Municipal Vulnerability Preparedness Program Action Grant Case Study

Municipality: Town of Falmouth
Project Title: Conceptual Design of Flood-Resiliency Improvements for Sewer Infrastructure – Town of Falmouth, MA
Award Year (FY): FY2022
Grant Award: $ 104,040
Match: $ 35,780
Match Source: Cash and in-kind services
One or Two Year Project: One year project
Municipal Department Leading Project: Falmouth Wastewater Division
Project Website URL: Falmouth Wastewater Division Website - https://www.falmouthma.gov/1354

Community Overview: The Town of Falmouth is located on the southwest corner of Cape Cod, between Buzzards Bay and Vineyard Sound. The community has a year-round population of approximately 32,500 people. Falmouth has over 70 miles of coastline resulting in a significant number of homes, businesses, facilities, and infrastructure within the vicinity of tidal waters. The main municipal sewer system has multiple lift stations that service these areas. Four critical lift stations are located within the 100-year flood plain. Research institutions, a ferry terminal, coast guard infrastructure, and commercial businesses connect into these stations, along with numerous residential homes. The stations also serve Environmental Justice (EJ) Communities and Climate Vulnerable communities. The Town of Falmouth, especially the Village of Woods Hole has historical value and is a world-renowned tourist destination.

Project Description and Goals: A large portion of the Town's sewer infrastructure is located along the Town's southern coastline. This area is vulnerable to storm events from Vineyard Sound under both current and projected future conditions. This project assessed the impacts of coastal flooding on vulnerable sewer infrastructure, specifically focusing on four vulnerable lift stations and a force main. The table below identifies the proposed design elevations for the four lift stations assessed for this project.

Parameter	Woods Hole Lift Station	Park Road Lift Station	Falmouth Beach Lift Station	Inner Harbor Lift Station
2050 Design Flood Elevation (Mechanical) (ft)	17.4	19.1	17.4	17.8
2070 Design Flood Elevation (Structural) (ft)	18.6	19.9	18.0	18.4

The goal of this project was to build upon previous MVP funded planning projects which identified the vulnerability of this infrastructure, to evaluate nature-based and hard infrastructure alternatives to allow the most vulnerable infrastructure to withstand a design storm event.

As part of this project, public meetings were held to discuss the project and alternatives considered. Areas surrounding and served by the lift stations and force main focused on in this project are home to Environmental Justice communities and elderly climate vulnerable populations. The project was completed on time and materials developed in this effort are on the Town of Falmouth's website for public review.

Results and Deliverables:

Design flood elevations were established for critical sewer infrastructure using projected sea level rise and flood-related freeboard elevations. Vulnerable aspects of each lift station and the force main were identified. An upgrade was proposed for each identified vulnerability to reduce or eliminate the risk of damage from coastal flooding. Conceptual designs and cost estimates were developed to increase the flood resilience of the five assets. Recommended flood resiliency measures incorporated into the conceptual designs for lift stations include strategic relocation of critical equipment (such as louvers and electrical equipment) and dry flood proofing critical infrastructure through the installation of immersion rated panels and hatches. Options for force main protection included relocation and installation through directional drilling at depth.

Lessons Learned:

Multiple flood resiliency strategies were assessed for the four sewer lift stations and critical force main infrastructure. The criticality of infrastructure served by each lift station was used to evaluate options to maintain operation during a design storm versus shutting down the station during the design storm and providing the capability to restart equipment shortly after flood waters recede. Flood duration projections for future flood events were used to evaluate how long lift stations were anticipated to be inaccessible during a design storm event.

Multiple cost-effective flood resiliency strategies (such as relocation of strategic critical equipment and installation of water-proofing measures to existing infrastructure) are anticipated to increase the flood resilience of the evaluated infrastructure while the Town continues its planning effort to adapt to climate change. The alternatives evaluated in this project will provide a valuable example of potential adaptation options to neighboring low-lying coastal communities in Southeastern Massachusetts.

Partners and Other Support:

- Massachusetts Office of Coastal Zone Management
- Owner – Town of Falmouth, MA – Amy Lowell, Wastewater Superintendent
- Engineer – GHD Inc.
- Nature-based alternatives evaluation and climate change modelling – Woods Hole Group, Inc.

Project Photos:

Figure 1: Park Road Lift Station During a Flooding Event in 2018.

Figure 2: Falmouth Beach Lift Station Located in the Parking Lot of Surf Drive Beach

Figure 3: Inner Harbor Lift Station Located at the Head of Falmouth Inner Harbor

Figure 4: Woods Hole Lift Station Located on the water in Woods Hole Village

Figure 5: Woods Hole Force Main Located under the Shining Sea Bike path