ferry Road. The proposed project would increase the resilience of the Ring's Island neighborhood, which becomes isolated during extreme flooding events. The proposed MVP Action project involved ***redesign and retrofit*** of infrastructure as well as an ***ecological restoration to increase resiliency***. The project would

increase the resiliency of the roadway, reduce upland flooding in current and future climates, and enhance the resiliency of over 30 acres of salt marsh.

Project Goals:

The project goals were to design the implementation and infrastructure to support the previous study performed in 2019. The study addresses three of the highest priorities/goals identified in Salisbury's MVP Summary of Findings Report (February 2019), summarized below:

- Protect roads as municipal investments and as access/evacuation routes for residents, tourists, and workers. Strategies could include raising roads; improving flushing at road-water crossings; and protecting areas along, or in the vicinities of March Road and Ferry Road.
- Evaluate and study the addition of flood protection measures, as appropriate, on flood-prone streets/areas.
- Protect the marsh by implementing strategies that eliminate restrictions.

Replacement of the Ferry Road culvert was also selected by the Ipswich River Watershed Association based on a hydraulic and ecological screening assessment conducted in the aftermath of Super Storm Sandy, as part of the Great Marsh Resiliency Project. The Merrimack Valley Region Hazard Mitigation Plan (updated 2016) identified the Ferry Road culvert as a high priority project, recommending adjusting the culvert sizes and consideration of "tidal control structures to increase tidal flows (for marsh restoration) while providing increased protection from flooding during coastal storms." Finally, the Great Marsh Coastal Adaptation Plan (2017) called for a comprehensive assessment of the Ferry Road area culverts, recommending consideration of raising the elevation of the road and implementation of a marsh restoration project.

Approach:

To meet the Project goals and complete the scope items, the project team and its subconsultants:

1. Met with residents of the community as part of the extensive public outreach program, the Director of Public Works, the Director of Planning and Development, and other town staff.
2. Held several workshops with select community members representing the residents of the Ring's Island neighborhood.
3. Visited the project area, and continued field data collection including additional survey, and borings throughout the project area.
4. Performed modeling of final culvert size including scour mitigation and overtopping analysis.
5. Performed structural, geotechnical and stormwater design services to support final design and permitting efforts.

6. Drafted permit documents and held meetings with permitting agencies.
7. Drafted final design drawings and specifications.

The goal of the proposed Resilient Rings Island Project is to increase the resiliency of the neighborhood and roadways, reduce upland flooding in current and future climates, and enhance the resiliency of over 30 acres of salt marsh upstream of the proposed project through the redesign and retrofit of roadway infrastructure.

The approach was to perform the work two general phases; phase one will be the Ferry Road reconstruction and phase two will be the 1st Street/March Road reconstruction. Ferry Road was chosen as the first phase of construction because it will allow for the restoration of tidal flow and subsequent salt marsh restoration.

The roadway infrastructure improvements include raising sections of the roadway along 1st Street, March Road and Ferry Road such that the road surface meets or exceeds elevation 9.0 ft NAVD88 in order to accommodate for future sea level rise scenarios. Raising the roadway will be accomplished using two methods: retaining walls and slope grading. Slope grading is only proposed in a few small areas such as on the south side of March Road where a retaining wall would not be practicable due to the limited size of the area. The remaining portions of 1st Street and Ferry Road will be elevated using retaining walls unless slope grading does not greatly impact the saltmarsh. The use of retaining walls will allow for the smallest amount of salt marsh impact possible an alternatives analysis examining these design considerations had been completed. Finally, the roadway infrastructure improvements will also include the installation of larger culverts to allow for increased tidal flow with the addition of a self-regulated tide gate.

Results and Deliverables:

Due to the significant impacts to wetland resource areas the project was found to be “not permittable” by permitting agencies as currently designed. Several factors that led to this decision are:

- Wetland impacts, specifically salt marsh included approximately 8,700 square feet (sf) of permanent salt marsh impacts and 4,000 sf of temporary salt marsh impacts.
- Poor soil conditions prevented the use of sheet piles along Ferry Road therefore increasing the salt marsh impacts.
- The goals of the project could be met with a much smaller footprint by focusing on the area closest to Route 1 (Bridge Road), 1st Street and March Road and not Ferry Road.
- Unclear goals for access and evacuation for tidal and storm event scenarios.
- Community’s desire to have pedestrian and bike access vs. environmental impacts.

Project deliverables required for the project is as follows:

- Permitting and Final Design Drawings
- Contract Document Specifications including technical specifications and front-end documents.
- Meeting agendas, minutes, committee meetings, public meetings, presentations
- Geotech Site reports
- Revised Survey Data/Plan
- Borings and materials testing results
- Geotechnical memorandum
- Scour and Overtopping Analysis
- Notice of Intent
- MESA checklist
- MEPA/ENF Submittal
- ACOE IP
- Outreach materials
- Monthly Reporting/Progress Reports
- Engineer's opinion of probable construction cost

The following link is the presentation to the community:

https://m.facebook.com/SCTVMC/videos

Resilient Ring's Island Project Public Information Meeting July 22, 2021

Salisbury Planning Project Homepage:

Resilient Ring's Island Road Improvement Project | Salisbury MA

Lessons Learned:

- There is limited flexibility with permitting regardless of climate change vulnerable sites such as the Ring's Island neighborhood. The Town had limited land available conducive to offset or mitigate any wetland impacts, this was a contributing factor in the likelihood of future permit denial.
- The size and scope of the project along with the extent of wetland impacts was also a contributing factor for a" non-permittable" project.
- The soil conditions in the project area are not favorable for standard construction techniques. The inclusion of lightweight fill and geotechnical and structural specialty foundations required due to soft-consolidating soils was necessary and the cost of these mitigatory measures was near prohibitive.

Partners and Other Support:

The project was managed and performed by Weston & Sampson with collaboration from the Woods Hole Group (WHG), and town personnel. Weston & Sampson managed all aspects of the design and data gathering through the development of the final design drawings, report and engineer's opinion of probable construction cost.

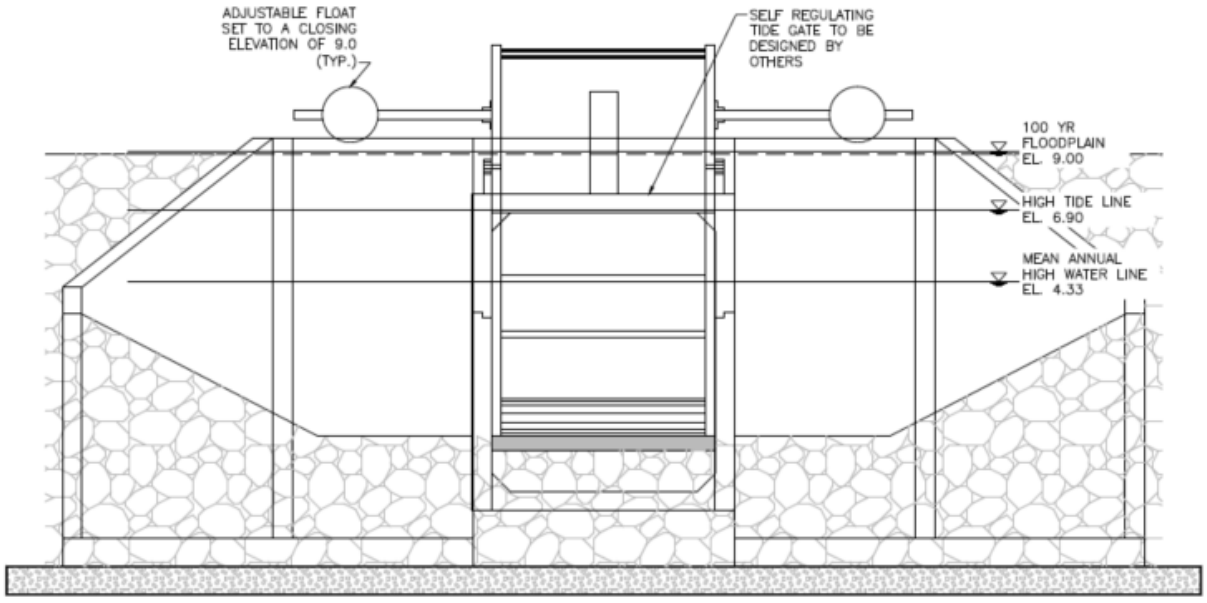
Project Photos:

Ferry Road-Existing Conditions (Photo 1)

First Street-Existing Conditions (Photo 2)

Self Regulating Tide Gate Desgin (Photo 3)

1st Street & March Road Proposed Upgrade Drawing (Photo 4)



SELF REGULATING TIDE GATE FRONT VIEW

SCALE: $\frac{3}{8}$" = 1'–0"