Municipal Vulnerability Preparedness Program Action Grant Case Study

Municipality: Haverhill
Project Title: Little River Dam Removal Feasibility Study
Award Year (FY): FY21
Grant Award: $ 129,693
Match: $ 43,418
Match Source: In-kind staff time; Haverhill Community TV resources
One or Two Year Project: One-Year Project
Municipal Department Leading Project: Mayor's Office
Project Website URL: Little River Dam Project Information

Community Overview:

- The City of Haverhill has a population of approximately 63,000 and is located in northeastern Massachusetts in northern Essex County, along the Merrimack River.
- The Little River Dam is located within a mapped minority EJ community in Haverhill. Resilientma.org indicates that this community's population is 29% minority, with a 2010 median household income of $51,096 (compared to $62,072 for the state of Massachusetts as a whole). 7% of residents in this neighborhood have no high school diploma, and 1.4% have no English language ability. This EJ community stretches northward along the Little River to I-495. Immediately south and east of the project site, an additional EJ community is mapped as having both a low-income and high minority population (median household income of $30,942; 34.85% minority; 30.3% without a high school diploma; and 2.2% of residents with no English language ability).
- Haverhill is the most inland City on the tidally-influenced portion of the Merrimack River. As a gateway city, Haverhill has significant historical importance and its history is closely tied to the Merrimack River, the Little River, and other waterways in the City that provided power and transportation to the City's mills during the industrial revolution. The Little River Dam itself is a relic of the City's industrial legacy. While Haverhill's industry was most commonly associated with shoe production, the Little River Dam was a source of mechanical hydropower to power the adjacent Stevens Mill, which produced woolen textiles. The mill was expanded several times over its history and mechanical hydropower was replaced with hydroelectric power generation. Within the last 40 years that mill ceased to operate and the dam was no longer needed for power generation.

Project Description and Goals:

- The Little River Dam is a run-of-the-river dam located on the Little River, a tributary to the Merrimack River. The Little River Dam is located in a highly developed area in the center of the City of Haverhill, just north of Winter Street (Route 97) and approximately 240 feet west of the intersection with Stevens Street. The dam is immediately adjacent to the Stevens Mill Building (aka Pentucket Mill), the foundation of which is integrated with the dam abutment.

- During the City's MVP planning process, stakeholders identified areas upstream of the Little River Dam as a particular concern in terms of flooding. The Little River Dam was originally built to power the Stevens Mill, although it has not been used for this purpose for many decades. Future extreme precipitation events brought about by climate change will impact the Little River in the coming years. Estimates developed during the project indicate that peak river flow rates during storm events will be 48% higher 50 years from now than they are currently. This has the potential to increase flood risk at individual properties upstream, even where flooding has not been seen historically. Significantly higher volumes of water during storm events may also result in increased risk of scour and erosion along riverfront properties. It also increases the risk of a catastrophic dam failure, which would result in uncontrolled release of contaminated sediment, debris, and the large volume of impounded water currently held back by the dam. The damages from such a failure could be significant.

- The MVP Action Grant project focused on exploring removal of the dam through a feasibility study with the following key objectives:
    - Reduced flooding risk in an environmental justice neighborhood
    - Potential addition of a river access point and public green space amenity from land recovered from the dam's impoundment
    - Increased tree cover in the downtown area
    - Increased marketability of the Stevens Mill property for mixed-use redevelopment and affordable housing (sale of the property has been hindered in part by liability associated with dam ownership)
    - Environmental benefits associated with removal of a barrier to fish passage along the Little River
    - Demonstration of nature-based solutions for riverbank restoration and stabilization that could be replicated along the City's waterways, including the Merrimack River, as well as throughout the Commonwealth.

  The feasibility study included review of existing information and initial outreach to regulators, base mapping from available data sources, initial evaluations of sediment quality and quantity, preliminary hydrologic and hydraulic modeling using HEC-RAS, structural evaluation of the connection between the dam and adjacent mill building, concept-level design and community engagement.

- The project has met all of the goals set forth in the City's grant application in terms of:
    - Employing nature-based solutions
        - Dam removal offers an opportunity to employ nature-based solutions by eliminating a hard-engineered structure to restore the natural path of a watercourse. Dam removal is thus a nature-based approach to both flood resiliency and ecosystem restoration. Removal of the Little River Dam would restore the natural flow of the river, removing the existing impoundment, and

thereby lower both current and projected future flood elevations in the adjacent EJ neighborhood. Removing the dam also removes a barrier in the river which currently impedes the passage of fish and many other aquatic organisms and would open up an approximately 4-mile stretch of river between the Merrimack and the New Hampshire state line. All information gathered through the dam removal feasibility study points to a viable implementation project to achieve these outcomes.

- Improving equitable outcomes for, and fostering strong partnerships with, EJ and other Climate Vulnerable Populations
  - The City of Haverhill employed a Community Liaison model for this project and has built a successful partnership that has been very effective in reaching residents, homeowners, and business owners in the impacted EJ neighborhood, as well as other community stakeholders. The outreach efforts by the Community Liaison have proved invaluable in connecting directly with residents and providing sufficient support time to listen to and coordinate responses to individuals' concerns and questions. Feedback from the community was directly incorporated into the concept design developed at the end of the project, and the City looks forward to continued dialog with residents as the project progresses and plans are further refined.

- Providing regional benefits
  - Given the Little River Dam's central location in the city, close to City Hall, benefits of the project will extend to larger segments of the population outside of the adjacent EJ community. The concept design includes increased walkable connectivity to existing recreational resources, including an access route and walkway along the river that would connect between Cashman Park and the Stevens Mill/Winter Street area. The concept also includes an overlook platform and pocket park at Winter Street to welcome City residents and visitors into the site. Tree planting along the river edge would also increase shade and cooling for the river and adjacent properties.
  - Removal of the dam will remove the risk of catastrophic flooding should the dam fail, and will open up connectivity to a significant length of upstream habitat all the way to the New Hampshire State line. The removal of the Little River Dam would therefore eliminate the first barrier to anadromous fish passage on the Little River and extend available spawning habitat an additional 4 river miles upstream.

- Implementing the public involvement and community engagement plan set forth in the grant application
  - The principal engagement elements of the project centered on two community forums, which were held in both English and Spanish during consecutive sessions. Over 70 people logged on to participate in the project's first community forum in late March, and approximately 30

logged on to participate in a follow-up session in early June. As planned, input and feedback from the first forum fed directly into the vision for the overall concept design developed for the project, which was then presented to the community at the second project and received with much positive feedback and enthusiasm.

- Support from Haverhill Community Television made live-casting of the remote meetings possible and all project information was posted to a central page on the City's website, along with recordings of the meetings and a question and answer document which provided detailed responses to various questions raised by the community during the initial public forum.
- The Community Liaisons developed flyers and did extensive on-the-ground outreach at local businesses and events to let stakeholders know about the upcoming events. The Liaisons also orchestrated translation of the print materials and presentations into Spanish and arranged live interpretation for the Spanish language events. This was an exciting precedent for the City in terms of equitable engagement.

- Finishing the project on time
  - All project deliverables were completed on time and on budget.

Results and Deliverables:

- The project application outlined three key milestones of success:
  - Completion of the feasibility study. The study has been completed as planned, with all technical information pointing toward a successful future project. Early communication with regulators has been positive.
    - Hydraulic modeling completed for the study showed that planning now to remove the dam in a controlled fashion will reduce the risks of upstream flooding as precipitation increases (current flood levels in the Acre Neighborhood will be decreased by 3.1 feet for the 10-year flood, 1.9 feet for the 50-year flood, and 0.7 feet for the 100-year flood). Dam removal will also eliminate the downstream risks of a catastrophic dam failure. This proactive step would restore the river to its natural hydrology in a planned fashion, allowing the City to work with residents to develop a design that addresses residents' goals and concerns and ensures that all materials are handled safely and that thorough river cleanup and restoration are part of the design before construction even begins.
    - The width and depth of the river will be significantly reduced after the dam is removed. In general, these changes will be most pronounced in the immediate vicinity of the dam and will gradually lessen further upstream or north. Minimal changes in width are expected upstream of the I-495 Bridge. Based on the results of modeling analyses for the dam removal scenario, water levels are expected to drop between 4.6

and 9.8 feet immediately upstream of the dam up to the MBTA bridge, and about 2.8 feet from the MBTA bridge up the Utility Conduit Crossing. The change in water level will lessen from 2.7 feet to essentially no change from the utility crossing up to the I-495 bridge. The anticipated width of the restored, free-flowing river will range from about 20 to 35 feet under low-flow conditions anticipated during the August and September (late summer) months when water levels will be at their lowest and the river at its narrowest.

- Testing of the sediments as part of this project show that there are areas of contamination where approximately 5,000 cubic yards of sediments will need to be dredged and transported off site for disposal at a licensed disposal facility. The dam removal project would allow for these contaminated sediments to be handled properly in a controlled manner, whereas failure of the dam would release these sediments downstream without any remediation. The remainder of the accumulated sediment in the impoundment does not represent a hazard to humans or the aquatic environment. With the approval of permitting agencies, the non-hazardous sediments can be allowed to redistribute naturally downstream. Modeling has shown that these sediments will pass through the downstream flood conduit without issue and ultimately out to the Merrimack River.
- As part of the modeling of the dam removal, flow velocities and scour potential were analyzed to assess potential risks to infrastructure, including upstream bridges and utilities. It has been deemed feasible to develop a design that will include the necessary protections to ensure that these structures are not negatively impacted by dam removal.
- Similarly, modeling results indicated that sufficient depths can be maintained to accommodate recreational boating and fish passage. Additional information is needed to determine which species are most appropriate to plan for, given the downstream flood conduit which will continue to restrict passage for certain species.
- Dam removal will restore what is currently a ½ mile long dammed reach of the Little River to a free flowing condition, opening access to approximately 4 miles of additional stream habitat.

- Engagement by local neighborhood residents, as evidenced by participation in community meetings and public comment opportunities.
    - Over seventy (70) people logged on to participate in the project's initial community forum, held in back-to-back English and Spanish sessions. According to City officials this was likely a record for the City in terms of community participation in a project meeting. Seventeen (17) people asked questions and voiced opinions about the project, expressing a mix of support and concerns. Those who opposed

removal of the dam generally expressed doubt about the likelihood of extreme flooding and voiced concerns with the ecological effects of removal of the dam and the impact to usage of the impoundment such as use by small boats. Those in favor of the dam removal expressed general support for removal of the dam and returning the river and the area's plant and wildlife more to their natural states. There was also support for an increase in recreational opportunities and neighborhood connections for residents.

- A follow-up document was developed and circulated via the community liaisons with detailed responses to many of these questions based on additional information from the City's engineers and new results from the feasibility analyses. Feedback regarding community concerns was then used to shape and inform the concept design to best meet the desires and needs of the community.
- The design concept was presented in a follow-up forum which drew approximately 30 participants and received overwhelmingly positive feedback.
- The community members participating in the project to date have been diverse, including direct abutters, businesses, other local residents (renters and owners), long-time residents and newcomers to the City. The Latino Coalition of Haverhill has been a strong supporter. The project team has also connected with anglers and watershed and environmental groups. The Haverhill Conservation Commission organized a kayak trip on the river to get to know the area better, and a group of volunteers has organized to monitor fish at the base of the dam during the spawning season to better understand which species are able to traverse the flood conduit to the dam, and therefore which species should be the focus of upstream design to best encourage fish passage.

    - Successful long-term implementation of the study recommendations, which are expected to include removal of the dam, development of a new river access point, and creation of an enhanced riparian buffer through planting of trees and other native species.
        - All outcomes to date point toward a successful long-term project. The City is proactively pursuing funding for the next stages of project design, and has applied for both an FY22/FY23 MVP Action Grant and DER Priority Project Status.

- Key project deliverables include the overall dam removal feasibility report, which contains graphics of the proposed concept for dam removal and river restoration, as well as recordings of the community forums and public workshop on nature-based bank stabilization. All of these deliverables will remain available for easy access on the project webpage: **Little River Dam Project Information**

Lessons Learned:

- The Community Liaison model works. Having dedicated project staff with existing connections and trusted relationships in the community is key to reaching people, being responsive to questions and feedback, and making residents feel genuinely heard throughout the project. Our Community Liaisons also took on the role of making sure information about the project was presented in a way that was easy to understand and accessible for a wide audience. This was not only in terms of spoken and written languages, but in targeting the level of language used (especially scientific and acronym-filled information) to as broad an audience as possible.
- When faced with change, many people tend to assume that the existing conditions (if somewhat positive and pleasant) are the natural state and future conditions can be difficult to envision or imagine, resulting in opposition to the proposed change no matter what the potential benefits. We had purposely proposed the first community event as an interactive design charrette to be held early in the project to guide conceptual design for the future site, but this format had to be adapted due to limitations imposed on gatherings due to COVID-19. In our revised community forum format, it would have been beneficial to have graphics of a conceptual vision to present to people right from the start to help them envision what positive change for the site could look like. We saw much more positive and productive responses during our second community forum when these visioning tools were available.
- Tips for other communities approaching this type of project:
    - Be thorough in presenting the history of the project area under study. Most often the landscape has been heavily altered from its original natural condition – use historic maps and photos to show how this is a man-made or man-affected landscape that may not be suitable for its current use/configuration.
    - Create clear and compelling graphic representations of the potential future to help people see what is meant by proposed improvements and use these as a jumping off point for further discussion and refinement.
    - Provide clear and measurable benefits for the potential future condition. Residents had detailed and thoughtful questions and wanted to know in detail what future conditions of the river would entail, including water depths, sediment disposal, riverbank vegetation and dimensions, and measurable water quality forecasts. Presenting these details clearly helps move the discussion from "do this because we say it's a good idea" to "here are the 6 ways this will benefit the community, the ecosystem and the City's overall resilience."

Partners and Other Support:

- City of Haverhill Project Team
    Allison Heartquist, Mayor's Chief of Staff
    Rob Moore, Conservation Agent
    John Pettis, City Engineer
    Mike Stankovich, DPW Director

Mayor James Fiorentini
Bill Cox, City Solicitor
Andrew Herlihy, Community Development
Orlando Pacheco, Energy Consultant
Matt Belfiore, Haverhill Community Television

As the project lead for the City, Allison Heartquist has provided project management, grant oversight and administration, and leadership of the project team and coordination of the work done by the project's community liaisons. Rob Moore has been organizing volunteers to monitor fish at the base of the dam during spawning season. Bill Cox and Orlando Pacheco are heavily involved in coordination with the existing owner and future developer of the adjacent mill and are involved in ownership transfer arrangements and gaining an understanding of title rights within the remainder of the impoundment. John Pettis and Mike Stankovich have been involved in data collection and information gathering with respect to utilities, existing plans and planning related to the improvements at Cashman Park and elsewhere. Mike Stankovich has also been leading coordination with MBTA regarding the potential formation of a trail along the east side of the restored river corridor. The Mayor is actively involved in all of these discussions and a very active member of the team in terms of planning, leadership, and coordination of ownership arrangements and funding support.

- Fuss & O'Neill – Engineering Consultant Team

  Julianne Busa, PhD, Project Manager
  Phil Moreschi, PE, Water Resources Engineer
  Arnold Robinson, AICP, WEDG, Community Engagement
  Sean Arruda, PE, Hydraulic and Hydrologic modeling
  Greg Wilson, PLA, Landscape Architect

- Community Liaisons – coordination of outreach, public information sessions, and media coverage

  Christine Soundara
  John Cuneo

Project Photos:

- See attached photo of existing conditions and rendering of proposed conditions. Photo credit: Fuss & O'Neill.