Background

After three major flooding events within a one-year period the Town of Waterbury has made serious efforts to reevaluate critical infrastructure, determine the future of neighborhoods, and improve its ability to respond to future floods and other natural disasters. Our efforts ultimately led to a community forum on July 29, 2024 when an array of mitigation options and strategies were discussed with the community. The Town utilized professional facilitators to lead community conversations, culminating in individuals voting on community priorities. Those priorities were used to inform the Town's hazard mitigation pre-application, along with expert advice.

The Town has hired SLR Consulting to assist with preparation of the hazard mitigation grant pre-application, and we seek to engage with this firm to complete the hydrology, design and engineering work necessary to ultimately completing capital projects that would lessen the impact of future floods.

Project 1: Update the December 2013 Waterbury Choke Study

The Town of Waterbury is seeking a FEMA grant to update the Waterbury Flood Study (also known as the Winooski Street Bridge Restriction Study or the Waterbury Choke Study) completed in December 2013 by SLR Consulting (formerly Milone & MacBroom). Since this study was performed following flood damages from Tropical Storm Irene in 2011, data collection and hydraulic modeling tools have advanced warranting another look at flood mitigation alternatives following recent floods and expanding the model to look at other repeat damage areas.

The primary task for this project is to collect water-penetrating green LIDAR over a larger study area and then create a 2-dimensional hydraulic model to (re)evaluate flood mitigation alternatives. Some of the same alternatives from the 2013 study will be evaluated as well as new alternatives to try and reduce local flood damages for larger floods like Tropical Storm Irene, moderate floods like July 2023, and smaller floods like July 2024. The model will be expanded to include the mainstem Winooski River from upstream of the Ice Center to Farrs Field (~5.8 miles), Thatcher Brook from the confluence to Kneeland Flats Road/Guptil Road (~3.4 miles), and Graves Brook to near Perry Hill Road (~0.7 miles).

This work will be coupled to ongoing buyouts in repeat damage areas, property improvements such as floodproofing, and infrastructure improvements. In addition, findings will be reviewed in the context of dam operations at both Waterbury Reservoir and Bolton Falls.

An additional task of this project is to evaluate the downtown storm drainage pipes that drain runoff from the Main Street area towards the Winooski River. We note the gravity fed storm drainage system creates challenges for areas of Waterbury's downtown, as there are areas where the storm drains are lower than the Winooski. We therefore experience flooding through the storm drain system in areas that were not inundated by river water.

Pipe network models will be run with a range of downstream backwater conditions from no backwater (i.e., free flow) to large flood levels (i.e., fully backwatered). The models will be used to evaluate alternatives to improve drainage and reduce flood risk when river water enters and backwaters the systems. If available, the models used to design the system upgrades for the Main Street Reconstruction Project will be used to evaluate alternatives. Alternatives will include modifying the drainage systems, changing outlet elevations, stopping back flow with check valves, or installing pumping systems.

The goal of this study is to identify beneficial flood reduction alternatives that reduce the risk of damage during a range of flood levels to submit FEMA Hazard Mitigation Grant applications for design and implementation.

Approach

Modeling is only as good as the data you put into the model, and thus we propose collecting drone-based topography and imagery across the project site. This information will provide high-accuracy elevations of the river channels, floodplain, roads, and buildings. LiDAR data collection will include both traditional and topobathymetric systems to collect floodplain, channel, and below water elevation data. Data provided will include digital terrain models, digital surface models, water surface model, ground control points, and a data accuracy report. The LiDAR data collected and resulting deliverables will be state-of-the-art, providing Waterbury with an asset and tool that will be useful for this study and moving forward.

Data collection will include survey of the storm sewer system, as needed. The Town's pipe and structure network mapping will be updated with survey and television investigation, as needed. The existing and new data will be used to create or update models of the drainage systems in the project area. The models will be used to evaluate potential modifications to reduce the extent of inundation in known problem areas during flood events.

We will estimate flood flows by scaling from nearby river gauges and assemble the 2-dimensional hydraulic model. The modeling will be validated with past high water marks and USGS flow and water level records during recent floods. Model runs will include past flood events to reconstruct scenarios that the community has recently lived through as well as predicted future flood levels. A wide range of existing and new flood mitigation alternatives (described below) will be evaluated for local and downstream flood mitigation.

Results from the alternatives analysis will be shared with the project team and the public to reach consensus on a set of preferred alternatives. The selected alternatives will be advanced to concept design (30% complete) to assist with funding applications.

A FEMA Benefit-Cost Analysis (BCA) will be prepared for the selected alternatives to confirm eligibility for FEMA HMGP funding. The BCA will require estimates of project construction costs and the benefits (i.e., avoided flood damages) to determine if the selected projects will be eligible for funding.

The modeling results, recommendations, conceptual designs, construction costs, permit needs, and BCA will be summarized in a report that is the ultimate deliverable for this phase of the project. Waterbury's leaderhship team, in concert with SLR Consulting, will present the project findings and recommendations at a final public meeting.

Specific Alternatives to be Examined:

(1) Harvey Farm Area Reconnection: The first Waterbury Flood Study indicated that floodplain reconnection at the Harvey Farm would provide up to 1.1 feet of flood reduction for larger floods. The hydraulic model shows that the constricted floodplain due to channel incision, the presence of the railroad embankment, and historic fill has created a narrow floodplain that backs up water during floods. Removal of some of the fill along the farm could lower upstream flood levels. This flood mitigation alternative will be reevaluated with the more detailed data and hydraulic modeling approach to confirm flood risk reduction benefits.

(2) State Owned Cornfield: The agricultural field between the state office complex and the Winooski River has an accumulation of sediment in the middle of the field from past flooding. The Town is seeking to remove the sediment to increase flood storage and drop flood levels along Randall Street and Elm Street. This project will likely include shaping the land along the edges of the cornfield to prevent flood waters from preferentially flowing towards homes while the center of the cornfield is dry. This evaluation would include floodplain reconnection on a piece of state-owned land across the Winooski River in the Town of Duxbury, along with re-evaluation of the connected floodplain at Dascomb Rowe Field that the Town owns.

(3) Winooski Street Bridge Area: The Winooski Street Bridge has been suggested to be a restriction (or choke point) on flood flows leaving downtown Waterbury. However, the original flood study did not show change in flood

levels with widening or even removing the bridge. The bridge will be evaluated again using the improved hydraulic model. The alternative will include creating local floodplain storage and allowing road overtopping.

(4) The Waterbury Wastewater Treatment Plant (WWTP) sits on a 39-acre parcel with open fields located between the lagoons and the Winooski River. The lower field overtopped during Tropical Storm Irene with shallow flooding. The previous hydraulic study indicated limited upstream flood reduction benefits with lowering the field, yet this floodplain reconnection alternative will be explored in the new model to understand potential flood mitigation benefits.

The berm around the WWTP is armored with either light riprap or Type II heavy stone fill based on past design plans. The hydraulics model will be used to understand if this amor is adequate to protect the WWTP from erosion damages, and if some level of floodplain reconnection in the area is possible that could reduce local or upstream flood levels.

(5) Ice Center Lands: The Ice Center of Washington West, surrounding fields, and the access road are located in the Winooski River floodplain. The Ice Center was damaged during Tropical Storm Irene, yet was not damaged in July 2023 and July 2024 floods. The past hydraulic study explored limited field lowering to create flood storage, and now the Town would like to explore larger floodplain reconnection and possibly road relocation to maximize flood storage in the area to reduce risks to the Ice Center and downstream areas.

(6) Route 2 Drainage: Homes in the low-lying areas between Little River Road and Jenny Davis Road on the north side of the Vermont Route 2 and the south side of Interstate 89 have experienced flooding prior to their neighbors across the road that are closer to the river. Local topography and drainage around the interstate appear to be creating increased local flood risk. The Town proposed to work with the Vermont Agency of Transportation to determine if culvert upsizing and other drainage improvements could reduce or eliminate repeat damages in the area. A drainage analysis will be performed to map runoff paths and estimate the amount of runoff making it to this location during a range of precipitation events to identify the preferred alternative. The updated hydraulic model of the Winooski River would be used in conjunction with the drainage analysis to guide design.

(7) Thatcher Brook and Graves Brook Bridges, Culverts, Dam, and Floodplain

Flooding took place along Thatcher Brook and Graves Brook during July and December 2023 floods. The hydraulic study will be extended upstream to include the area where the brook flooded and damaged property and infrastructure to evaluate flood mitigation alternatives.

On Thatcher Brook, the updated model will be used to evaluate the bridges at Armory Drive and Main Street to reduce risks to nearby properties on Union Street, O'Hear Court, Huntington Place, and North Main Street. Floodplain reconnection along Thatcher Brook near Guptil Road would be evaluated to increase local storage. Finally, removal of the failing dam located just downstream of Laurel Road would be analyzed for local flood mitigation benefits, in addition to eliminating a downstream risk associated with a dam breach.

Further downstream, there are several large parcels along Thatcher Brook, in between Stowe Street and Armory Drive, that are undeveloped. While one is privately owned, the others are owned by the State of Vermont and the Edward Farrar Utility District. There are also several adjacent properties on Union Street (36, 38, 40 & 42 Union) which have pending buyout applications through FEMA. These properties collectively total ~ 16 acres. The updated

hydraulic model will be used to evaluate floodplain restoration in the area.

On Graves Brook the culvert at Lincoln Street would be evaluated to reduce flood risk from overtopping damages to the road and nearby houses.

The Town has an ongoing HMGP application with FEMA to create a flood bench and armor sewer infrastructure on lower Thatcher Brook along Stowe Street. This improved hydraulic model will support final design of this flood mitigation alternative.