JUNE 2021

CASE STUDY: CONTROLLING FLOODING AND ADDRESSING FUTURE CLIMATE IMPACTS THROUGHT THE REPLACEMENT OF THE ORCHARD STREET CULVERT, NEWBURY, MA

Prepared for:

Town of NEWBURY Massachusetts

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IPSWICH RIVER WATERSHED ASSOCIATION

TEAMS INVOLVED

This project was a collaboration between the Ipswich River Watershed, as project manager, The Town of Newbury as project proponent, and Gill Engineering and Derosa Environmental as project partners

Funding for this project was provided by EOEEA's Massachusetts' Municipal Vulnerability Preparedness Action Grant Program.

Massachusetts MunicipalVulnerability Preparedness Program Action Grants

INTRODUCTION

COMMUNITY OVERVIEW

The Town of Newbury is a small semi-rural suburban community located in the low-lying coastal plain region of Northeast Massachusetts. It is located within the Parker River watershed, which is a primary tributary to the Great Marsh Area of Critical Environmental Concern (ACEC). The Town of Newbury committed to working with the Ipswich River Watershed Association (IRWA) and other project partners to further their planning efforts as part of the MVP Program. As part of this effort, the Town prioritized actions that would work towards building climate resiliency. One of the identified "high priority" actions was restoration to improve resiliency and hydrology management of the Great Marsh and other coastal habitats of Newbury.

The Orchard Street crossing at Cart Creek was the highest ranking barrier on both the Town's priority list and IRWA's priority list for the Town that resulted from the Great Marsh Barrier Mitigation Project. This prioritization alignment provided an ideal opportunity to create a partnership that would equally benefit a municipality and critical ecological resources.

Cart Creek is part of tidally influenced marsh system, with two-way tidal flow adding additional complexity to designing an appropriately sized structure upgrade. The site currently suffers from flooding that regularly overtops the roadway, leading to significant scouring of both the stream bed and banks, and the crossing structure itself. The width of the current stone box culvert is undersized at approximately 29 feet and poses a significant constriction to tidal flow.

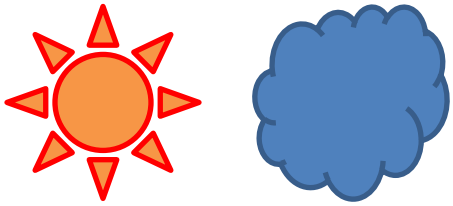
FUNDING DETAILS

MVP GRANT AWARD: $126,324

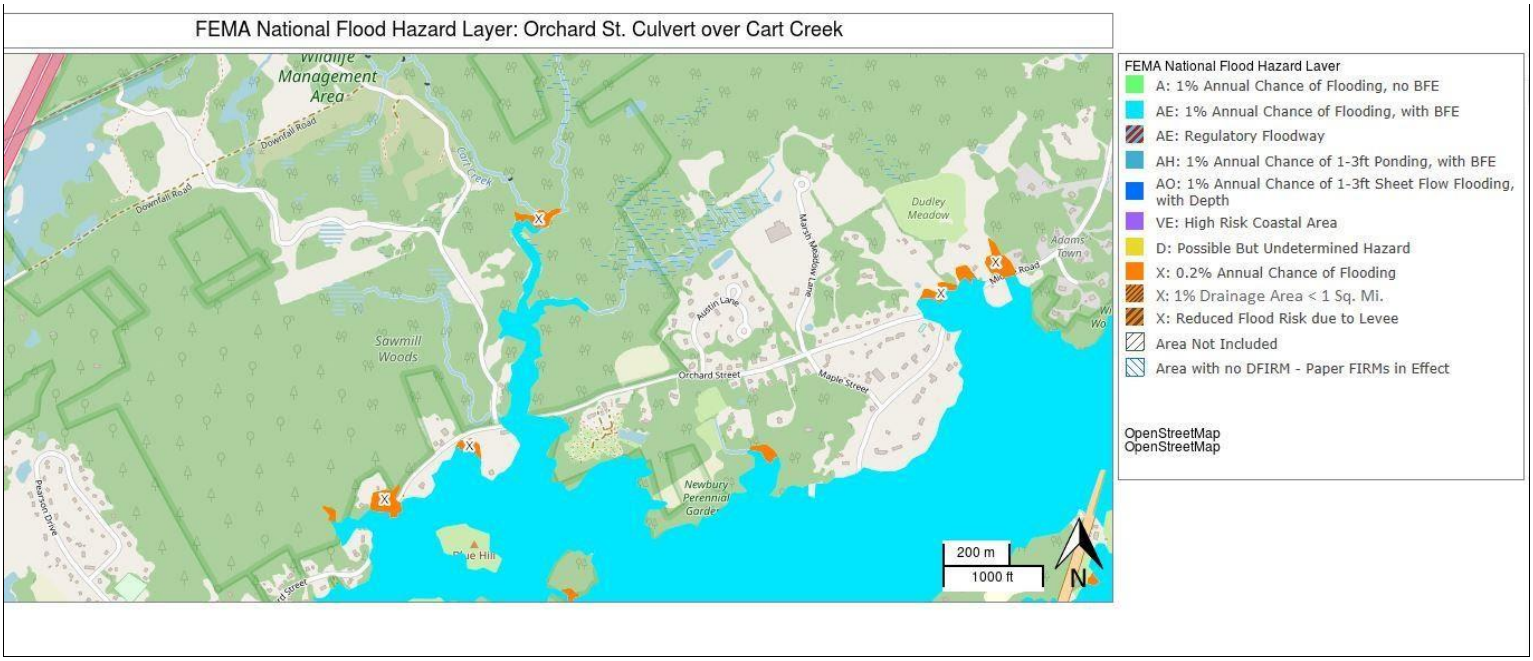
PROPOSED MATCH: $44,872

ACTUAL MATCH: $46,666.40

CLIMATE IMPACT



- Enhanced flood protection through the use of nature-based solutions.
- Properly sized crossings offer reduced vulnerability to climate change impacts.
- Newbury will experience an increase in relative mean sea level of 0.5 feet to 0.8 feet over year 2000 conditions by 2030
- Designed upgrade will improve the tidal exchange conveyance, allowing for increased resiliency against more frequent, larger flood events



PROJECT APPROACH & OUTCOMES

Site assessments and hydraulic analysis determined that a new single span bridge with a 3-sided concrete frame supported by H-Piles would provide the best upgrade at the Orchard Street location. This new structure will supply the benefit of an increased opening width to minimize scour caused by storm events and tidal fluctuations.

Additionally, construction of the new crossing is designed to minimize impacts to the environmentally sensitive ACEC. H-Piles will be driven into shallow bedrock in order to minimize excavation and the area of salt marsh disturbance. Roadway elevation will also be increased by over 0.5 feet, effectively making the roadway more resilient to the projected 10-year storm inundation.

Plan set packets were prepared and delivered to Newbury.

The following analyses, reports, and permits were completed as part of the project:

- Culvert Replacement Technical Report
- Wetland and Waterbody Delineation
- Fluvial geomorphological Survey
- Hydraulic Design and Scour Analysis Report
- Environmental Notification Form (ENF)
- Massachusetts Environmental Policy Act (MEPA)

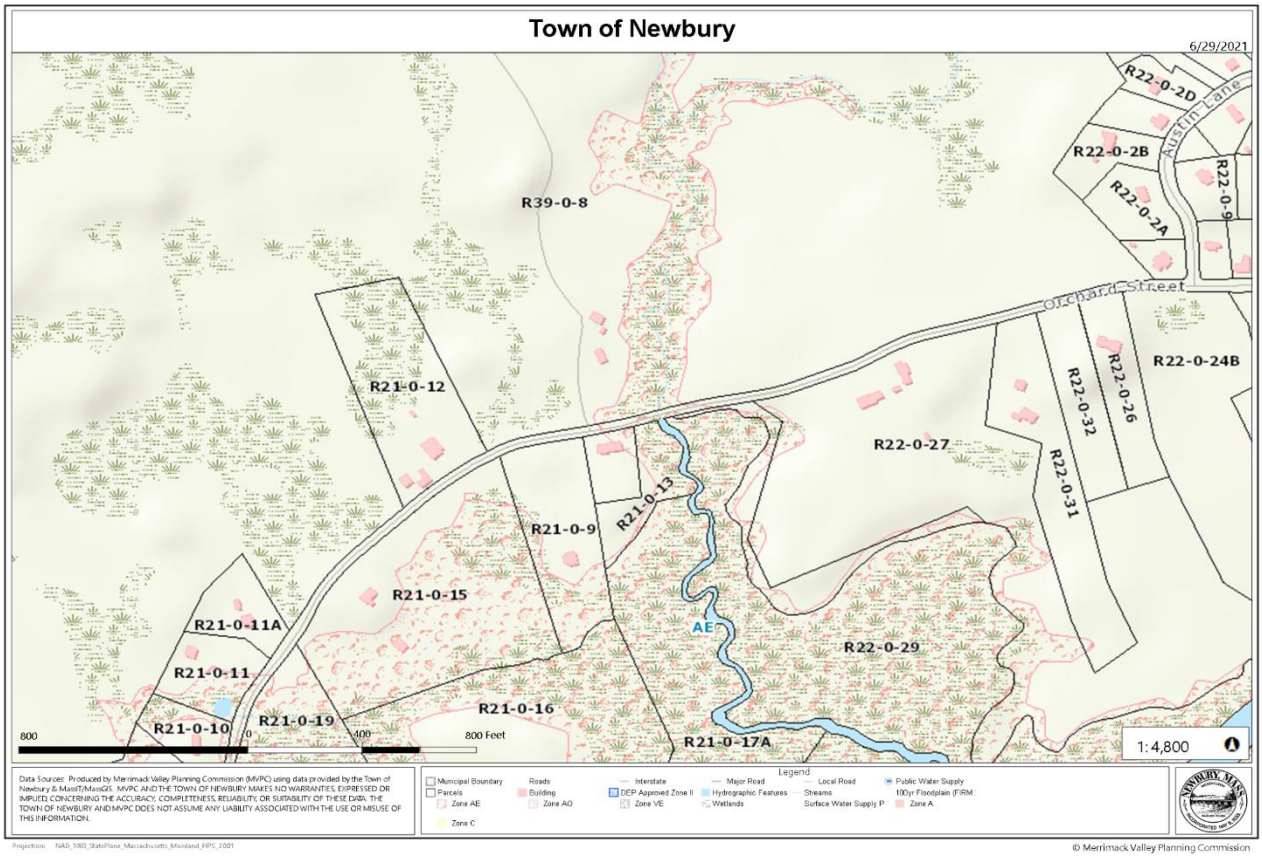
OUTREACH OUTCOMES

- Blog post:

  https://www.ipswichriver.org/06/17/orchard-street-a-project-for-people-and-fish/

Project Page Web link:
https://pie-rivers.org/portfolio-item/orchard-street-newbury-culvert-replacement/

LESSONS LEARNED



PROJECT BENEFITS VERSUS IMPACTS

- Careful consideration had to be made during the design and permitting phases to accurately describe all potential environmental impacts of the project.
- Being located within an ACEC provides significant potential restoration benefits but also brings additional scrutiny to the permitting process.
- Local areas of wetland and marsh needed to be carefully delineated and described in order to adequeately determine ecological impacts.
- The North Atlantic Aquatic Connectivity Collaborative (NAACC) Data Center website supplied road stream crossing locations and ID's as well as field notes, photos, structural condition of crossings, existing AOP conditions, roadway characteristics, and geographic location.

TIDAL CROSSINGS

- Two-way tidal crossings add a significant layer of complexity to a culvert upgrade project when compared to a one-way stream crossing.
- Tidal monitoring during the beginning phases of the project was key in determining the magnitude of local tidal fluctuations. Subsequently, this also informed the calculations necessary to determine the width and freeboard of the new structure such that it would not impose a constriction on the tidal channel.

PARTNERS & OTHER SUPPORT

- Town of Newbury- project proponent/ applicant,assistance with monthly progress meetings and conservation commission meetings
- Gill Engineering- plan set and costdevelopment
- Derosa Environmental- Federal, State, and local permitting
- Ipswich River Watershed Association- project management

NEXT STEPS

Now that designs and permitting are complete, IRWA as project manager will strive to continue our partnership with the Town of Newbury in seeking future sources of funding for the construction phase of the project (see Appendix).

Our hope is that this MVP Project can serve as a model for other Towns going forward when attempting to prioritize and address barriers.

APPENDIX

Potential Grant Funding for Culvert Replacement

IPSWICH RIVER WATERSHED ASSOCIATION
The Voice of the River

Funding & Technical Resources for Barrier (Culvert, Dam, Bridge) Mitigation Projects

FUNDER	GRANT PROGRAM*	NON-TIDAL	TIDAL	DAM	BRIDGE
DFG Division of Ecological Restoration (DER)	Culvert Replacement Municipal Assistance (CRMA)	X			
DFG Division of Ecological Restoration (DER)	Restoration and Revitalization Priority Projects	X	X	X	X
MassDOT	Small Bridge Program	X	X		X
National Atmospheric and Oceanic Administration (NOAA), National Marine Fisheries Service (NMFS)	Habitat Restoration Grants, Coastal Resilience Grants	X	X	X	X
EEA Municipal Vulnerability Preparedness (MVP)	Action Grants	X	X	X	X
EEA Office of Coastal Zone Management	Coastal Resilience Grant Program		X	X	X
EEA	The Dam and Seawall Repair or Removal Program			X	
Department of Fish and Game (DFG)	In-Lieu Fee (ILF) Program	X	X	X	X
United States Fish and Wildlife Service (USFWS)	National Fish Passage Program	X	X	X	X
National Fish and Wildlife Foundation (NFWF)	Forest and Rivers Fund	X	X	X	X
FEMA, administered by MEMA	Hazard mitigation, pre-disaster mitigation, flood mitigation	X	X	X	X
EOHED	MassWorks Infrastructure Program	X	X	X	X
Division of Local Services	Community Compact Best Practices Program	X	X	X	X
Private & Corporate Foundations	Regional Foundations	X	X	X	X

*Refer to most current RFR for types of project funded.

Adapted from 10/30/19 DER Massachusetts Culvert Replacement Resources document

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Funding & Technical Resources for Barrier (Culvert, Dam, Bridge) Mitigation Projects

TECHNICAL SUPPORT	DESCRIPTION	WEBSITE
DFG- Division of Ecological Restoration	Technical Assistance with culvert, dam & salt marsh restoration projects	https://www.mass.gov/orgs/division-of-ecological-restoration Stream Crossing Handbook
DFG- Division of Marine Fisheries	Technical Assistance with diadromous fish passage projects	https://www.mass.gov/orgs/division-of-marine-fisheries
DFG- Office of Fishing and Boat Access	The Office of Fishing and Boating Access provides access to waterways.	https://www.mass.gov/fishing-and-boating-access
DFW- MassWildlife	Conservation of freshwater fish and wildlife, including endangered plants and animals.	https://www.mass.gov/orgs/division-of-fisheries-and-wildlife
US Fish and Wildlife Service	Endangered Species Act Technical Guidance	https://www.fws.gov/newengland/endangeredspecies/index.html
NOAA	Estuarine, coastal and river habitat restoration technical assistance	https://www.fisheries.noaa.gov/topic/habitat-conservation#how-we-restore
MVP Regional Coordinators	Work with city and town officials to support communities through the MVP process.	https://www.mass.gov/municipal-vulnerability-preparedness-mvp-program
Massachusetts Emergency Management Agency (MEMA)	FEMA grants are administered by MEMA	https://www.mass.gov/service-details/pdm-fma-grants
DEP Circuit Rider	Technical, administrative, and regulatory assistance on numerous wetland topics	https://www.mass.gov/orgs/eea-office-of-grants-and-technical-assistance
EEA Office of Grants and Technical Assistance	Conservation of natural resources and outdoor recreational programs	https://www.mass.gov/orgs/eea-office-of-grants-and-technical-assistance
Community Grant Finder	Mass.gov resource for finding grant opportunities	https://www.mass.gov/lists/community-grant-finder
MassDOT	Stream Crossing Handbook	https://www.mass.gov/massdot-environmental-services
Local Conservation Agents	Assistance on local wetland topics	Located on Town or City Conservation Commission Website Page

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