

Funding recommendations for 2024-2025 Trust Fund Monies

Projects recommended for funding:

Project Name	City/Town	Award Amount	Match
Woonasquatucket River Streambank Stabilization – San Souci Drive	Providence	\$50,000	\$234,985
Restoring a Coastal Buffer and Marsh Migration Corridor along Winnapaug Pond	Westerly	\$5,000	\$5,923
Succotash and Potter Pond Marsh Restoration	South Kingstown	\$65,000	\$200,000
Restoring Coastal Habitats and Improving Resilience on Winnapaug Pond	Westerly	\$83,924	\$2,560,000
Salt Marsh Habitat Improvement and Phragmites Suppression in a Protected Marsh	Jamestown	\$21,076	\$3,830
Total		\$225,000	\$3,004,738

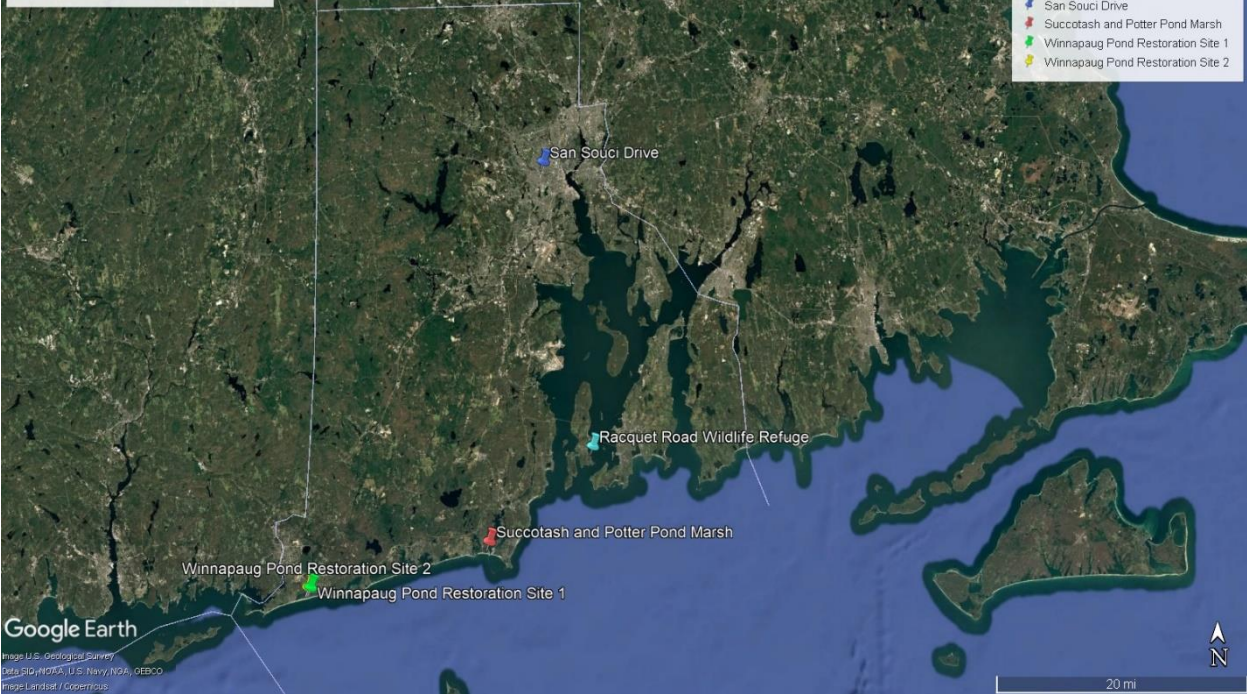
Habitat Restoration Team Technical Advisory Committee:

Member	Affiliation
Tom Ardito	Restore America’s Estuaries
*Caitlin Chaffee (Chair)	Narragansett Bay National Estuarine Research Reserve
*Philip Edwards	RI DEM Division of Fish and Wildlife
Natalie Schafer	US Environmental Protection Agency
*Emily Hall	RI Coastal Resources Management Council
Suzanne Paton	US Fish and Wildlife Service
Danielle Perry	National Oceanic and Atmospheric Administration
Margherita Pryor	US Environmental Protection Agency

**Member recused from reviewing some full proposals*

Habitat Fund Projects 2025

- Legend**
- Racquet Road Wildlife Refuge
 - San Souci Drive
 - Succotash and Potter Pond Marsh
 - Winnapaug Pond Restoration Site 1
 - Winnapaug Pond Restoration Site 2



III. BUDGET SUMMARY

(List individuals or organizations providing financial or in-kind support to the project under Project Partners)

Amount Requested from Trust Fund		\$50,000
Matching Funds	Project Partner(s)	Amount of Match
In-Kind	Providence DPW Chief Engineer Staff Time	\$5,000
Cash	Rhode Island Coastal and Estuary Habitat Restoration Fund (CEHRT) (includes previous unexpended grant remainder)	\$109,750
Cash	WRWC Project management Staff Time (from SNEP Pilot Watersheds Initiative)	\$15,570
Cash (Pending, grant application submitted February 2024)	319 Nonpoint Grant Funds	\$70,150
In-Kind	United Way of RI	\$5,000
Cash	Additional Funding Needed to Complete Permitting, Sources Pending	\$29,515
	TOTAL PROJECT COST	\$284,985

IV. PROPOSAL NARRATIVE

1. Justification and Purpose

Overview: The Woonasquatucket Streambank Stabilization Project has significant funding/investment. Currently, funding is secured for the Alternatives Analysis/Conceptual Plans that includes an Existing Conditions Survey and Wetland Assessment and for the Environmental and Geotechnical Assessment tasks. To date, the Survey and Alternatives Analysis have been completed and the Environmental Consultant is starting the Conceptual Plans. For the project to progress without interruption to Phase II that includes the 60% Design and associated project management and meetings, the CRMC funding is urgently needed. As described in detail below in this Proposal Narrative, the Conceptual Plans schedule was delayed due to the United Way of Rhode Island’s (UWRI) emergency wall repair that changed the bathymetry needed to model the streambank restoration project. In addition, UWRI’s intended commitment to the streambank restoration project of \$50,000 become unavailable for the streambank restoration project since the funds were needed for their wall repair.

Proposed Project: The Woonasquatucket River Watershed Council (WRWC) proposes to restore the habitat and stabilize the streambank along San Souci Drive and the United Way of Rhode Island (UWRI) Property in urban Providence, RI. Our priority is creating a flood and climate resistant stable streambank that improves habitat for pollinators, aquatic species, and mammals along the river. As part of this effort, the streambank will also be stabilized with a mix of both hard (gabion baskets and/or geocells) and softer (coir fiber matting, and/or other plantable structures planted with native, wildlife friendly vegetation) bank stabilization methods. The need for hard methods is not preferred; however, the high flow velocities and limited space require more substantial infrastructure, particularly at the

bend of the river in the project area. Nonetheless, our priority is creating a flood and climate resistant stable streambank that improves habitat for pollinators, aquatic species, and mammals along the river.

Restoration Goal: Our goal is sustainable habitat restoration and stabilization of the streambank. As part of our initial meeting with the RIDEM Wetland Program to review the Alternatives Analysis, a goal of the project that includes vegetative habitat was discussed. The Engineer Consultant will identify as much re-vegetation that is feasible at the top of the streambank that provides habitat for pollinators and bird populations. As part of our design effort, a landscape architect experienced with streambank restoration projects will be contracted to identify the best suitable restoration vegetation for habitat.

Short-term and Long-Term Outcomes: Both short-term and long-term outcomes include creating a flood and weather resistant stable streambank that improves habitat for pollinators and mammals. Over the long-term this project will prevent further bank slumping and degradation of the recently installed multi-use trail at the top of the bank along San Souci Drive and San Souci Drive adjacent to the trail. The project will also help the UWRI mitigate impacts to their existing retaining wall where a portion of the wall is undergoing an emergency repair, as detailed under Human Impacts below.

Human Impacts: The river in this area of Providence is channelized due to dense industrial, commercial, and residential development along its banks. As climate change brings higher intensity and more frequent storms, erosion along this bend in the river has become worse over the last ten years. We need to stabilize it before it degrades completely.

In particular, the multi-use trail completed in 2019 and San Souci Drive are at a high risk of further slumping into the river and degradation with noticeable increasing cracks visible in January and February 2024 to the point where the Providence Emergency Management Agency (PEMA) assessment found it necessary to place cones on the trail in March 2024. The City of Providence Department of Public Works (DPW) is very concerned and identifies this project as a priority, with the slumping and degradation of the trail, adjacent to San Souci Drive, becoming a safety issue. Both City departments provided support letters attached to this grant.

Additionally, the United Way of RI (UWRI), an important partner who serves the greater community, has experienced degradation of their retaining wall adjacent to the river that worsened during the December and January 2024 storms. Concerned about the wall and its impact on the attached patio foundation and to their building, the UWRI was forced to conduct an emergency repair of their retaining wall for fear of the wall collapsing into the river in March 2024. Currently, the UWRI is replacing a portion of the compromised retaining wall to protect the stability of the shoreline and their upland offices as well as properly conveying the river flow around the bend. This is an immediate issue that required immediate attention – the proposed restoration project will help mitigate structural impacts to the portion of the retaining wall replaced as well as the remaining wall that has not yet been compromised. The UWRI has a total investment of \$1.5 Million in their wall repair project, as stated in the attached support letter.

Previous Restoration Activities/Current Standing (Overview): This section of the Woonasquatucket River benefitted from previous restoration activities concurrent with building the multi-use trail on San Souci Drive in 2019. We received previous CRMC Coastal and Estuarine Habitat Restoration Trust (CEHRT) Funds in the amount of \$16,900 to purchase plants and soils and add pollinator habitat directly in and around the trail adjacent to the streambank and in the immediate vicinity such as on United Way of UWRI's property and a new walkway that includes green stormwater infrastructure between

Westminster Street and San Souci Drive in Olneyville Square. Because the trail project did not cost as much as initially estimated, we did not need to use all the funds allocated at that time. We still had \$9,750 remaining from those project funds and used them to help complete the Alternative Analysis. We received \$50,000 in 2022 CRMC CEHRT that has been used to pay the remaining cost of the Alternative Analysis and for funding the conceptual plans scheduled to be completed. We also received \$50,000 in 2024 CRMC CEHRT (that will be used to replace the UWRI funding loss) to conduct Phase I/II Environmental Assessments and the Geotechnical Analysis. Work completed, that includes the reason for delay in the conceptual plan development, is further detailed below.

Previous Restoration Activities/Current Standing (Detail): The Woonasquatucket Streambank Stabilization Project has significant funding/investment. To date, the following activities have been completed:

- 2022 - 2023: WRWC developed a scope of work, a request for proposals (RFP), reviewed bids, and chose an engineering firm to complete a survey of the project area and develop an alternatives analysis/conceptual plans for streambank restoration.
- March 2024: Survey with bathymetry data was completed.
- June 2024: Environmental Consultant completed the Alternatives Analysis (see attachment). Four alternatives were identified for the streambank restoration project and reviewed with WRWC in July 2024.
- August 2024: A stakeholder meeting was held with the City of Providence, United Way, WRWC, and the Engineer Consultant to review the alternatives and receive feedback.
- August 2024: A separate community stakeholder meeting was held with the Campeones, United Way, and Engineer Consultant to review the alternatives and receive feedback. The Climate Action Champions (Campeones de Combate Climático or Campeones in Spanish) live in the Olneyville neighborhood of Providence and within the project area. The WRWC works with the Campeones in climate adaptation and mitigation strategies through specialized stormwater and habitat restoration training, and through following projects that include the San Souci streambank restoration project. The Campeones, who have been included in preliminary project meetings, are aware of the flooding and erosion issues in this project area and view it as a neighborhood priority.
- September 2024: Based on the feedback from the August 2024 meetings, a separate meeting was held with the Habitat Restoration Team that included the RIDEM Wetlands Program, WRWC, and the Engineer Consultant to review the proposed alternative and obtain feedback for completing the conceptual plans. During this meeting, habitat restoration was identified as a priority for the design.
- October 2024 – February 2025: Due to United Way's emergency wall repair, the Engineer Consultant has not been able to progress with the conceptual plans. UWRI's wall repair covers the streambank restoration area (refer to yellow area on the Locus Map that highlights the retaining wall and patio attached to UW's building). The UWRI's emergency wall repair includes riprap material placed adjacent to the most upstream portion of the retaining wall with visible cracks. This riprap is located along the streambank and also in a portion of the river that has changed the bathymetry. The WRWC conducted a survey of the river that identified the bathymetry for the streambank restoration project prior to the riprap being placed, which now renders WRWC's bathymetry data inaccurate for this area of the river. To avoid (1) re-surveying this area that adds additional cost and (2) any potential re-design of the streambank restoration project, it was decided to wait until the UW's full design of the emergency wall repair was complete in February 2025. The UW's design includes modeling and updated bathymetry data

that the WRWC’s Engineer Consultant can use going forward to prepare the conceptual plans. As previously discussed and detailed in Section 2. below, UWRI also needed to reallocate their monetary commitment to the streambank restoration project to their wall repair.

2. Project Activities, Schedule and Work Plan

The following table summarizes the planned activities including tasks, schedules, and funding status. A detailed description of the planned activities is detailed after the table.

Task	Schedule	Funding
Exiting Conditions Survey	Complete - March 2024	Secured
Wetland Assessment	Complete - March 2024	Secured
Alternatives Analysis & Conceptual Plans	Alternatives Analysis – June 2024 Conceptual Plans – July 2025	Secured
Environmental Assessment – Phase I	July 2025	Secured 2024 CEHRF Funding
Geotechnical Analysis	August 2025 – September 2025	Secured 2024 CEHRF Funding
Environmental Assessment – Phase II	August 2025 – October 2025	Secured 2024 CEHRF Funding
60% Design	October 2025 – January 2026	2025 CEHRF Request and Pending Funding
Permitting	February 2026 – September 2026	Pending Funding
90% Design	October 2026 – December 2026	Future Funding
Construction Documents and Bidding	January 2027 – April 2027	Future Funding
Construction/Oversight	July – October 2027	Future Funding

For the project to progress without interruption to Phase II that includes the 60% Design and associated project management and meetings, the CRMC funding is urgently needed. The UWRI had originally committed \$50,000 in cash toward the streambank restoration, but unfortunately due to their emergency wall repair, funds were needed to pay for the repair. Therefore, the CRMC funds awarded in 2024 replaced the loss of UW’s contribution to continue the design in the coming year. UWRI will continue to be an important project partner and property owner committed to the streambank restoration project to see it to its completion. The following activities are planned to continue with design:

- March 2025 – July 2025: Conceptual Plans. Using UW’s modeling data that includes the most up to date bathymetry for the river adjacent to the wall repair, WRWC’s Engineer Consultant will complete the conceptual design (conceptual plans) of the project. Once the conceptual plan is complete, it will be reviewed with the (RIDEM) Habitat Restoration Team to further the design process. Review and input from the stakeholders from previous meetings and the Habitat Restoration Team will help ensure the restoration of the ecosystem functions are met and set precedence for completion of the design.
- July 2025 – October 2025: Phase I & II Environmental Assessments and a Geotechnical Analysis will be performed, as necessary, to further identify any hazards and constraints to advance the design process to 60%.

- October 2025 – January 2026: 60% Design. Based on the Conceptual Plans and Environmental/Geotechnical assessments, the design will be advanced to 60% with plans and specifications submitted to the regulatory agencies as part of the necessary environmental permit applications.
- February 2026 – September 2026: Permitting. Necessary permit applications will be completed and sent to the appropriate regulatory agencies for review and final approval of project permits. As part of the review process, regulatory agencies will provide input to ensure the intent of the habitat and streambank restoration activities meet criteria for the intended ecosystem function.
- October 2026 – December 2026: 90% design that includes plans and specifications will be completed.
- January 2026 – April 2027: Final Construction Documents that include Bidding Forms will be completed. In addition, the RFP for construction services, bid reviews, contract selection, and final agreement will be completed. The project will be constructed within the timeframe allowed for streambank projects. Final restoration and final as-builts will also be completed.

3. Coordination and Public Support

WRWC has worked in this project area for over 25 years. The multi-use trail on San Souci Drive, completed in 2019, was developed through our advocacy, partnership and funding efforts with strong community support. Through that effort, we met with all property owners surrounding the project area and have developed strong relationships with them. We also partnered closely with the City of Providence DPW and PEMA, as San Souci Drive is a Providence owned and operated street. Although we have had a long and productive relationship with United Way of Rhode Island, we deepened our relationship with them as Woonasquatucket River abutters and a property owner on San Souci Drive. Attached, you will find support letters from Providence Chief Engineer, Craig Hochman, who has committed to be part of our project team and the United Way of Rhode Island (UWRI) COO, Robert Bush, another member of the project team and our connection to the work that will take place on UWRI property. In addition, we have a support letter from PEMA.

Outreach and education strategies include programs through the Olneyville Resilience Hub, a shared community space and resource for residents to learn about and act on environmental resilience, economic security, and community health. The Hub, formed in November 2023, was launched through the efforts of the WRWC, City of Providence Office of Sustainability and PEMA to directly engage residents with projects that include San Souci, so they can learn about each phase of a restoration project through direct participation. Features of these programs support preparation to activate their community to engage with projects and project teams for education and advocacy purposes. A support letter from the Office of Sustainability is attached.

The WRWC will also continue investing in our community leadership training programs such as New Voices (Nuevas Voces in Spanish) Program to build leadership capacity and advocacy for environmental justice and climate resilience among Olneyville residents living in flood zones and experiencing the greatest challenges due to these issues. This impactful opportunity features an 10-month resident-to-resident cohort training/empowerment program delivered in Spanish and/or other languages as preferred by participants. We will also continue to work with a select group of Nuevas Voces graduates, Climate Action Champions (Campeones de Combate Climático or Campeones in Spanish). WRWC trains this team specifically in climate adaptation and mitigation strategies through specialized stormwater and habitat restoration training, and through following projects including the San Souci Streambank Restoration and other stormwater capture and treatment and streambank restoration projects in their

neighborhoods from problem identification all the way through construction. The Campeones, who have been included in preliminary project meetings, are aware of the flooding and erosion issues in this Project area and view it as a priority project in their neighborhood. They also support WRWC in monitoring and recording at the Project Site during extreme flood events. What the Campeones learn through this project will help them identify and prioritize additional projects that we can work on together to continue to make their neighborhood and local river more resilient to the impacts of climate change.

As previously stated, the Alternatives Analysis was reviewed with United Way and Providence stakeholders as well as the Campeones to obtain feedback to help identify the preferred alternative.

4. Planning Consistency and Restoration Priority

This project is consistent with CRMC's restoration priorities of enhancing habitat resiliency to climate change on projects located within Environmental Justice communities and/or that address Environmental Justice Concerns. We discuss both these priorities in sections 6 and 7 below.

5. Species of Concern

The project will help assure the success of fish runs which can lead to an increase in breeding populations of birds on the Woonasquatucket. As part of the design, consideration for vegetative habitat is a priority. Vegetation that includes smaller native trees near the top of the streambank will be evaluated, as they are seen as a benefit for bird populations. Some of the species of concern listed in the above report, such as black crowned night heron and the hooded merganser are observed on the Woonasquatucket. In addition, native pollinator species will also be evaluated for inclusion.

6. Climate Change and Coastal Resiliency

As described above, this project will create sustainable wildlife habitat and stabilize the streambank to directly mitigate the effects of and provide resiliency in the face of increased flashy streamflows and flooding related to higher intensity and more frequent storms brought about by climate change. This project will have direct impacts on resiliency of habitat to climate change. It will improve streambank habitat resiliency to increased storm flows and protect migratory fish spawning habitat that can make up for other coastal habitat losses due to climate change. We considered the present and future impacts of climate change during the project planning and design phases. As a result, the project is designed to withstand stronger and more frequent storms and rainfall amounts. It is also designed to improve avian, mammal and pollinator habitat along this stretch of the Woonasquatucket River.

7. Environmental Justice

This project takes place in and will benefit an environmental justice community. The proposed project takes place in the Olneyville neighborhood of Providence in an area identified by the Narragansett Bay Estuary Program as their highest environmental justice priority area: Priority Index 4 – 94.9% non-white and/or Latinx, 47.3% low income, 41.5% limited English, 47.1% less than high school education level.

This area is also listed as between the 90th and 96th percentile in EPA Region 1 for all environmental justice indices using EPA's EJ Screen tool: https://ejscreen.epa.gov/mapper/ejscreen_SOE.aspx

Under the EPA Environmental and Climate Justice Program (ECJ Program), San Souci Drive is located in a designated EPA Inflation Reduction Act (IRA) Disadvantaged Community. The area is underserved and overburdened with cumulative environmental and public health impacts. San Souci Drive is situated in the heart of the Olneyville neighborhood of Providence - one of the two most racially and socioeconomically diverse neighborhoods in Providence. Olneyville is the economic center of Providence's west side, the core of the historically/geographically significant Woonasquatucket River Valley, and located near polluting industries and highways. Portions of Olneyville lie in the flood plain of the Woonasquatucket River, and as such, Olneyville is disproportionately impacted by severe storm and flooding and other environmental justice and climate concerns. Olneyville Square, including San Souci Drive, is densely developed with numerous minority-owned restaurants and businesses, offices and studio spaces where flooding has dire impacts on community life.

8. Permitting

This project will require a Rhode Island Department of Environmental Management (RIDEM) Freshwater Wetlands Permit and, most likely, a RIDEM Water Quality Certification and a US Army Corps of Engineers Permit. We plan to apply for all permits once we complete the 60% design phase.

Currently, WRWC with their Engineer Consultant have met with the RIDEM Wetlands Program to review the proposed alternative and address comments as conceptual plans are completed.

9. Capacity of Lead Organization (attach additional materials if necessary)

(a) The Woonasquatucket River Watershed Council, a 501(c)(3) organization creates positive environmental, social and economic change by revitalizing the Woonasquatucket River, its Greenway and its communities. The WRWC is actively involved in and plays a critical role in ongoing restoration efforts in the watershed including the initiative to restore fish runs to Woonasquatucket; restore the Centredale Manor Superfund site; wetland restoration efforts such as the Deerfield Park and Department of Public Works projects in Smithfield; and riparian buffer restoration projects such as those we successfully completed at Cutler Brook in Glocester, and the Stillwater Brook in Smithfield. The WRWC brings local knowledge and the ability to coordinate funding and partners to facilitate project success.

(b) WRWC has a team dedicated to capital improvement projects. Our team includes two professional engineers (Bridget Zwack, PE and Mark Pereira, PE), and a stormwater specialist (Haley Essington). The team also has the ongoing support and direction of the WRWC Executive Director (Alicia Lehrer). The design, permitting, and construction oversight of several of our projects are contracted out to local engineering firms through a competitive bid process.

For this project, WRWC will assign Bridget Zwack, PE as the Project Manager and dedicated staff person. Bridget is an environmental engineer with over 15 years of experience in design, permitting, construction, and project management. Her projects focus on habitat and streambank restoration, water quality, and flood mitigation. For this project, her role will include:

- Directing technical matters;
- Overseeing work by EA Engineering, the engineering firm responsible for the alternatives analysis/conceptual plans. EA will continue work on the full design, permitting, and eventual construction documents, bidding, and construction oversight;

- Coordinating with project stakeholders, who include the City of Providence (owner for San Souci Drive), United Way of Providence (property owner), CRMC (funder), and RIDEM (permitting agency/potential funder);
- Hosting periodic project meetings during design and permitting; and
- Project reporting.

(c) To date, we have successfully completed five fish passage projects with deep appreciation to the Coastal and Environmental Habitat Restoration Trust for ongoing support to complete them all. The WRWC has successfully coordinated and overseen project development, RFP development, bid management, and construction for dozens of projects throughout the Woonasquatucket Watershed including eight green infrastructure projects completed in the last five years.

In addition, we implemented the design of a streambank restoration project in the Manton area of the Woonasquatucket River. WRWC managed the multi-year design effort, bidding, and eventual construction that took place in Summer 2024. The project was successfully constructed ahead of schedule.

10. External Factors and Climate Change

Flooding is a major concern that affects the habitat of the study area. This flooding, in large part, that includes more frequent, intense rainfall events is due to climate change. Climate change is already causing increased frequency and intensity of storms that have led to the issues we are addressing with this project, especially, the destabilization of the habitat and slumping of the streambank into the river. The vegetated streambank will need ongoing maintenance as described above and extremely intense storms could compromise the project. We know that this is the case and therefore, our plan for ongoing maintenance by the WRWC River Rangers will assure project success over the long term.

As part of the design considerations, climate change affects will be considered that include the more frequent, intense rainfall events and any design measures implemented will not increase the volume of the river that would create increased flooding conditions.

V. EVALUATING PROJECT SUCCESS (one page maximum)

1. Performance Measures and Deliverables

WRWC will develop a record drawing (as-builts) of the Project following construction. Using this record drawing, we will summarize the following Measurable Environmental Results in our final report:

- Pollutant loads reduced via vegetated riparian buffer (sediment, TP, TN, BOD, COD);
- Linear feet of vegetated riparian buffer created;
- Linear feet of riverbank stabilized;
- Fish counts (ongoing effort for entire Woonasquatucket River); and
- Others as requested.

Long term, success of this project will be measured through annual monitoring of fish return through the fish ladder at Rising Sun Mills (see monitoring plan below).

2. Monitoring Plan

Rangers maintain the site and monitor for slumping and erosion on a weekly basis. WRWC volunteers monitor fish return annually at the Rising Sun Mills Fish Ladder using RIDEM F&W monitoring protocol.

Volunteers collect direct counts at least twice daily from the middle of March through the middle of May annually. They record data in a notebook stored in a lockbox at the site. The data are analyzed by RIDEM F&W. The WRWC reports results through our Constant Contact email list, on our website, in our newsletter and directly to project partners.

Since 2010, over 40 volunteers have collected fish return data at Rising Sun Mills annually. The WRWC will assure that this practice continues in perpetuity by coordinating with RIDEM F&W, recruiting, training and setting up a monitoring calendar annually. As more habitat becomes available, we expect to see an increase in fish return at Rising Sun annually.

Additionally, the WRWC began a new volunteer monitoring program in 2014 that we continue annually. Volunteers collect fish community data annually through an electrofishing program at two sites on the Woonasquatucket. The upstream site is located on a section of river next to Whipple Field in Smithfield, a site we consider to be a fairly pristine riverine site. The second site is just downstream of Rising Sun Mills Dam in Providence, our urban site. Volunteers inventory the fish community once annually at each site on a 100' stretch of the river. This program allows us to establish a baseline and monitor changes in the fish community. We expect that our fish passage projects will strengthen the fish community diversity and population at our downstream site because all river fish will have a greater habitat range as a result of our fish passage projects. Our protocol for this program was developed with the assistance of Alan Libby, state Fishery Biologist.

Finally, we have our six year grant agreement through the Southeast New England Program (SNEP) Pilot Watersheds Initiative, so we know we will have at least four years of support after construction for all our watershed restoration activities. Maintenance will include monthly inspections during the growing season for three years as well as invasive removal and plant replacement if necessary. Should the bank stabilization show signs of failing, the WRWC team will work with partners to correct any issues expediently.

VI. PROJECT BUDGET TEMPLATE

BUDGET CATEGORY	CRMC REQUEST	MATCH	MATCH PENDING OR SECURED? (select one)	SOURCE OF MATCH	TOTAL
RFP Development / Consultant Selection (completed)		\$2,060 \$1,000	SECURED SECURED	SNEP Pilot Watersheds In-Kind DPW Time	\$3,060
Consultant Project Mgmt. WRWC Project Mgmt.		\$2,050 \$4,175 \$6,000	SECURED SECURED SECURED	Previous CEHRT Grant SNEP Pilot Watersheds Previous CEHRT Grant	\$12,225
Project Team Mtgs – Cons. Project Team Mtgs – WRWC Project Team Mtgs - Partners		\$6,000 \$5,000 \$9,000	SECURED SECURED SECURED	Previous CEHRT Grant SNEP Pilot Watersheds In-Kind DPW & UWRI Time	\$20,000
Existing Conditions Assessment		\$20,600 \$860	SECURED SECURED	Previous CEHRT Grant SNEP Pilot Watersheds	\$21,460
Alternatives Analysis		\$17,100 860	SECURED SECURED	Previous CEHRT Grant SNEP Pilot Watersheds	\$17,960
Habitat Restoration Team Meeting		\$2,000 \$1,350	SECURED SECURED	Previous CEHRT Grant SNEP Pilot Watersheds	\$3,350
Basis of Design (Conceptual Plans)		\$6,000 \$1,265	SECURED SECURED	Previous CEHRT Grant SNEP Pilot Watersheds	\$7,265
Environmental Assessment – Phase I		\$5,500	SECURED	Previous CEHRT Grant (2024 CEHRT Grant)	\$5,500
Geotechnical Analysis		\$22,000	SECURED	Previous CEHRT Grant (2024 CEHRT Grant)	\$22,000
Environmental Assessment – Phase II		\$22,500	SECURED	Previous CEHRT Grant (2024 CEHRT Grant)	\$22,500
60% (Phase II) Project Management	\$14,425	\$0	-	-	\$14,425
60% (Phase II) Team Meetings	\$11,600	\$0	-	-	\$11,600
60% Design Submittal	\$23,975	\$53,465	PENDING	319 Nonpoint Grant	\$77,440
Permitting		\$16,685 \$29,515	PENDING PENDING	319 Nonpoint Grant Future Match Sources	\$46,200
SUBTOTAL CURRENT DESIGN PHASE II REQUEST	\$50,000	\$234,985		TOTAL CURRENT PROJECT COST	\$284,985
FUTURE WORK PLANNED/COSTS					
Final Engineering (90% & 100%), specs, bid package		\$25,000	PENDING	NRCS Emergency Watershed Protection (EWP) Program	\$25,000
Bid Administration		\$6,000	PENDING	“	\$6,000
Construction Oversight / Admin		\$45,000	PENDING	“	\$45,000
Construction		TBD	PENDING	“	TBD
Maintenance		TBD	PENDING	“	TBD
FUTURE TOTAL	TBD	TBD		TOTAL PROJECT COST	TBD

VII. BUDGET NARRATIVE (one page maximum)

The following narrative details the project budget template in Section VI. This includes a breakdown of WRWC staff time and hourly rate. Some additional information includes the following:

- The Engineer Consultant who has provided design services for the streambank restoration project was chosen by a competitive bid process for consultant selection. The Alternatives Analysis and Basis of Design (Conceptual Plans) were previously contracted with the selected Engineer Consultant.
- The selected Engineer Consultant has provided cost estimates for additional scope of services that include the environmental assessments, 60% design, and permitting to budget for this project. These cost estimates have been used for this grant's project budget.
- The Engineer Consultant cost estimates are in line with a previous streambank restoration design project that was successfully constructed in Summer 2024 for the Manton area of the Woonasquatucket River, taking into account inflation and the complexity of the San Souci project located along a city street in a highly urbanized area.
- The \$50,000 commitment from UWRI for the Environmental Assessments and Geotechnical Analysis was reallocated to their wall repair. Therefore, the 2024 CRMC CEHRT funds awarded for \$50,000 replaced these funds, allowing the project to continue without delays and making it even more urgent to receive future CRMC funding to continuous this project without lapse.
- Cash funding sources secured include the Southeast New England Program (SNEP) Pilot Watershed Initiative in the amount of \$15,570 and CRMC CEHRT previous grant awards in the amount of \$109,750. In-kind match includes the City of Providence and UWRI in the amount of \$5,000 each for staff time related to stakeholder/project coordination meetings.
- Cash funding pending includes a 319 Nonpoint Source Grant WRWC applied for in 2024 in the amount of \$70,150 for the Engineer Consultant. Grant selection and awards are expected this Spring 2025.

(CRMC Fund Request in Bold/underlined below)

Phase I Design: Through Basis of Design Step

RFP Development & Consultant Selection: \$3,060

- No New CRMC Funds Requested
- WRWC Staff Time (paid through SNEP Pilot Watersheds grant): \$2,060
 - Alicia Lehrer, Executive Director, 10 hours @ \$85/hour (includes fringe) = \$850
 - Bridget Zwack, Environmental Engineer, 16 hours @ \$75/hour (includes fringe) = \$1,210
- Providence DPW Time (in-kind), 10 hours @ \$100/hour (including fringe) = \$1,000

Project Management: \$12,225

- No New CRMC Funds Requested
- WRWC Staff Time (paid through previously granted CRMC fund - \$2,050, and SNEP Pilot Watersheds grant - \$4,175)
 - Alicia Lehrer, Executive Director, 15 hours @ \$85/hour (includes fringe) = \$1,275
 - Bridget Zwack, Environmental Engineer, 66 hours @ \$75/hour (includes fringe) = \$4,950
- Previously granted CRMC funds for Consultant Staff Time: \$6,000

Project Team Meetings: \$20,000

- No New CRMC Funds Requested
- Previously granted CRMC funds for Project Team Meetings - Consultant Staff Time: \$6,000
- Project Team Meetings - WRWC Staff Time (paid through SNEP Pilot Watersheds grant): \$5,000
 - Alicia Lehrer, Executive Director, 10 hours @ \$85/hour (includes fringe) = \$850
 - Bridget Zwack, Environmental Engineer, 55 hours @ \$75/hour (includes fringe) = \$4,150
- Project Team Meetings – Partners
 - Providence DPW Time (in-kind), 40 hours @ \$100/hour (including fringe) = \$4,000
 - UWRI Time (in-kind), 50 hours @ \$100/hour (including fringe) = \$5,000

Existing Conditions Assessment: \$21,460

- No New CRMC Funds Requested
- Previously granted CRMC funds for Consultant Staff Time: \$20,600
- WRWC Staff Time (paid through SNEP Pilot Watersheds grant): \$860
 - Alicia Lehrer, Executive Director, 4 hours @ \$85/hour (includes fringe) = \$340
 - Bridget Zwack, Environmental Engineer, 7 hours @ \$75/hour (includes fringe) = \$520

Alternatives Analysis: \$17,960

- No New CRMC Funds Requested
- Previously granted CRMC funds for Consultant Staff Time: \$17,100

- WRWC Staff Time (paid through SNEP Pilot Watersheds grant): \$860
 - Alicia Lehrer, Executive Director, 4 hours @ \$85/hour (includes fringe) = \$340
 - Bridget Zwack, Environmental Engineer, 7 hours @ \$75/hour (includes fringe) = \$520

Habitat Restoration Team Meeting: \$3,350

- No New CRMC Funds Requested
- Previously granted CRMC funds for Consultant Staff Time: \$2,000
- WRWC Staff Time (paid through SNEP Pilot Watersheds grant): \$1,350
 - Alicia Lehrer, Executive Director, 5 hours @ \$85/hour (includes fringe) = \$425
 - Bridget Zwack, Environmental Engineer, 12 hours @ \$75/hour (includes fringe) = \$925

Basis of Design: \$7,265

- No New CRMC Funds Requested
- Previously granted CRMC funds for Consultant Staff Time: \$6,000
- WRWC Staff Time (paid through SNEP Pilot Watersheds grant): \$1,265
 - Alicia Lehrer, Executive Director, 3 hours @ \$85/hour (includes fringe) = \$255
 - Bridget Zwack, Environmental Engineer, 13.5 hours @ \$75/hour (includes fringe) = \$1,010

Environmental Assessments (Phase I & II) and Geotechnical Analysis: \$50,000

- 2024 CRMC Funds: \$50,000

Phase II: 60% Design – (a) Includes Phase II Project Management, (b) Phase II Project Team Meetings, and (c) 60% Design Submittal:

(a) Project Management: \$14,425

- **CRMC Funds Requested for Consultant Staff Time: \$8,200**
- **CRMC Funds Requested for WRWC Staff Time: \$6,225**
 - Alicia Lehrer, Executive Director, 15 hours @ \$85/hour (includes fringe) = \$ 1,275
 - Bridget Zwack, Environmental Engineer, 66 hours @ \$75/hour (includes fringe) = \$3,000

(b) Phase II Project Team Meetings: \$11,600

- **CRMC Funds Requested for Consultant Staff Time: \$6,600**
- **CRMC Funds Requested for WRWC Staff Time: \$5,000**
 - Alicia Lehrer, Executive Director, 8.2 hours @ \$85/hour (includes fringe) = \$700
 - Bridget Zwack, Environmental Engineer, 57 hours @ \$75/hour (includes fringe) = \$4,300

(c) 60% Design Submittal: \$77,440

- **CRMC Funds Requested for Consultant Staff Time: \$23,975**
- Match for Consultant Staff Time (paid through 319 Nonpoint Grant Source - Pending): \$53,465

Permitting: \$46,200

- Match for Consultant Staff Time (paid through 319 Nonpoint Grant Source - Pending): \$16,685
- Match for Consultant Staff Time (Future Grant Source): \$46,200

IX. ADDITIONAL MATERIALS

Please include the following with your application:

Site and Locus Maps

Ground-level photographs of existing site conditions

- Photos taken on March 25, 2004 showing damage to San Souci bike path and United Way emergency wall repair.
- Photos taken after the December 2003 and January 2004 major storm events.
- Photos taken December 2, 2021 showing streambank erosion and undercutting.

Aerial photographs, if available

Preliminary design drawings, maps or engineering plans, if available

- Woonasquatucket River Alternatives Analysis at San Souci Drive Providence, Rhode Island Technical Memorandum, June 10, 2024.

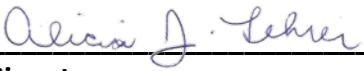
Pertinent physical, ecological, biological, and cultural / historical survey data

Letters of support

- Providence Department of Public Works – City Engineer
- United Way of RI
- Providence Emergency Management Agency (PEMA)
- Providence Department of Sustainability

AUTHORIZED SIGNATURE

AUTHORIZED AGENT OF LEAD ORGANIZATION


Signature

March 3, 2025
Date

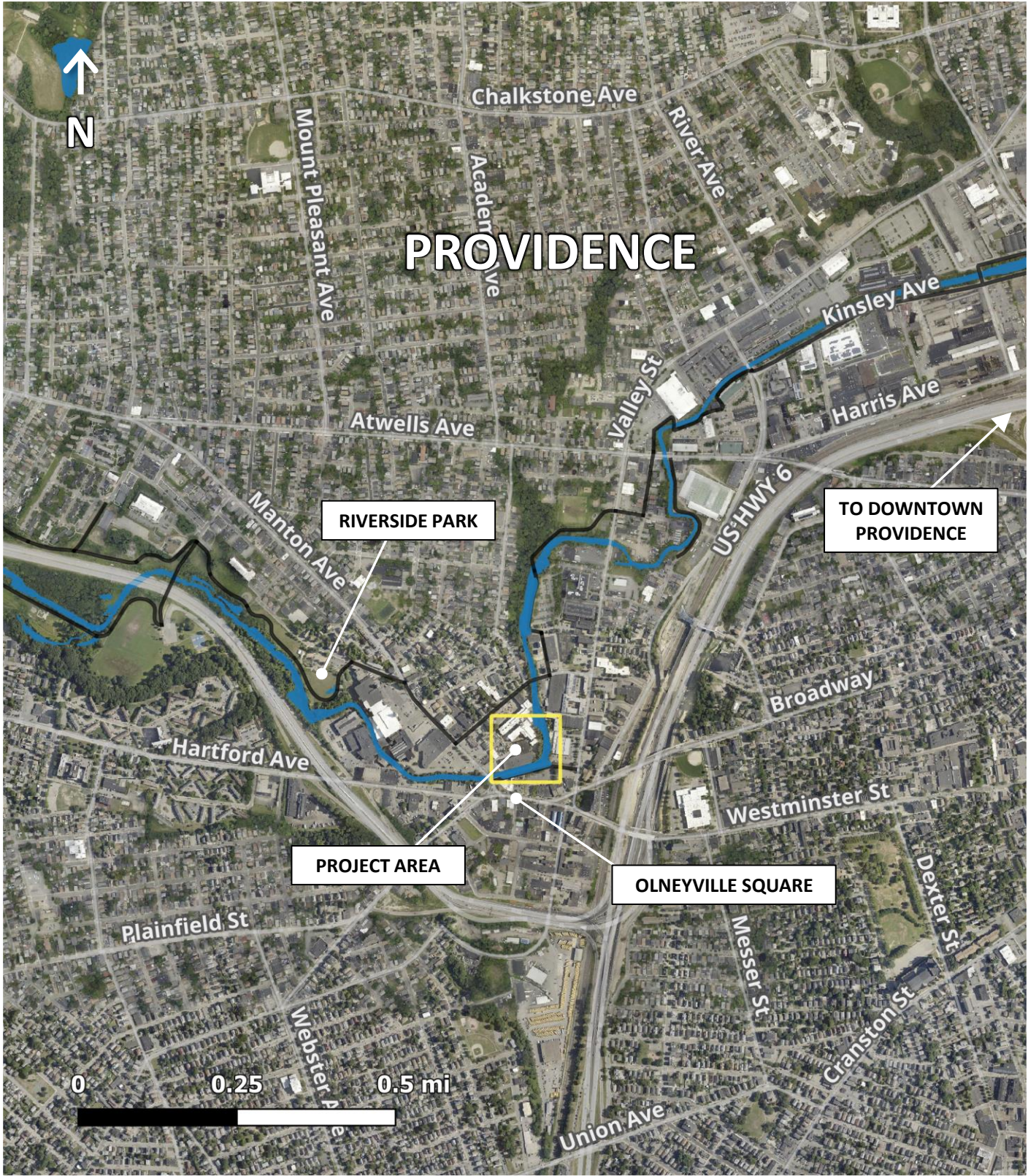
Return your completed proposal by 4:00 p.m. on **March 3, 2025** to:



Bruce Lofgren
RI Coastal Resources Management Council
Oliver Stedman Government Center
4808 Tower Hill Road
Wakefield , RI 02879
blofgren@crmc.ri.gov

Applicants are required to submit one (1) signed hard copy of the proposal form and one (1) electronic copy in Adobe PDF format. ****Please submit electronic copy as a SINGLE PDF FILE containing all application materials.****

Contact Bruce Lofgren at by email or **401-782-4196** with any questions.





PROJECT AREA COORDINATES	LEGEND	
41.81745330 N, -71.44231044 W	 GREENWAY	 WOONASQUATUCKET RIVER & TRIBUTARIES



SAN SOUCI RIVERBANK RESTORATION PROJECT –
OVERVIEW
PROVIDENCE, RHODE ISLAND

NOT TO SCALE
DATE: 2/16/2024



WOONASQUATUCKET RIVER

UNITED WAY OF RI

CATHEDRAL ART FACILITY

PROJECT AREA

WOONASQUATUCKET RIVER GREENWAY

Delaine St

Tanyard Ln

Manton Ave

San Souci Dr

Westminster St

0 100 200 ft



WOONASQUATUCKET RIVER WATERSHED COUNCIL

SAN SOUCI RIVERBANK RESTORATION PROJECT – PROJECT AREA PROVIDENCE, RHODE ISLAND

NOT TO SCALE

DATE: 2/16/2024



FIGURE 1A – BIKE PATH ALONG SAN SOUCI DRIVE SHOWING EXTENT OF PAVEMENT CRACKING. PEMA PLACED CONES ON PATH FOR SAFETY MEASURE. FACING EAST.



FIGURE 1B – BIKE PATH ALONG SAN SOUCI DRIVE SHOWING EXTENT OF PAVEMENT CRACKING. PEMA PLACED CONES ON PATH FOR SAFETY MEASURE. FACING WEST.





FIGURE 1C – VIEW FROM SAN SOUCI DRIVE FACING NORTH TOWARD UNITED WAY SHOWING UNDERCUTTING OF STREAMBANK AND EXTENT OF UNITED WAY’S EMERGENCY WALL REPAIR



FIGURE 1D – CLOSER VIEW OF UNITED WAY’S EMERGENCY WALL REPAIR. LOCATED ON UNITED WAY’S PROPERTY FACING SOUTH SHOWING EXTENT OF RIPRAP PLACEMENT ALONG BUILDING AND AT CORNER OF RETAINING WALL.





FIGURE 1A – SEPARATED BIKE PATH (WOONASQUATUCKET RIVER GRENWAY SPUR) ALONG SAN SOUCI DRIVE. SINKING AND CRACKING OF PAVEMENT AS A RESULT OF BANK EROSION VISIBLE. PHOTO TAKEN AFTER DECEMBER 18, 2023 RAINFALL EVENT.



FIGURE 1B – VIEW FROM RIVER OF AN ADJACENT AREA. TREE ROOTS ARE EXPOSED/UNDERCUT. THIS AREA IS ADJACENT TO BIKEPATH AND SAN SOUCI DRIVE.



FIGURE 1C – BIORETENTION BASINS INSTALLED JUST SOUTH OF SAN SOUCI DRIVE. FLOODING FROM THE RIVER AFTER DECEMBER 18, 2023 RAINFALL EVENT HAS FILLED THE BASINS WITH SILT AND MUD.



FIGURE 1D – VIEW LOOKING EAST ALONG SAN SOUCI DRIVE AFTER THE DECEMBER 18, 2023 RAINFALL EVENT. SEDIMENT ON BIKE PATH AND ROAD SHOW THE EXTENT OF FLOODING.





FIGURE 1E – SEDIMENT DELTA AND TREE/TRASH DEBRIS ON THE LEFT SIDE OF THE RIVERBANK LOOKING DOWNSTREAM. PHOTO TAKEN FROM UNITED WAY PROPERTY.



FIGURE 1F – ANOTHER VIEW OF SEDIMENT DELTA AND TREE/TRASH DEBRIS ON THE LEFT SIDE OF THE RIVERBANK LOOKING DOWNSTREAM. PHOTO TAKEN FROM UNITED WAY PROPERTY.



FIGURE 1G – ERODED RIVERBANK ALONG BIKEPATH/SAN SOUCI DRIVE FACING UPSTREAM LOOKING WEST. PHOTO TAKEN AFTER DECEMBER 18, 2023 RAINFALL EVENT.





FIGURE 1H – FLOODING ON BIKEPATH AND SAN SOUCI DRIVE. VIEW LOOKING EAST ALONG SAN SOUCI DRIVE 1 DAY AFTER THE JANUARY 10, 2024 RAINFALL EVENT.



FIGURE 1I – FLOODING ON BIKEPATH AND SAN SOUCI DRIVE. VIEW LOOKING WEST ALONG SAN SOUCI DRIVE 1 DAY AFTER THE JANUARY 10, 2024 RAINFALL EVENT.



FIGURE 1J -- VIEW LOOKING EAST ALONG SAN SOUCI DRIVE AFTER THE JANUARY 10, 2023 RAINFALL EVENT. SEDIMENT ON BIKE PATH AND ROAD SHOW THE EXTENT OF FLOODING.





FIGURE 1K - RECENT FLOOD EVENTS LEFT SIGNIFICANT AMOUNTS OF SILT, SAND AND OTHER SEDIMENT IN UPLAND AREAS, WHICH INCLUDED STORMWATER MEASURES INSTALLED BY WRWC IN 2020 NEAR DONIGIAN PARK.



FIGURE 1L – RECENT FLOOD EVENTS CREATED A SEDIMENT AND TRASH DAM AT THE SITE OF THE RECENTLY CONSTRUCTED GOTHAM GREENS BIKE PATH.



Ground Level Photos of Existing Site Conditions PHOTOS TAKEN 12/2/2021





10 June 2024

TECHNICAL MEMORANDUM

TO: Bridget Zwack, P.E. Environmental Engineer, Woonasquatucket River Watershed Council

FROM: Amy Hunt, P.E., EA Project Manager

SUBJECT: Woonasquatucket River Alternatives Analysis at San Souci Drive
Providence, Rhode Island
EA Project No. 6209207

The purpose of this Alternatives Analysis Technical Memorandum is to document the recommended alternative selection process for the stabilization of bank erosion along the Woonasquatucket River (the river), adjacent to San Souci Drive in Providence, Rhode Island, for the Woonasquatucket River Watershed Council. This analysis includes hydraulic modeling, development of key design criteria, and four design alternatives, cost comparisons, and alternatives evaluation.

1. EXISTING CONDITIONS

The project site is located in Providence, Rhode Island, (Providence County – 450 feet [ft] downstream from the Manton Avenue bridge) spanning approximately 80 ft on the outer right¹ bank (see Attachment A, Figure A-1 for the project location). The site is located at a bend in the river where the bank has been significantly undercut by approximately 4 ft (measured by Dawood Engineering, Inc. [Dawood], a Rhode Island Professional Licensed Surveyor, on 13 March 2024). San Souci Drive and the Woonasquatucket River Greenway Bike Path are directly south of the Woonasquatucket River in the project area and are aligned parallel to the river, with the bike path located between the river and San Souci Drive. Portions of the bike path pavement on the northern (river) side of the bike path have cracked and shifted, likely due to the undermining bank. The slope between the bike path and the undercut bank ranges from vertical to approximately 1 horizontal to 1 vertical (1H:1V) slope.

The U. S. Geological Survey (USGS) StreamStats application was run on the project site (see Attachment B). StreamStats is a website with data and tools that can be used to delineate watersheds, estimate stream flow rates, and determine other basin characteristics. StreamStats reported that the watershed is approximately 48 square miles and consists of approximately 40 percent (%) forest and 40% developed (urban) land. According to the aerial imagery and observations from site visits, the area immediately surrounding the site is mostly impervious cover, which results in flashy floods that can exacerbate the bank erosion. A 50-year storm event occurred in the watershed on 18 December 2023 (the upstream USGS gage 01114500 Woonasquatucket River at Centerdale, Rhode Island recorded a flow of 1770 cubic feet per second [cfs] and the

¹ Designations of right and left refer to river right and river left looking downstream.

50-year flow at that stream gage according to StreamStats is 1720 cfs), and adjacent property owners to the project site reported that the river overtopped its banks and the bike path and San Souci Drive were flooded.

Debris such as scooters, tires, and shopping carts have been observed within the river. A large sand bar consisting of sediment and debris has accumulated on the left side of the river approximately 100 ft downstream of the site, which has narrowed the channel in this area by approximately 50%. On the opposite side of the channel from the sand bar (river right), there is a stone masonry wall that transitions into a concrete retaining wall for a patio area that is associated with the adjacent building (owned by United Way). The concrete retaining wall projects 14 ft into the river channel from stone masonry wall, and then runs parallel to the river downstream. The 14-ft-long upstream face of the concrete retaining wall is perpendicular to the river flow; eddies have been observed in this area and a large crack is present on this face of the concrete retaining wall that continues around the corner.

The project site is within a Federal Emergency Management Agency (FEMA) Special Flood Hazard Area Floodway within Zone AE, which is defined on the Flood Insurance Rate Map (FIRM) as “the channel of a stream plus any adjacent floodplain areas that much be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.” Work that occurs within the regulatory floodway must provide hydrologic and hydraulic modeling to show that there will be no increases in the 100-year flood water surface elevation (WSE) from existing conditions (called the corrected effective model) to the proposed conditions model. This is referred to as a no-net rise analysis. If there is an increase in WSE, FEMA requires a Letter of Map Revision to be submitted and approved to document the floodplain increase. The project site is on the FIRM 44007C0304J, effective date 2 October 2015.

Photographs of the site were collected during various site visits, depicting many site features including areas of bank erosion, the downstream masonry wall and retaining wall, the upstream Manton Ave bridge, and the bike path. A photographic log is provided in Attachment C.

1.1 TOPOGRAPHIC SURVEY

Dawood, a Rhode Island Professional Licensed Surveyor, completed a topographic survey of the restoration area. Dawood surveyed the site in September 2023, and then returned to the site in November 2023 and March 2024 to collect missing survey data. Data collected during the survey included bank topography, trees greater than 6 inches in diameter, the existing bike path, roadway, and utilities. The survey included the approximate location and extent of the bank erosion and bathymetric spot elevations along twelve cross sections extending to the top of slope on the left bank. A topographic survey map of the existing conditions has been prepared and is provided in Attachment D.

Publicly available tax map information was used to define riverfront ownership and to locate and show property lines and easements along the banks on the topographic survey map. Property ownership, plot and lot numbers, and property information is shown.

2. HYDRAULIC MODELING

Hydraulic analysis of the site was completed through the development of a hydraulic model using the Hydrologic Engineering Center's River Analysis System (HEC-RAS) software (Version 6.5). Two existing conditions models were created: a one-dimensional (1D) model and a two-dimensional (2D) model. The 2D model was used to determine the existing conditions of the river, including peak water surface elevations and maximum water velocity, and the 1D model was used to calibrate the 2D model. A 2D model was used as the base existing conditions model in anticipation of future design phases where a proposed conditions model will be created that incorporates a preferred design alternative; the design alternatives offered in this memorandum can be more accurately modeled using a 2D mesh than 1D cross-sections. Therefore, the existing conditions model also needs to be 2D to appropriately compare results. The existing conditions 2D model will be used as the corrected effective model for the future no-net rise analysis.

2.1 EXISTING CONDITIONS 1D MODEL

To develop the project's existing conditions 1D model, EA Engineering, Science, and Technology, Inc., PBC (EA) obtained the existing HEC-RAS model for the Woonasquatucket River that was created to delineate FEMA floodplains and regulatory zones (FEMA 2015). The FEMA HEC-RAS model is a 1D, steady state model of the entire Woonasquatucket River from the headwaters to just upstream of the I-95 bridge where the river discharges to Providence Harbor. EA updated the FEMA HEC-RAS model with new survey data that were collected by EA and Dawood within the project area. This updated 1D model was used to calibrate the 2D model, which is discussed in Section 2.2.7. The following sections describe the creation of the existing conditions 1D model.

2.1.1 Cross Sections

Existing conditions cross section data were collected during the topographic survey. The surveyed data were developed into cross sections using AutoCAD Civil3D, ArcGIS Pro, and GeoHECRAS software. Channel cross section data were generated from the bathymetric spot elevation data collected during the survey. Eleven new cross-sections were created, and one FEMA cross-section was updated with the new data. Overbank cross-section data for the 11 new cross-sections were extracted from a surface created by Dawood of the topographic survey, and Light Detection and Ranging (LiDAR) elevation data were supplemented for the portions of the overbanks not covered by the topographic survey. The transition between the survey and LiDAR was manually smoothed in the Cross Section Data editor in GeoHECRAS. FEMA cross-sections upstream and downstream of the project limit were not modified. The horizontal datum used for the model was Rhode Island Coordinate System Mainland Zone, North American Datum of 1983, 2011 Epoch 2010.00, and the vertical datum used was the North American Vertical Datum of 1988. The project area and the cross sections generated by EA for the existing conditions 1D model are shown in Attachment A, Figure A-2.

2.1.2 Bank Stations

Left and right bank stations for each updated or new cross section were placed at the cross section point nearest to the surveyed top of bank elevation using the Cross Section Data Editor in the GeoHECRAS software.

2.1.3 Manning's n

The channel and overbank area roughness coefficients (Manning's n) from the FEMA model in the project area were compared to aerial imagery to determine if the coefficients needed updating. The coefficients that were used in the FEMA model were determined to be an accurate representation of the project area landscape; therefore, these values were applied to the new cross-sections accordingly. Two FEMA cross-section overbank roughness coefficients were changed to different values based on aerial imagery. Table 1 presents the Manning's n values used in the project area.

Table 1. Manning's n Roughness Coefficient Values for 1D Model

Manning's n Value	Description
0.034	Channel
0.03	Overbank - mostly impervious cover, some buildings
0.045	Overbank - mostly impervious cover, more buildings
0.055	Overbank - mostly impervious cover, even more buildings
0.075	Overbank - mostly impervious cover, lots of buildings

2.1.4 Infrastructure

EA updated the Manton Avenue bridge data using the survey provided by Dawood and measurements collected by EA on a site visit on 16 October 2023. The breached Paragon Dam inline structure that is downstream of the project site was removed from the model since that structure has been completely removed from the river since the creation of the FEMA model.

2.1.5 Computation Settings

The FEMA model was computed using a subcritical flow regime and a steady flow file (see Section 2.1.6 for a discussion of the flows); these settings were left unchanged.

2.1.6 Flow Data

Flow rates from the 10-, 50-, 100-, and 500-year storm event in the FEMA HEC-RAS model were retained for the existing conditions 1D model. The flow rates from the FEMA HEC-RAS model were compared to flow rates published in the Flood Insurance Study for Providence County, Rhode Island (FEMA 2015), and StreamStats values to verify that they are accurate. Flows rates are summarized in Table 2.

Table 2. Flow Rates

Storm Event	10-Year	50-Year	100-Year	500-Year
Flow Rate (cfs)	1,290	2,100	2,430	3,310

2.1.7 Boundary Conditions

The upstream and downstream boundary condition in the FEMA model is the known water surface boundary condition. This was left unchanged in the existing conditions 1D model since there is no updated information regarding water surface elevations at the model extents.

2.2 EXISTING CONDITIONS 2D MODEL

As stated previously, the existing conditions 2D model was created to serve as a comparison for future proposed modeling of the preferred design alternative. The following sections describe the creation of the 2D model, the calibration process, and the model results (see Attachment A, Figure A-3 for the model layout).

2.2.1 Terrain Development

The terrain used for the 2D model was created using a combination of the bathymetric cross-section data, the surface created by Dawood of the topographic survey of the banks and surrounding area, and publicly available LiDAR data. EA created a bathymetric surface in AutoCAD Civil 3D using the bathymetric cross-sections and miscellaneous bathymetric survey points. The extent of the bathymetric surface is up to the edge of the topographic surface created by Dawood. EA also took out the portion of the topographic surface that represents the Manton Avenue bridge since the bridge will be entered into the model separately and adjusted a section of the edge of the topographic surface to tie-in to the surrounding LiDAR surface.

EA created the terrain in RAS Mapper by pasting the surfaces on top of each other in the following order, with the first surface being on top and subsequent surfaces as the next layer underneath:

- Dawood topographic surface with the bridge portion removed and adjusted to tie-in to LiDAR
- Bathymetric surface created by EA
- LiDAR downloaded using the National Oceanic and Atmospheric Administration Data Access Viewer

2.2.2 Manning's n Cover

The Manning's n land cover layer was created from the survey provided by Dawood and from aerial imagery. The land cover layer in HEC-RAS was created in RAS Mapper by assigning Manning's n values to each type of land cover. The Manning's n values for the overbank regions were calculated using Cowan's method, which uses a base Manning's n value and adds adjustment values to account for irregularity, variations, obstructions, vegetation, and meandering. The channel Manning's n was determined through the model calibration process, which is discussed in Section 2.2.7. Table 3 presents the Manning's n roughness coefficient values for the 2D model.

Table 3. Manning's n Roughness Coefficient Values for 2D Model

Manning's n Value	Description
0.03	Channel
0.03	Grass
0.092	Brush
0.05	Bare Ground
0.055	Mulch
0.036	Railroad
0.013	Impervious

2.2.3 Mesh Creation

The mesh was generated by drawing a perimeter around the project area. The perimeter approximately covers the area that is represented in the existing conditions 1D model by the cross-sections, from just downstream of cross-section 18468 to just upstream of cross-section 17247. These are the most upstream and downstream newly-added surveyed cross-sections, respectively, and are at the extent of the bathymetric survey. The base mesh size is 30 ft.

A refinement region was added to the mesh to provide more detail in the river channel. The refinement region was drawn approximately along the riverbanks and was assigned a mesh size of 10 ft. The refinement region edge along the river right side lines up with the adjacent bike path and San Souci Drive, thereby aligning the mesh cells and capturing the elevation data along both features.

Manual computation points were added to the mesh if there were mesh cells with more than 8 faces, which is not allowed in HEC-RAS.

2.2.4 Infrastructure

The only infrastructure within the extent of the 2D model is the Manton Avenue bridge. The bridge was entered into the model as a SA/2D connection. The bridge data inputs are from the survey provided by Dawood and measurements collected by EA on a site visit on 16 October 2023.

The SA/2D connection was enforced as a breakline in the mesh with a cell size of 10 ft to match the channel cell size.

2.2.5 Computation Settings

HEC-RAS 2D models can only be run with an unsteady flow simulation, which requires an unsteady flow file (see Section 2.2.6 for a discussion of the flow data). The model was run for 24 hours with a computation interval of 1 second. Other computation settings were changed as part of the model calibration process (see Section 2.2.7).

2.2.6 Flow Data/Boundary Conditions

The model consists of an upstream and a downstream boundary condition. The downstream boundary condition was set to normal depth, which requires an energy slope input. The energy slope was estimated by calculating the average slope of the river over the model extent, which is

0.09%. The upstream boundary condition is a flow hydrograph corresponding to the 10-, 50-, 100-, and 500-year peak flows from the FEMA model. Each hydrograph starts at the 50% duration flow (pulled from the USGS StreamStats report, see Attachment B) at time zero and “ramps-up” to the peak flow for that storm event over the first 9 hours of the simulation, and then stays at that constant peak flow for the remaining time. An initial conditions period of 1 hour was also added to allow the mesh to gradually transition from a dry condition to the initial 50% duration flow before the simulation begins.

2.2.7 Model Calibration

The existing conditions 2D model WSE results were compared to the existing conditions 1D model WSE results to check whether the two different methodologies were providing comparable values. Some of the 2D model computation settings and geometry were altered slightly so that the 2D WSE results would more closely match the 1D WSE results. This included changing the equation set from Diffusion Wave to SWE-EM, reducing theta from 1.0 to 0.8, reducing the computation interval to 1 second, and reducing the channel Manning’s n value from 0.035 to 0.030. Figure 1 shows a comparison of the existing conditions 1D and 2D WSE for the 100-year storm event.



Figure 1: Existing Condition 1D and 2D WSE Comparison

The WSEs in the 2D model are mostly higher than the 1D model, especially downstream of the Manton Avenue bridge (at river station 18190). This could be a result of the 2D model having a more detailed bathymetric surface, differences in the way the buildings are represented in each model (ineffective areas versus terrain modification), changing the downstream boundary condition from known water surface to normal depth, shortening the model extent from the entire Woonasquatucket River to just the immediate project area, or other factors. Ultimately, the 2D

model is presenting more conservative results; therefore, this is the model that will be used in future design phases to provide a comparison of the corrected effective modeling to the proposed modeling results of the preferred alternative.

2.2.8 Model Results

The 2D model shows the following maximum velocities within the river channel during the modeled storm events in Table 4. For consistency between models, the 2D model results are extracted at the 1D model cross-section locations.

Table 4. Maximum Velocity Results

1D River Station	Velocity (ft/s)			
	10-year	50-year	100-year	500-year
18229	4.5	5.5	5.5	8.1
18215	4.9	5.8	5.8	8.6
18194	5.4	6.4	6.5	9.7
18119	7.8	8.9	9.1	11.8
18095	10.9	11.1	11.1	11.8
17943	6.1	7.5	8.0	10.4
17762	5.8	7.1	7.6	9.8
17693	4.7	5.7	6.1	7.9
17657	4.1	4.8	5.1	6.4
17606	5.8	6.6	6.8	8.1
17571	6.5	7.1	7.3	8.4
17534	5.5	6.2	6.5	7.4
17369	5.6	6.6	7.0	8.4
17304	5.7	6.5	6.9	8.1

Notes:

ft/s = Foot (feet) per second

The highest maximum velocity across all storm events occurs at 1D river station 18095, which is just downstream of the Manton Avenue bridge. This is likely due to flow being constricted through the bridge opening and thereby increasing in velocity from the decrease in cross-sectional area. The velocities in the vicinity of the eroded bank (river station 17762 through 17534) range from 5.1 to 7.6 ft/s during the 100-year storm event. The velocity results map shows lower velocity values on the right side of the bank (where there is erosion) than the left side of the bank. This could be because the terrain is showing the thalweg in the center of the channel instead of along the right bank and the terrain is showing an increase in the ground elevation on the right side of the channel, which is most likely due to a lack of bathymetry in the area as observations have shown that the path of the main channel flows closer to the right bank. The terrain is also showing that the channel increases in width at this location, so an increase in width combined with a decrease in depth could result in lower velocities. Additional bathymetry and refinement may be needed to validate the model so that it more closely matches what is being observed. It is important to have accurate velocity results in the model since the velocity values will be used to preliminarily size the proposed bank protection features. See Attachment E for detailed HEC-RAS results.

The WSE results map generally shows an increase in WSE and flooding extent from the 10-year to the 50-year to the 100-year storm event. There is an increase in WSE and flooding extent from the 100-year storm event to the 500-year storm event up until 6 hours into the simulation; however,

at this point the stage hydrograph for Manton Avenue during the 500-year storm event shows a drop in headwater elevation, which indicates that the flow is overtopping the bridge. When the flow is overtopping the bridge, it has more space to flow downstream (as opposed to having to fit through the constricted bridge opening) so this can shrink the flooding extents and lower the WSE upstream of the bridge. Attachment E shows the stage and flow hydrographs for the 100-year and 500-year storm event for Manton Avenue and the WSE profiles at 6 hours into the simulation and the end simulation time (24 hours).

2.3 PROPOSED CONDITIONS MODEL

A proposed conditions 2D model will be developed in a future design phase after a preferred alternative has been selected. The proposed alternatives are described in Section 4.

3. DESIGN CRITERIA

Design criteria are key decisions or major design assumptions with significant schedule and/or cost driver implications. The design criteria form the basis for design elements, and they also include key technical requirements from published design guidance, published standards, or previous successful designs determined to be appropriate for the site that would become integrated into design. As the bikeway itself has been undercut in some areas, there is very little room between the bike path and the edge of river for repair of the riverbank. Keeping this challenge in mind, the following project-specific design criteria have been established for the design alternatives:

- **Repair erosion**—Repair eroded bank to design grade with imported fill to provide a stable bank slope.
- **Bank stability**—Minimize erosion of right bank to minimize loss of sediment downstream. Slope stability will be further evaluated during final design upon completing geotechnical investigations.
- **Service life**—The design will require minimum maintenance and will have a proven track record of longevity in other case studies similar to this project.
- **Flow redirection**—Technologies that provide flow redirection may be considered to minimize impact of flow on the right bank, however there must be no risk of directing flow towards the left bank.
- **Restoration**—Provide bank habitat restoration. Enhance the bank with seeding or other opportunities such as in-water features to improve habitat.
- **Floodway no-net-rise/Permitting**—The Woonasquatucket River has a regulatory floodway. The design for any project within a floodway may not result in any increase in water surface elevation during the 100-year storm event.
- **Access to commercial properties**—Maintain access to the commercial properties located off San Souci Drive.

4. DESIGN ALTERNATIVES

This technical memorandum presents four design alternatives for consideration. The following sections describe the different elements and general procedures involved in each alternative. It should be noted that for all alternatives, relocation of utilities may be required.

4.1 ALTERNATIVE 1 – ARMOR PROTECTION WITH STONE STRUCTURES

Alternative 1 includes stabilizing the undercut bank and installing stone armoring structures such as gabion baskets and geocells. This alternative would be implemented uniformly across the project area. Attachment F – Exhibit 1 shows photos of a gabion basket stabilization project and the plan view and typical cross section for this alternative. Alternative 1 would most likely allow for a no-net rise scenario as the structures can be installed to a near vertical angle.

4.1.1 Earthwork

Alternative 1 would require filling and excavating the undercut bank to a 1 horizontal to 1 vertical (1H:1V) or a 2H:1V slope. The eroded bank would be repaired with suitable backfill keyed into the existing bank to achieve the desired slope. The slope above the undercut bank would be excavated for placement of the gabion baskets and a riprap toe. This option would require the least amount of fill in the river channel.

The large sand bar located downstream of the site would be removed to provide compensatory flood storage for a no-net rise certification. The left bank would also be re-graded in some sections as necessary to facilitate a no-net rise.

Vegetation would be cleared from the bank prior to repair. Temporary erosion controls would be placed and maintained during construction and disturbed areas would be revegetated immediately upon completion of construction. On the right bank, a temporary cofferdam would be installed using sheet piles and a pump to dewater the working area. On the left bank, a turbidity curtain would be installed parallel to the work area in the river to capture sediment runoff.

4.1.2 Gabion Baskets and/or Geocells

Alternative 1 includes installing gabion baskets and/or geocells on the right bank from the Manton Avenue headwall to the stone masonry wall adjacent to the United Way building. Gabion baskets are wire mesh baskets filled with small rocks that can be stacked vertically and tied together to provide bank protection in areas where the slope is very steep and the river energy is high (U.S. Department of Agriculture [USDA] 2007a). The gabion baskets would be placed on a concrete pad at the toe of the bank to provide a stable, flat base. Gabion baskets are typically assembled on-site and require a combination of machine and hand work to fill the baskets with the specified rocks. Table 5 presents the appropriate rock sizes used in gabion baskets (from National Resource Conservation Assessment [NRCS] National Construction Specification [CS] #64) (USDA 2005).

Table 5. Specified Rock Sizes for Gabions (from CS #64)

Gabion	Predominant rock size (inches)
12-, 18-, or 36-inch basket	4 to 8

Gabion baskets can be used with different types of geosynthetic materials to protect the eroded bank. These geosynthetic materials include geocells, geotextiles, and geogrids. Geocells are defined as “a product composed of polyethylene strips, connected by a series of offset, full-depth welds to form a three-dimensional honeycomb system” (USDA 2007b). The geocells can be filled with stone or soil and the depth of the cell can range from 4 inches to 9 inches. If the outer layer of the geocells is filled with soil, the soil can be seeded to promote a natural aesthetic. A geotextile or geogrid layer can be added in between the bank and the gabion baskets and/or geocells to help stabilize the slope.

The gabion baskets and/or geocells would need to be anchored to the bank to resist movement from the river forces. The anchors would extend several feet into the bank on one end and the end would expand outwards into the soil (creating the anchor), and the other end would be on the face of the outer layer of stone armoring or hidden inside the outer layer of stone armoring for aesthetic purposes.

4.1.3 Riprap

A section of riprap would be placed at the toe of the gabion baskets to protect from scour. The riprap would be placed on the 2H:1V slope and would be keyed-in to a point below the probable maximum depth of anticipated bed scour (minimum key-in depth is one and a half times the riprap thickness or 2 ft below the existing streambed) (USDA 2007a).

4.2 ALTERNATIVE 2 – REDIRECTION TECHNIQUES

Alternative 2 includes stabilizing the undercut bank and installing stream redirection features, such as Rosgen-style j-hooks and stream barbs. This alternative would be implemented uniformly across the project area. Attachment F – Exhibit 2 shows example photos and typical cross sections of these stream redirection features.

4.2.1 Earthwork

Alternative 2 would require filling and excavating the undercut bank to a 2 horizontal to 1 vertical (2H:1V) slope from the top of bank, which is the recommended maximum slope for most riprap placement (USDA 2007a). The eroded bank would be repaired with suitable backfill keyed into the existing bank to achieve the desired slope. Fill would be sourced from suitable excavated on-site materials and borrowed off-site material.

The large sand bar located downstream of the site would be removed to provide compensatory flood storage; however, preliminary calculations show that this option would not meet the no-net rise requirement. The left bank would also be re-graded as necessary to provide compensatory flood storage.

Vegetation would be cleared from the bank prior to filling. Temporary erosion controls would be placed and maintained during construction and disturbed areas will be revegetated immediately upon completion of construction. On the right bank, a temporary cofferdam would be installed using sheet piles and a pump to dewater the working area. On the left bank, a turbidity curtain would be installed in the river surrounding the work area to capture sediment runoff.

4.2.2 J-Hooks and Stream Barbs

Alternative 2 includes installing 5 j-hooks, spaced approximately 80 ft apart, or 11 stream barbs, spaced approximately 30 ft apart, along the edge of the outer bank. The most upstream j-hook or stream barb would be placed on the right bank at the Manton Avenue bridge wingwall and the stream features would continue being placed on the right bank with the appropriate spacing at least up to the bend in the river (a total length of approximately 320 ft). Placing additional stream features beyond the bend would need to be confirmed by future modeling to verify there are no negative impacts to the left bank. J-hooks are flow redirection and grade control structures that are constructed with a line of appropriately sized rocks that extend from the bank that is being protected upstream into the channel in the shape of a J, with the curve of the J shape located in the center of the channel. J-hooks can be constructed using large rocks or a combination of rocks with log vanes. Stream barbs are shallow formations of riprap extending into the river at an upstream angle. When properly designed and installed, both features divert the flow away from the bank and into the center of the channel. The j-hooks and stream barbs would be designed per the NRCS Rosgen Geomorphic Channel Design (USDA 2007c) and the NRCS Stream Restoration Design (USDA 2007d), respectively.

4.2.3 Riprap

Riprap would be placed on the repaired bank from the toe to the top of the 2H:1V slope to provide slope stabilization and bank protection. The riprap at the toe of slope would be keyed-in to a point below the probable maximum depth of anticipated bed scour (minimum key-in depth is one and a half times the riprap thickness or 2 ft below the existing streambed) (USDA 2007a).

4.3 ALTERNATIVE 3 – MANAGED RETREAT

Alternative 3 includes abandoning and removing San Souci Drive and relocating the bike path to provide more floodplain space for nature-based bank protection solutions. This alternative would be implemented for the length of San Souci Drive, and riprap bank protection would be included just upstream of the bend in the river, until the stone masonry wall adjacent to the United Way building. Attachment F – Exhibit 3 shows the plan view and typical cross section for this alternative.

4.3.1 Earthwork

Alternative 3 would require removing San Souci Drive and the bike path and regrading the bank to a 4 horizontal to 1 vertical (4H:1V) slope. The bike path would be relocated to the southern side of San Souci Drive and would replace the current sidewalk. The bike path would be 8 ft wide

(which is the current width of the bike path) with a minimum 2-ft buffer from the regraded top of slope.

The large sand bar located downstream of the site would be removed to provide compensatory flood storage. This option would not require additional excavation to meet the no-net rise requirement.

Vegetation would be cleared from the bank prior to grading. Temporary erosion controls would be placed and maintained during construction and disturbed areas will be revegetated immediately upon completion of construction. On the right bank, a temporary cofferdam would be installed using sheet piles and a pump to dewater the working area. On the left bank, a turbidity curtain would be installed in the river surrounding the work area to capture sediment runoff.

4.3.2 Nature-Based Solutions

The abandonment of San Souci Drive and relocation of the bike path would provide more floodplain space and opportunity for nature-based solutions. These nature-based solutions could involve flow redirection techniques, vegetated bank, and geosynthetics without the need for armoring and extended riprap placement. The slope would be covered in a turf reinforcement mat and would be seeded with native grass and shrubs to provide bank habitat. The turf reinforcement matting can withstand velocities up to 25 ft/s (East Gate Supply 2024); as presented in Section 2.2.8, the existing modeling shows that the maximum velocity in the project area is 11.1 ft/s during the 100-year storm event so it is likely that velocities under proposed conditions would be less than 25 ft/s.

4.4 ALTERNATIVE 4 – NO ACTION

The No Action alternative would leave the eroded bank in its current state, with no repairs or added protection. Due to the condition of the eroded bank, ongoing maintenance might be needed in future years to maintain the structural integrity of the adjacent bike path. Abandonment of the bike path and eventually San Souci Drive may be needed if the bank continues to erode and undermine the surrounding infrastructure.

5. COST ESTIMATES

The cost estimates include a conceptual level cost estimate for each of the alternatives. The cost estimates are order of magnitude (-30% to +50%) cost estimates based on preliminary information from which approximate quantities for each kind, type, or class of material, equipment, or labor may be obtained.

The cost estimates were developed based on the alternative designs described in this technical memorandum, using quantity take-offs estimated from the topographic survey and computer-aided design and drafting software AutoCAD Civil3D. Unit costs were estimated using R.S. Means Cost Works construction estimating software (release year 2024), Rhode Island Department of Transportation Weighted Average Unit Prices, and unit pricing from previous projects of similar

size and scope. The cost estimates were developed using a 15% allowance for mobilization. The cost estimate results are shown in Table 6.

Table 6. Cost Estimate Results

Alternative	-30%	Estimate	+50%
1 – Armor Protection with Stone Structures	\$806,000	\$1,151,000	\$1,727,000
2 – Redirection Techniques	\$545,000	\$778,000	\$1,167,000
3 – Managed Retreat	\$1,020,000	\$1,457,000	\$2,186,000
4 – No Action	NA	No direct costs, high indirect future costs	NA

Notes:

NA = Not applicable

6. ALTERNATIVES EVALUATION

This section discusses the screening-level evaluation of the four assembled alternatives described in Section 4. In performing this screening-level evaluation, the four alternatives were given a relative score with respect to three comparative screening categories as compared to one another.

The screening-level criteria used to evaluate the alternatives include:

- Effectiveness at achieving design criteria
- Implementability of construction
- Estimated cost

Table 7 presents the evaluation of the alternatives. The first column of the table lists the four alternatives. The Effectiveness, Implementability, and Cost columns show the relative score of the alternative, from low (with a score of 1), to high (with a score of 5). Relative scores were given based on engineering judgement, experience with similar projects, and conceptual level cost estimates. The sum of the scores for the three relative evaluation categories for each alternative is provided as the screening level score included in Table 7 and are used to rank the alternatives. The relative score for each alternative is as follows:

- Alternatives 3 and 4 scored lowest (8)
- Alternative 2 had a moderate score (11)
- Alternative 1 scored highest (12)

Table 7. Alternatives Evaluation Matrix

Alternative	Effectiveness	Implementability	Cost	Total Score
1 – Armor Protection with Stone Structures	4	4	4	12
2 – Redirection Techniques	3	3	5	11
3 – Managed Retreat	3	2	3	8
4 – No Action	1	5	2	8

Screening Key to Table 7 Alternatives Evaluation Matrix

Effectiveness	Implementability	Cost	Total Score
5: Highest Effectiveness	5: Highest Implementability	5: Lowest Cost	>13
4: Medium-High Effectiveness	4: Medium-High Implementability	4: Medium-Low Cost	11-13
3: Medium Effectiveness	3: Medium Implementability	3: Medium Cost	8-10
2: Low-Medium Effectiveness	2: Low-Medium Implementability	2: High-Medium Cost	5-7
1: Lowest Effectiveness	1: Lowest Implementability	1: Highest Cost	<4

6.1 EFFECTIVENESS AND IMPLEMENTABILITY

The following lists effectiveness and implementability for all four alternatives based on construction considerations and the design criteria presented in Section 3.

- Site Access
 - Construction access to both sides of the bank is needed for both Alternatives 1 and 2. This would involve clearing the bank of vegetation and temporarily removing the bike path and the associated fencing between the bike path and the river so that the bank can be graded and construction equipment can access the undercut bank to repair it. Construction equipment must maintain a 10-ft offset from overhead power lines.
 - Alternative 3 includes permanently relocating the bike path, associated fencing, and a utility pole and overhead powerlines, in addition to clearing the bank of vegetation and grading the bank to a more gradual slope. Unless a pole has failed, the cost associated with moving the power pole would be the project’s responsibility. This would require additional coordination with National Grid.
 - Access to the bank would not be needed for Alternative 4 as no action is being taken.
- Repair Erosion and Bank Stability
 - Alternative 1 minimizes erosion by installing stone armoring that will protect that area from water velocities and shear stresses caused by high-flow storm events.

- Alternative 2 minimizes erosion by installing j-hooks or stream barbs which redirect the river flow away from the toe of the bank and into the center of the river, and by armoring the toe of the bank with riprap, which is the area of the bank most susceptible to erosion.
 - Alternative 3 minimizes erosion by creating more space to adopt nature-based solutions, such as flow redirection techniques, vegetated bank, and use of geosynthetics, all of which are designed to minimize the impact of the river on the bank to reduce erosion.
 - No action is being taken in Alternative 4 so erosion of the bank would continue which would likely lead to decreased bank stability.
- Service Life
 - The bank protection described in Alternative 1 has been used extensively and successfully in similar bank restoration projects with steep, vertical slopes. The stone structures require minimal maintenance after installation.
 - The stream features and riprap described in Alternative 2 have been used extensively and successfully in similar bank restoration projects; however, the slope of the bank would need to be regraded to a gentler slope for the riprap to remain in place, which would cause impacts to the floodway. These impacts are discussed in the “Floodway No-Net Rise” considerations. These stream features might require maintenance debris floats downstream in storm events and displaces some of the rocks.
 - Alternative 3 has been used successfully in similar bank restoration projects where the amount of space between the river and adjacent infrastructure is limited. The maintenance required would depend on the nature-based solution chosen; although most nature-based solutions are designed to require minimal maintenance.
 - No action is being taken in alternative 4; therefore, there is no service life associated with this alternative.
 - Flow Redirection
 - Alternatives 1 and 4 do not provide any flow redirection techniques.
 - Alternative 2 includes stream features that redirect the flow away from the bank. The stream features would be designed to direct flow into the center of the river, but not as far as the left bank.
 - Alternative 3 includes nature-based solutions for bank protection, which could include flow redirection techniques. These would be designed to direct flow into the center of the river, but not towards the left bank.

- Restoration
 - Alternatives 1 and 4 do not include vegetation and fail to meet design criteria for habitat restoration.
 - Alternative 2 does not include vegetation; however, the j-hooks and stream barbs can provide opportunity for fish habitat (USDA 2007c and USDA 2007d).
 - Alternative 3 includes native grass and shrub seeding for improved habitat on the bank and opportunity for fish habitat around flow redirection stream features.
- Floodway No-Net Rise/Permitting
 - Alternative 1 involves filling of the floodway to repair the undercut bank. This loss of floodway storage would be compensated for by removing the large sand bar located downstream of the site and grading of the left bank. It is expected that this alternative could meet the requirements for a no-net rise; however, hydraulic modeling would need to be completed to confirm this assumption.
 - Alternative 2 involves filling of the floodway to repair the undercut bank and to create a 2 horizontal to 1 vertical (2H:1V) slope for riprap placement and placing stone within the river to create the flow redirection stream features. Some loss of floodway storage would be compensated for by removing the large sand bar located downstream of the site and grading of the left bank; however, this might not be able to compensate for the entire amount of fill that needs to be placed in the floodway. If a no-net rise is not achievable, then a Letter of Map Revision would need to be prepared and approved. It is anticipated that this would be a difficult approval process based on the history of flooding and proximity of infrastructure in this area. Additionally, EA has previous experience applying for permits through the Rhode Island Department of Environmental Management and it has been historically difficult for a design with redirection stream features to be approved.
 - Alternative 3 would involve excavating material out of the floodway and floodplain and potentially installing flow redirection stream features. The installation of flow redirection stream features in the floodway would be compensated for by excavating material to create the 4 horizontal to 1 vertical (4H:1V) slope on the right bank, removing the large sand bar located downstream of the site. It is expected that this alternative would meet the requirements for a no-net rise; however, hydraulic modeling would need to be completed to confirm this assumption.
- Access to commercial properties
 - Alternatives 1 and 2 would maintain the existing bike path and San Souci Drive so access to commercial properties would remain intact. Alternatives 1 and 2 minimize erosion and provide bank stability which will protect access to these commercial properties.

- Alternative 3 involves removing San Souci Drive and relocating the bike path to where the current sidewalk is located on the southern side of San Souci Drive. In this alternative, these commercial properties would not have access with a motorized vehicle from the north side. Some of these properties are also accessible from Westminster Street, Broadway, or Valley Street. However, there are two small, paved areas behind 1995 Westminster Steet and 47–52 Westminster Steet that are only accessible from San Souci Drive. Based on Google Street view, these paved areas have parking spaces and dumpsters, and there are entryways into the buildings from the paved areas. The dumpsters could be relocated, and the buildings have other entryways from Westminster Street; however, it is likely that the parking spaces would be lost.
- San Souci Drive is not altered in any way in Alternative 4, which would provide access to these commercial properties in the short-term; however, erosion is likely to continue to occur under this alternative and in the long-term the road would eventually be abandoned, and some owners would lose vehicular access to some of their property (as discussed previously under Alternative 3).

6.2 COST

Results of the cost estimate evaluation are as follows:

- Alternative 1 has been estimated to cost up to \$1,727,000 and is priced in the middle of the design alternatives.
- Alternative 2 has been estimated to cost up to \$1,167,000 and is the lowest cost alternative.
- Alternative 3 has been estimated to cost up to \$2,186,000 and is the highest cost alternative.
- There is no direct cost associated with Alternative 4; however, there are high indirect future costs including, but not limited to: emergency repairs, removal of debris from the river, and/or potential lawsuits.

7. SUMMARY

Alternative 1 scored the highest in the screening-level evaluation due to having the highest effectiveness and implementability scores (except for the implementability of the No Action alternative). Alternative 1 is optimized to repair the existing undercut bank and protect the bank from future erosion without sacrificing San Souci Drive or needing to permit redirection features.

Further investigation should be included in the design phase to confirm the assumptions made in this Technical Memorandum. Test pits will be required to determine stable bank slopes. More detailed calculations will be required to select riprap stone size for armoring and barbs, and more detailed grading design is needed to refine the estimated cut and fill quantities. Wetland delineation will also be conducted during the permitting phase of this project.

8. REFERENCES

East Gate Supply. 2024. *Pyramat – Turf Reinforcement Mats*.

<https://www.eastgatesupply.com/collections/pyramat-turf-reinforcement-mats>

Federal Emergency Management Agency. 2015. *Flood Insurance Study*, Providence County, Rhode Island (All Jurisdictions)

U.S. Department of Agriculture (USDA). 2005. *Construction Specification 64-wire mesh gabions and mattresses twisted (woven) or welded mesh*. National Engineering Handbook, Part 642.

———. 2007a. *Technical Supplement 14K: Streambank Armor Protection with Stone Structures*, National Engineering Handbook, Part 654.

———. 2007b. *Technical Supplement 14D: Geosynthetics in Stream Restoration*, National Engineering Handbook, Part 654

———. 2007c. *Chapter 11: Rosgen Geomorphic Chanel Design*, National Engineering Handbook, Part 654

———. 2007d. *Technical Supplement 14H: Flow Changing Techniques*, National Engineering Handbook, Part 654

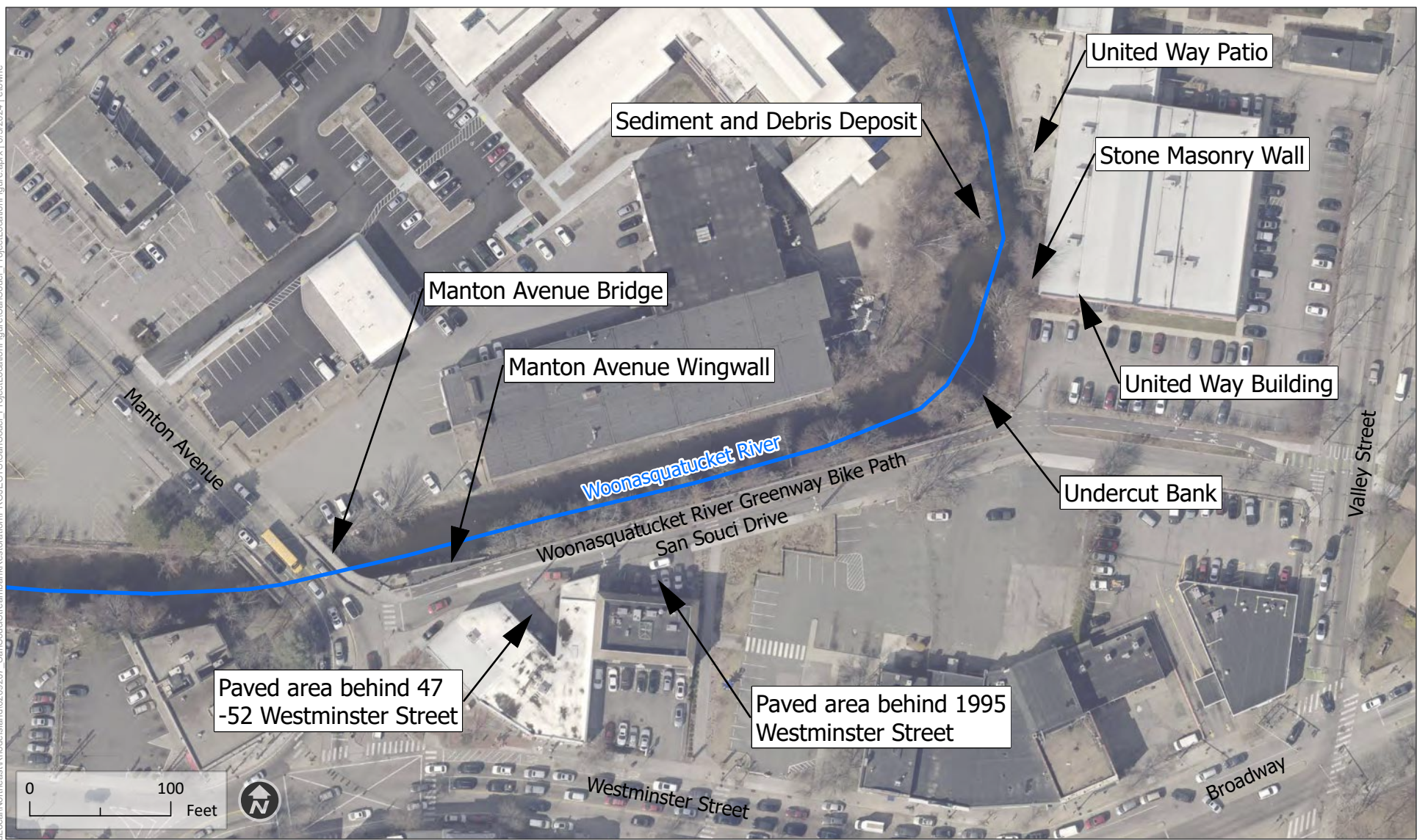
Attachments

- A Figures
- B StreamStats Report
- C Photographic Log
- D Topographic Survey
- E HEC-RAS Results
- F Design Alternative Exhibits

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Attachment A
Figures

Path: \\warwick\p\warwick\p\GIS - Warwick\StateandLocal\North\the\ast\Rhode\Island\62\09\2017 - SanSouci\StreamBankRestoration\PROJECTS\SanSouci - ProjectLocation\Figure.aprx | 16/02/2024 | elowme



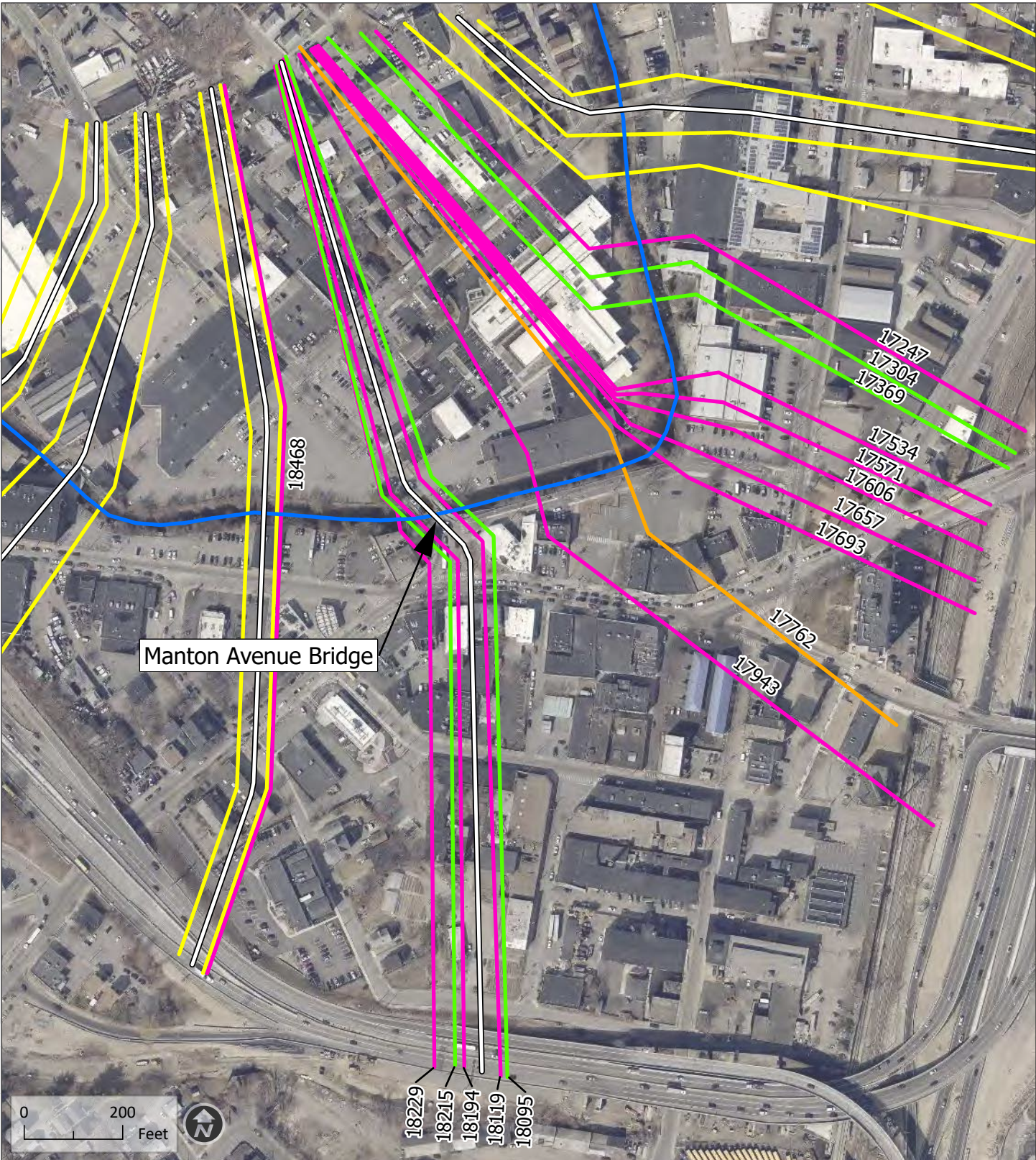
— Woonasquatucket River

Figure A-1 Site Location

Woonasquatucket River
Bank Restoration
Providence, Rhode Island



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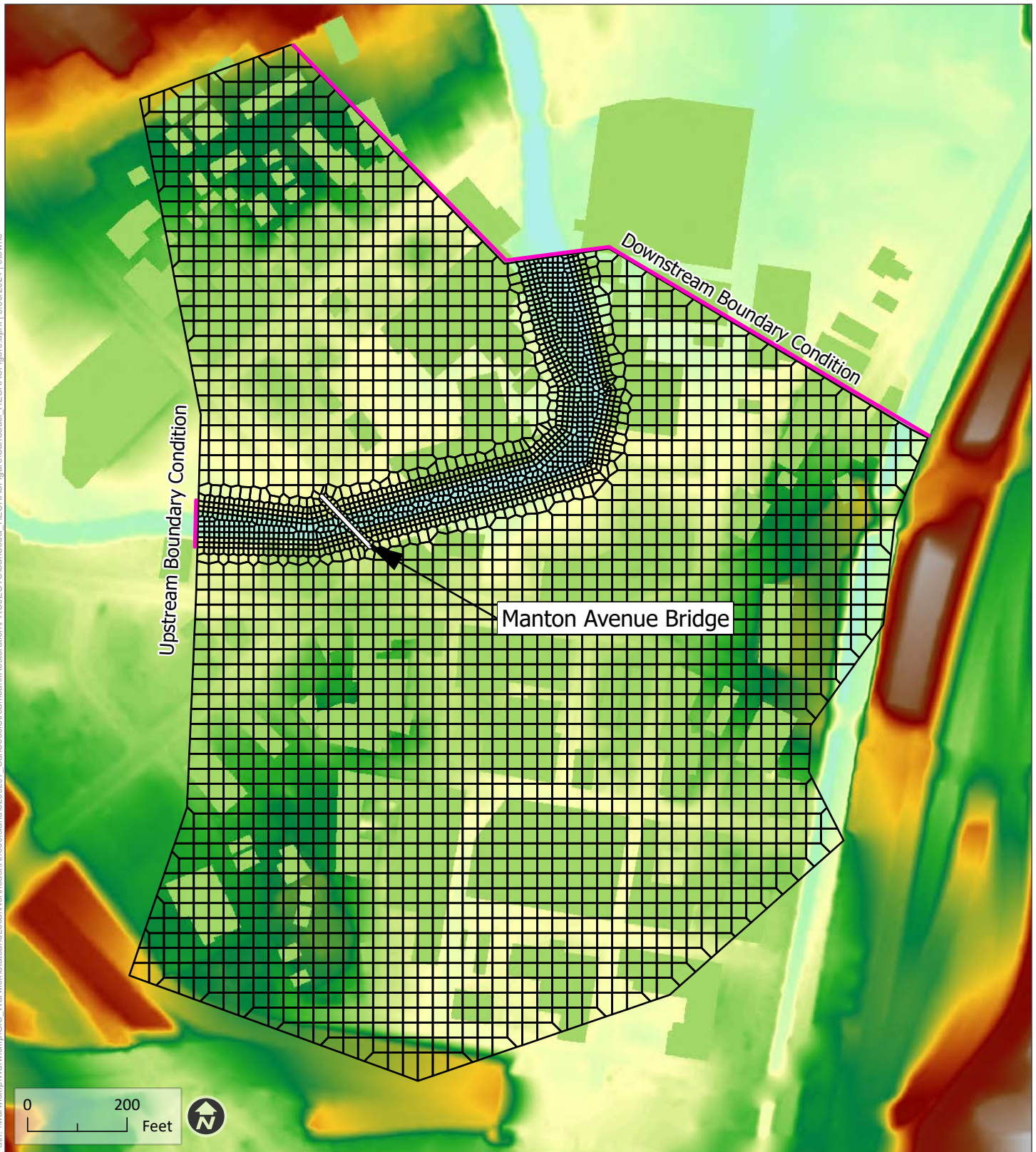
- Structure
- Woonasquatucket River Centerline
- Cross Sections
 - Inside of Project Limits - New XS
 - Inside of Project Limits - FEMA XS
 - Inside of Project Limits - FEMA XS updated with bathymetry
 - Outside of Project Limits

Figure A-2
HEC-RAS 1D Model Layout
Existing Conditions

Woonasquatucket River
Bank Restoration
Providence, Rhode Island



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




-  Structure
-  Boundary Condition Line
-  Mesh
- Terrain
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 -  13.1562

Figure A-3
HEC-RAS 2D Model Layout
Existing Conditions

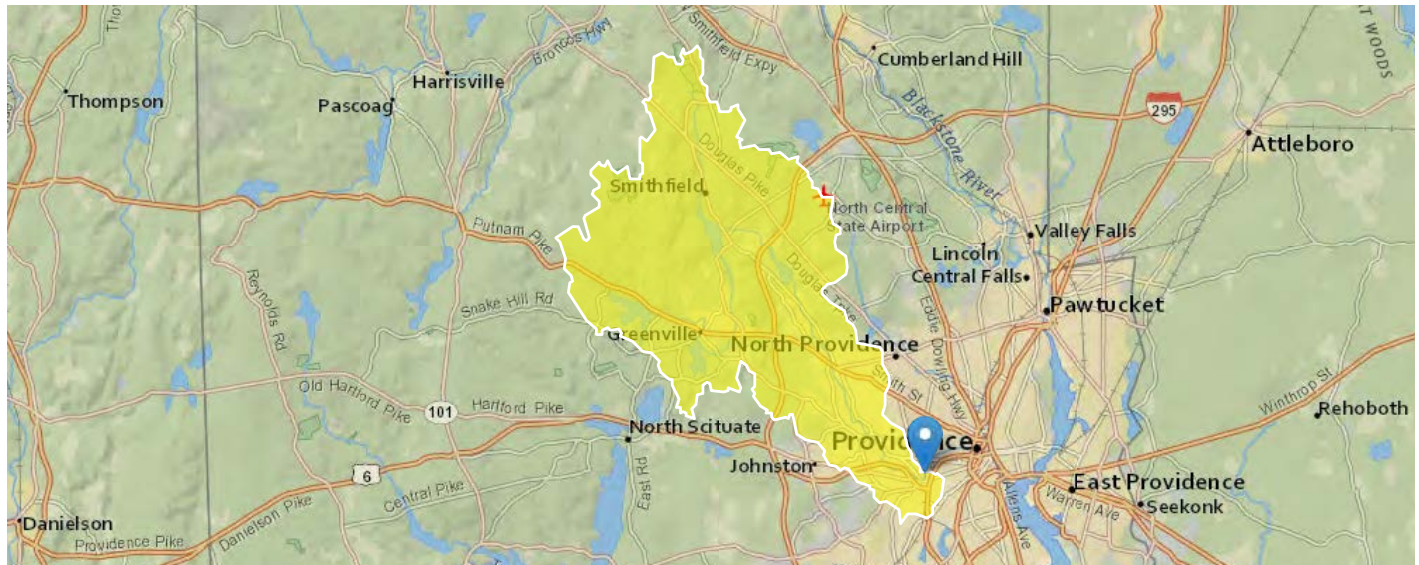
Woonasquatucket River
Bank Restoration
Providence, Rhode Island



Attachment B
StreamStats Report

StreamStats Report San Souci

Region ID: RI
 Workspace ID: RI20230503134253831000
 Clicked Point (Latitude, Longitude): 41.81932, -71.44227
 Time: 2023-05-03 09:43:17 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
CAT1ROADS	Length of interstates lmted access highways and ramps for lmted access highways, includes cloverleaf interchanges (USGS Ntl Transp Dataset)	33.2	miles
CAT2ROADS	Length of sec hwy or maj connecting roads; main arteries & hwys not lmted access, usually in the US Hwy or State Hwy systems (USGS Ntl Transp Dataset)	10.2	miles
CAT3ROADS	Length of local connecting roads; roads that collect traffic from local roads & connect towns, subdivisions & neighborhoods (USGS Nat Transp Dataset)	43.3	miles
CAT4ROADS	Length of local roads; generally paved street, road, or byway that usually have single lane of traffic in each direction (USGS Ntnl Transp Dataset)	333	miles
CROPS	Percent of area covered by agriculture	5.24	percent
CROSCOUNT1	Number of intersections between streams and roads, where the roads are interstate, limited access highway, or ramp (CAT1ROADS)	37	dimensionless
CROSCOUNT2	Number of intersections between streams and roads, where the roads are secondary highway or major connecting road (CAT2ROADS)	11	dimensionless
CROSCOUNT3	Number of intersections between streams and roads, where roads are local conecting roads (CAT3ROADS)	35	dimensionless
CROSCOUNT4	Number of intersections between streams and roads, where roads are local roads (CAT4ROADS)	150	dimensionless
CRSDFT	Percentage of area of coarse-grained stratified drift	26.8	percent
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	21.4	feet per mi
DRNAREA	Area that drains to a point on a stream	48	square miles
ELEV	Mean Basin Elevation	321	feet
FOREST	Percentage of area covered by forest	38.3	percent

Parameter Code	Parameter Description	Value	Unit
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	40.5	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	19.4	percent
LFPLENGTH	Length of longest flow path	20.8	miles
STORNHD	Percent storage (wetlands and waterbodies) determined from 1:24K NHD	9.29	percent
STRDEN	Stream Density -- total length of streams divided by drainage area	2.21	miles per square mile
STRDENED	Stream Density -- total length of streams divided by drainage area, edited from NHD	2	miles per square mile
STRMTOT	total length of all mapped streams (1:24,000-scale) in the basin	95.9	miles
STRMTOTED	Total stream length in miles - edited NHD	106	miles
WATER	Percent of area covered by open water (lakes, ponds, reservoirs)	3.99	percent
WETLAND	Percentage of Wetlands	11.6	percent

➤ Peak-Flow Statistics

Peak-Flow Statistics Parameters [Statewide peak 2012 5109]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	48	square miles	4	404
STRDEN	Stream Density	2.21	miles per square mile	1.25	3.53
STORNHD	Percent Storage from NHD	9.29	percent	3.37	19

Peak-Flow Statistics Flow Report [Statewide peak 2012 5109]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SE	ASEp
20-percent AEP flood	1050	ft ³ /s	681	1620	25.1	27.2
10-percent AEP flood	1360	ft ³ /s	901	2050	23.4	25.9
4-percent AEP flood	1840	ft ³ /s	1260	2690	20.9	24
2-percent AEP flood	2210	ft ³ /s	1500	3250	21.1	24.5
1-percent AEP flood	2610	ft ³ /s	1790	3800	20.6	24.2
0.5-percent AEP flood	3030	ft ³ /s	2000	4590	22.3	26.6
0.2-percent AEP flood	3630	ft ³ /s	2290	5740	24.8	29.6

Peak-Flow Statistics Citations

Zarriello, P.J., Ahearn, E.A., and Levin, S.B., 2012, Magnitude of flood flows for selected annual exceedance probabilities in Rhode Island through 2010: U.S. Geological Survey Scientific Investigations Report 2012-5109, 93 p. (<http://pubs.usgs.gov/sir/2012/5109>)

➤ Low-Flow Statistics

Low-Flow Statistics Parameters [Statewide Low Flow 2014 5010]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	48	square miles	0.52	294
STRDENED	Stream Density Edited	2	miles per square mile	0.94	3.49

Low-Flow Statistics Flow Report [Statewide Low Flow 2014 5010]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu
7 Day 2 Year Low Flow	9.04	ft ³ /s	2.16	37.9
7 Day 10 Year Low Flow	4.04	ft ³ /s	0.558	29.3

Low-Flow Statistics Citations

Bent, G.C., Steeves, P.A., and Waite, A.M., 2014, Equations for estimating selected streamflow statistics in Rhode Island: U.S. Geological Survey Scientific Investigations Report 2014–5010, 65 p. (<http://dx.doi.org/10.3133/sir20145010>)

➤ Flow-Duration Statistics

Flow-Duration Statistics Parameters [Statewide Low Flow 2014 5010]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	48	square miles	0.52	294
STRDENED	Stream Density Edited	2	miles per square mile	0.94	3.49

Flow-Duration Statistics Flow Report [Statewide Low Flow 2014 5010]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	ASEp
1 Percent Duration	499	ft ³ /s	237	1050	21.3
2 Percent Duration	391	ft ³ /s	189	809	19.2
5 Percent Duration	277	ft ³ /s	133	575	19.7
10 Percent Duration	210	ft ³ /s	103	430	17.7
15 Percent Duration	173	ft ³ /s	84.4	355	17.9
20 Percent Duration	143	ft ³ /s	69.5	294	18.3
25 Percent Duration	128	ft ³ /s	62.4	263	18
30 Percent Duration	112	ft ³ /s	54.4	231	18.4
40 Percent Duration	88.7	ft ³ /s	43.2	182	18.2
50 Percent Duration	65.8	ft ³ /s	31.9	136	18.8
60 Percent Duration	47.7	ft ³ /s	22.8	99.9	20.8
70 Percent Duration	33.5	ft ³ /s	15.4	72.8	25.4
75 Percent Duration	27.2	ft ³ /s	11.9	62.1	31
80 Percent Duration	21.9	ft ³ /s	8.95	53.6	38
85 Percent Duration	17.1	ft ³ /s	6.21	47.1	49.3
90 Percent Duration	13.3	ft ³ /s	3.65	48.4	75.5
95 Percent Duration	8.89	ft ³ /s	1.88	42	
98 Percent Duration	6.34	ft ³ /s	1.18	34	
99 Percent Duration	5.16	ft ³ /s	0.792	33.6	

Flow-Duration Statistics Citations

Bent, G.C., Steeves, P.A., and Waite, A.M., 2014, Equations for estimating selected streamflow statistics in Rhode Island: U.S. Geological Survey Scientific Investigations Report 2014–5010, 65 p. (<http://dx.doi.org/10.3133/sir20145010>)

➤ Bankfull Statistics

Bankfull Statistics Parameters [Appalachian Highlands D Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	48	square miles	0.07722	940.1535

Bankfull Statistics Parameters [New England P Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	48	square miles	3.799224	138.999861

Bankfull Statistics Parameters [USA Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	48	square miles	0.07722	59927.7393

Bankfull Statistics Flow Report [Appalachian Highlands D Bieger 2015]

Statistic	Value	Unit
Bieger_D_channel_width	75.8	ft
Bieger_D_channel_depth	3.4	ft
Bieger_D_channel_cross_sectional_area	263	ft ²

Bankfull Statistics Flow Report [New England P Bieger 2015]

Statistic	Value	Unit
Bieger_P_channel_width	74.7	ft
Bieger_P_channel_depth	3.22	ft
Bieger_P_channel_cross_sectional_area	249	ft ²

Bankfull Statistics Flow Report [USA Bieger 2015]

Statistic	Value	Unit
Bieger_USA_channel_width	48.4	ft
Bieger_USA_channel_depth	2.75	ft
Bieger_USA_channel_cross_sectional_area	138	ft ²

Bankfull Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
Bieger_D_channel_width	75.8	ft
Bieger_D_channel_depth	3.4	ft
Bieger_D_channel_cross_sectional_area	263	ft ²
Bieger_P_channel_width	74.7	ft
Bieger_P_channel_depth	3.22	ft
Bieger_P_channel_cross_sectional_area	249	ft ²
Bieger_USA_channel_width	48.4	ft
Bieger_USA_channel_depth	2.75	ft
Bieger_USA_channel_cross_sectional_area	138	ft ²

Bankfull Statistics Citations

Bieger, Katrin; Rathjens, Hendrik; Allen, Peter M.; and Arnold, Jeffrey G., 2015, Development and Evaluation of Bankfull Hydraulic Geometry Relationships for the Physiographic Regions of the United States, Publications from USDA-ARS / UNL Faculty, 17p. (https://digitalcommons.unl.edu/usdaarsfacpub/1515?utm_source=digitalcommons.unl.edu%2Fusdaarsfacpub%2F1515&utm_medium=PDF&utm_campaign=PDFCoverPages)

➤ Maximum Probable Flood Statistics

Maximum Probable Flood Statistics Parameters [Crippen Bue Region 2]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	48	square miles	0.1	3000

Maximum Probable Flood Statistics Flow Report [Crippen Bue Region 2]

Statistic	Value	Unit
Maximum Flood Crippen Bue Regional	59700	ft ³ /s

Maximum Probable Flood Statistics Citations

Crippen, J.R. and Bue, Conrad D. 1977, Maximum Floodflows in the Conterminous United States, Geological Survey Water-Supply Paper 1887, 52p. (<https://pubs.usgs.gov/wsp/1887/report.pdf>)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

USGS Software Disclaimer: This software has been approved for release by the U.S. Geological Survey (USGS). Although the software has been subjected to rigorous review, the USGS reserves the right to update the software as needed pursuant to further analysis and review. No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the software and related material nor shall the fact of release constitute any such warranty. Furthermore, the software is released on condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from its authorized or unauthorized use.

USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.14.0

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

Attachment C
Photographic Log

Path: I:\warwick\p\warwick\p\GIS_Warwick\StateandLocal\NorthEast\RhodeIsland\6209207_SanSouciStreamBankRestoration\PROJECTS\SanSouci_PhotoMap\SanSouci_PhotoMap.aprx | 5/30/2024 | etovne




 Photo Locations

Photo Location Map
Woonasquatucket River
Bank Restoration
Providence, Rhode Island





Photo 1: Undercut bank across the Woonasquatucket River, looking south (19 April 2023)



Photo 2: Undercut bank and vertical slope on river right, looking east (19 April 2023)



Photo 3: Upstream end of undercut bank on river right, looking south (19 April 2023)



Photo 4: San Souci Drive and cracked asphalt on bike path, looking west (19 April 2023)



Photo 5: Cracked asphalt on bike path, looking east (11 November 2023)

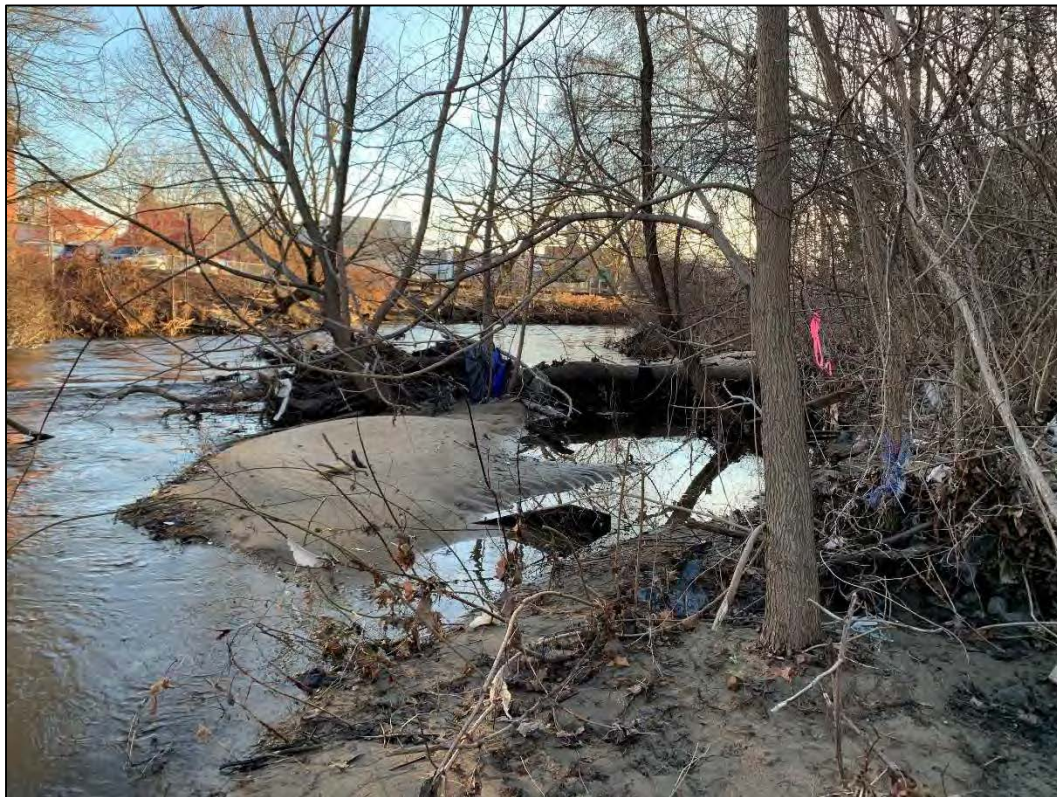


Photo 6: Sediment and debris accumulation on left side of river, looking south (11 November 2023)



Photo 7: Stone masonry wall adjacent to the United Way building, looking east (19 April 2023)



Photo 8: Face of cracked retaining wall perpendicular to flow, looking east (19 April 2023)

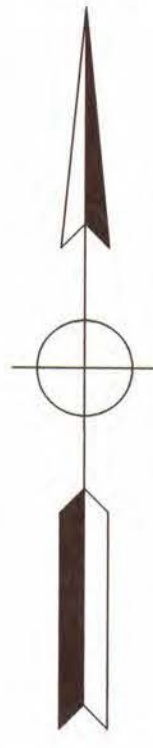


Photo 9: Woonasquatucket River upstream of the site, looking north (13 March 2024)



Photo 10: Woonasquatucket River downstream of the site, looking north (13 March 2024)

Attachment D
Topographic Survey



RHODE ISLAND COORDINATE SYSTEM
(NAD83/2011 EPOCH 2010.00)

MAP 62 LOT 621
N/F
PARAGON MILLS VENTURE, LLC

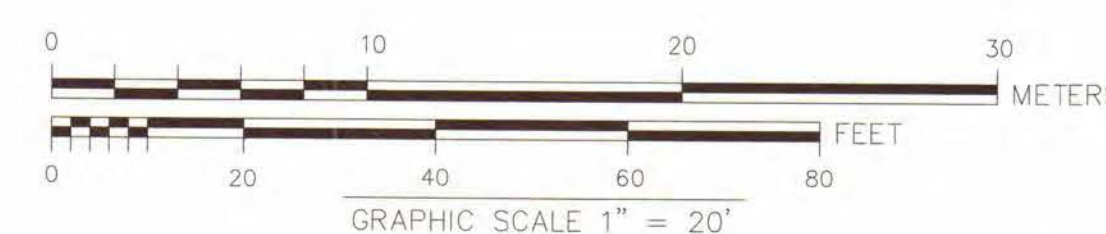
APPROX. LOCATION
10' WIDE RIGHT OF WAY
PLAN BK 98/102

MAP 62 LOT 574
N/F
TWENTY FIVE MANTON AVENUE
ASSOCIATES, LLC

APPROXIMATE LOCATION OF
SPECIAL FLOOD HAZARD AREA
AS SHOWN ON FIRM MAP
NO. 44007C0304J REVISED
OCTOBER 2, 2015

WOONASQUATUCKET RIVER

SAN SOUCI DRIVE



THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO 435-RICR-00-00-1.9 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 25, 2015, AS FOLLOWS:

- (a) TYPE OF BOUNDARY SURVEY: NOT A BOUNDARY SURVEY MEASUREMENT SPECIFICATION:
- (b) DATA ACCUMULATION SURVEY: TOPOGRAPHIC SURVEY ACCURACY: III T-2
- (c) THE PURPOSE FOR THE CONDUCT OF THE SURVEY AND FOR THE PREPARATION OF THE PLAN IS AS FOLLOWS:

TO PREPARE A LIMITED EXISTING CONDITIONS SURVEY AS NOTED HEREON AND TO PROVIDE RIVER CROSS SECTION DATA AT THE SPECIFIED LOCATIONS.

THIS COMPILATION PLAN HAS BEEN PREPARED FROM SOURCES OF INFORMATION (GIS PARCEL LINES) AND DATA WHOSE POSITIONAL ACCURACY AND RELIABILITY HAS NOT BEEN VERIFIED. THE PROPERTY LINES HEREON DO NOT REPRESENT A BOUNDARY OPINION, AND OTHER INFORMATION DEPICTED IS SUBJECT TO SUCH CHANGES AS AN AUTHORITATIVE FIELD SURVEY MAY DISCLOSE.

Kevin Hanley
23rd May 2024
KEVIN HANLEY, PLS RHODE ISLAND
REGISTRATION No. 1995
COA NO. LS000A440-COA



MAP 35 LOT 586
N/F
UNITED WAY OF RHODE ISLAND

NOTE:
RIP RAP WITHIN THIS LOCATION WAS
PLACED BY UNKNOWN PERSONS
BETWEEN THE NOVEMBER 17, 2023
AND MARCH 13, 2024 SURVEYS.

STATION #6
DH FOUND
N 267591.16
E 343965.45
ELEV=28.17

STATION #2
MAG. NAIL SET
N 267485.69
E 343950.22
ELEV=26.76

STATION #3
MAG. NAIL SET
N 267473.71
E 344079.01
ELEV=27.95

NO.	DATE	REVISIONS	DESCRIPTION

EXISTING CONDITIONS SURVEY
SAN SOUCI DRIVE
PROVIDENCE
RHODE ISLAND

DRAWING TITLE

DATE MARCH 22, 2024
JOB NO. 2200807.00
FILE NAME 2200807WS.DWG
DRAWN BY MC/EP
CHECKED BY NP/KH
SHEET NO.

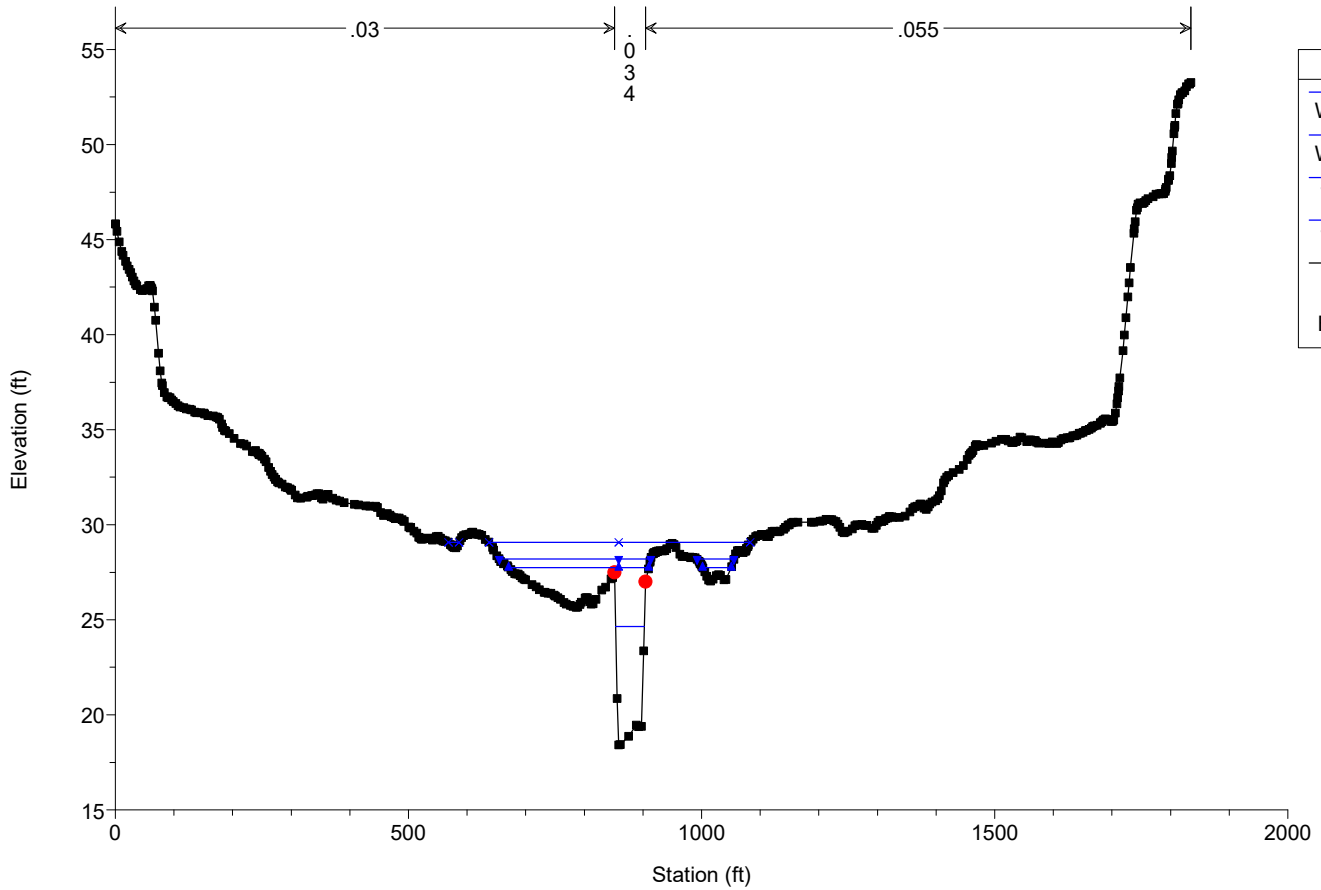
325 Wood Road
Providence, RI 02904
t: 781.380.7766
f: 781.380.7757

DAWOOD

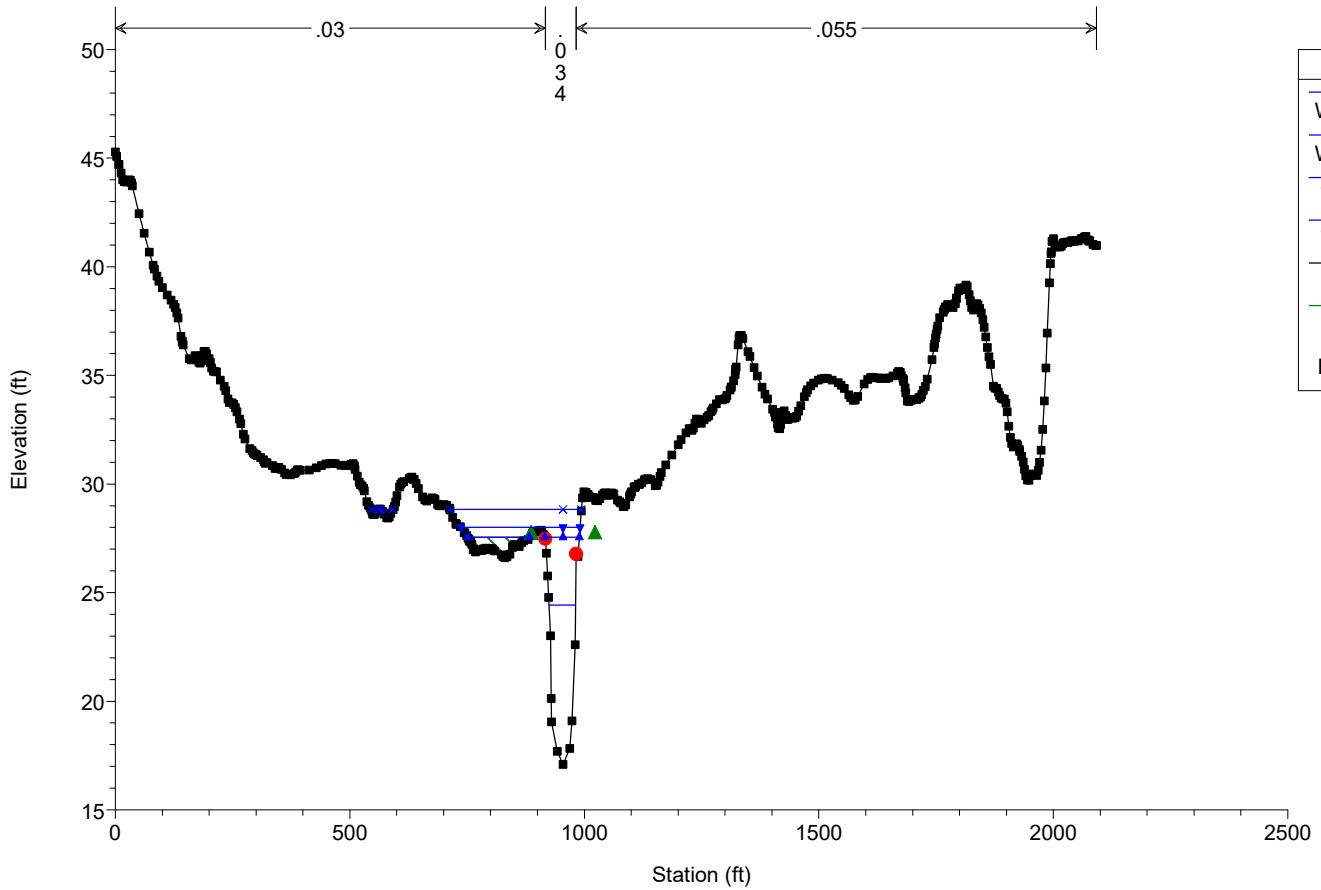
Attachment E
HEC-RAS Results

1D Existing Conditions Model Results

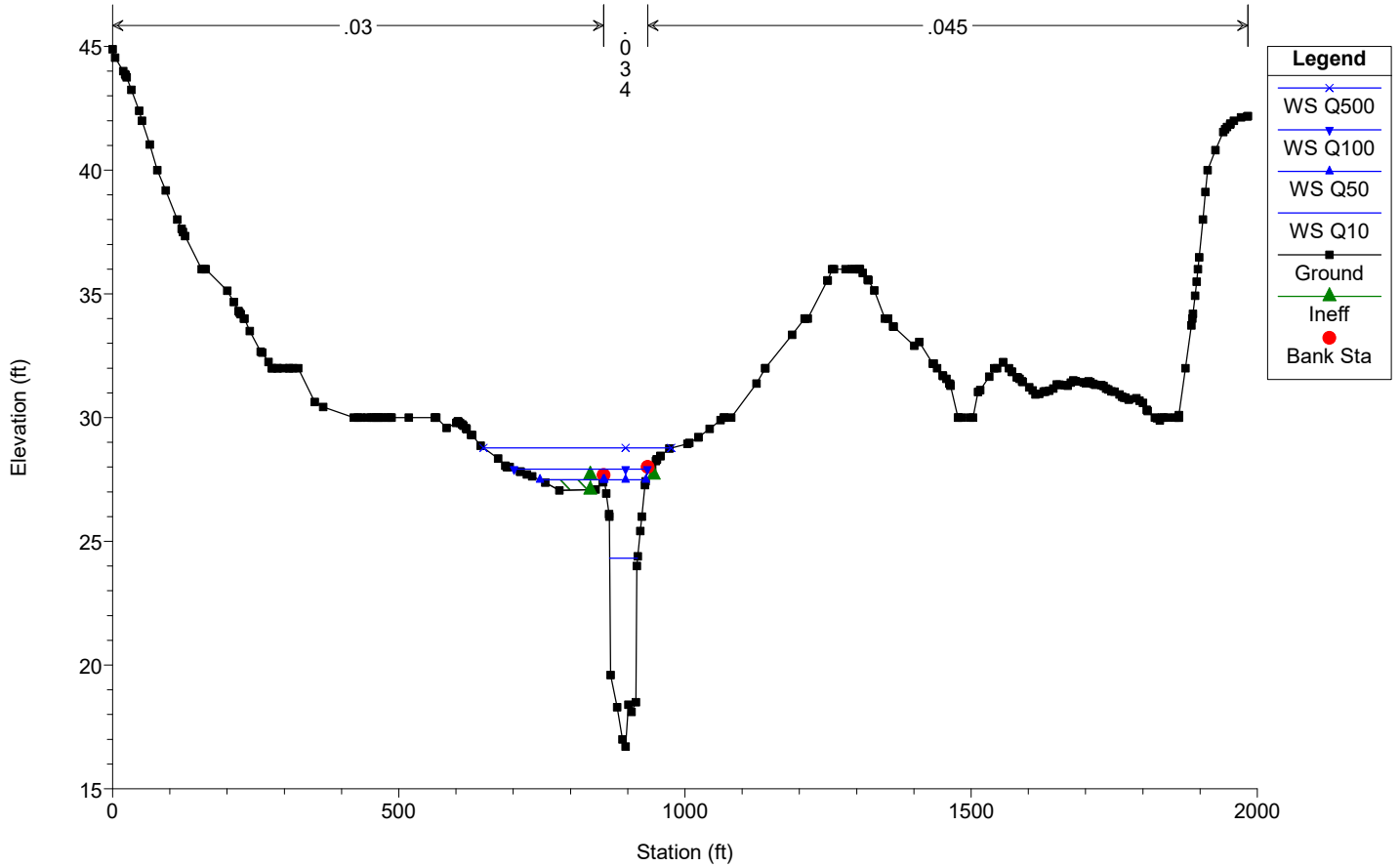
Woonas Plan: 1D_Plan_CE 5/13/2024
RS 18468



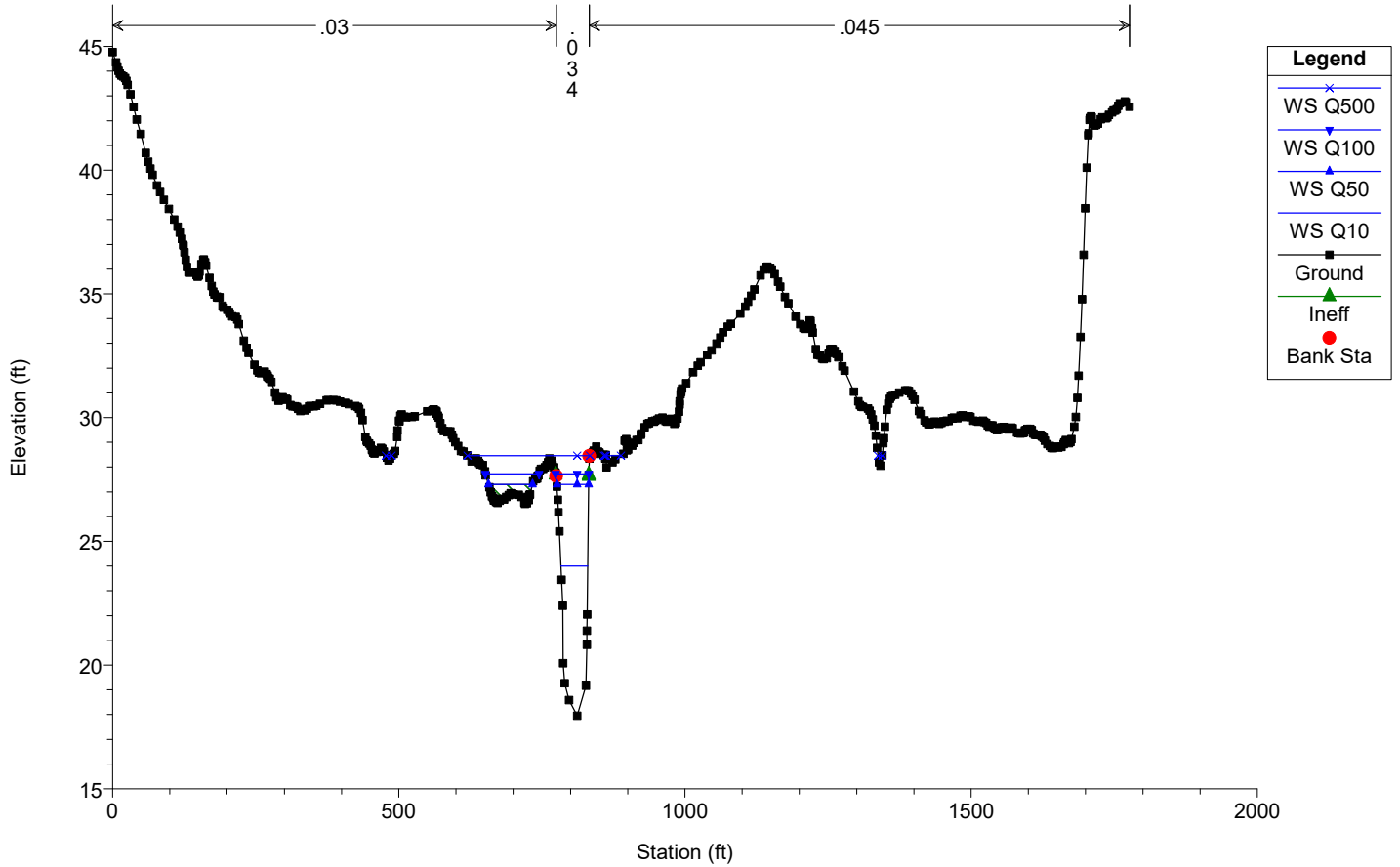
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RS 18229



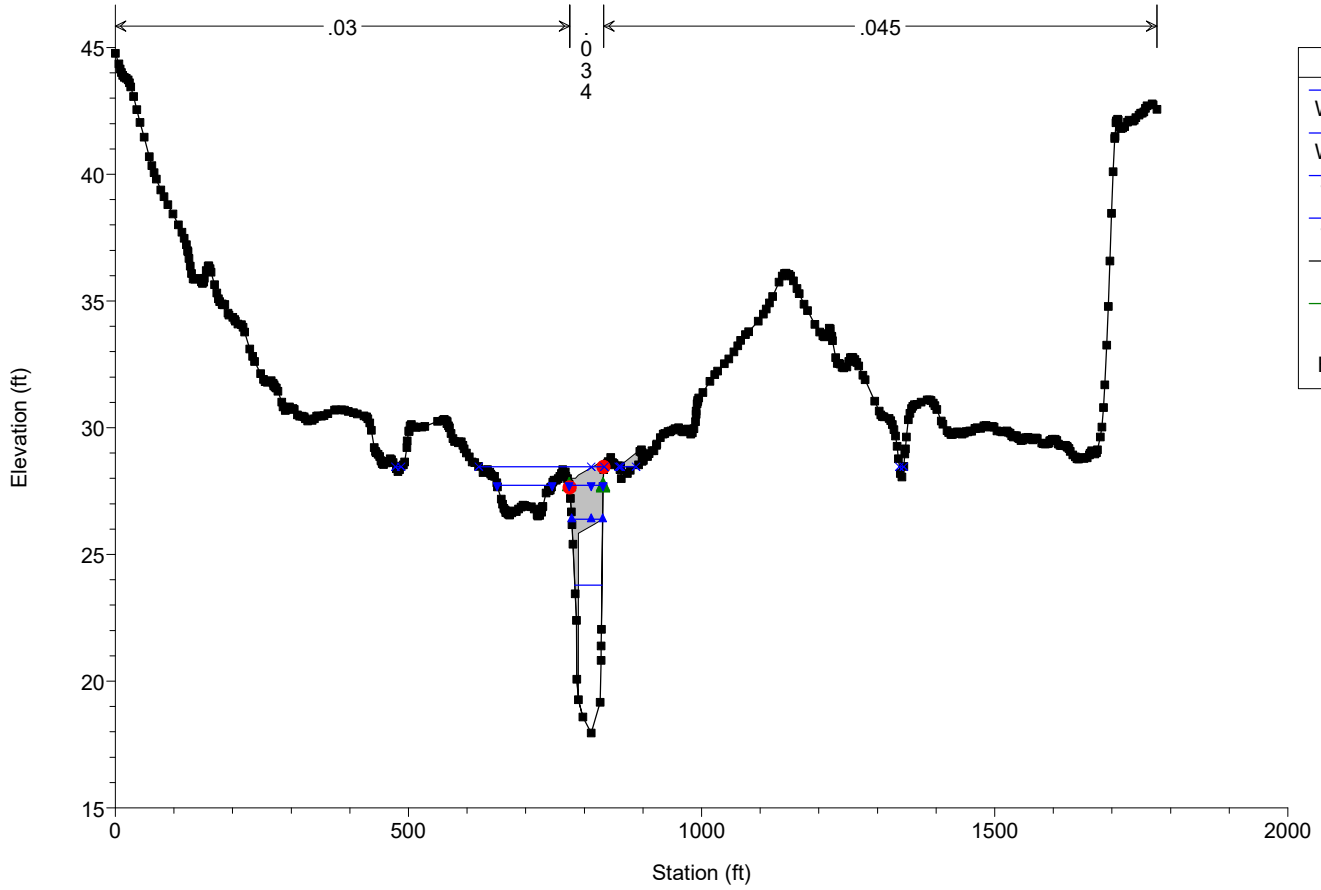
Woonas Plan: 1D_Plan_CE 5/13/2024
RS 18215



Woonas Plan: 1D_Plan_CE 5/13/2024
RS 18194

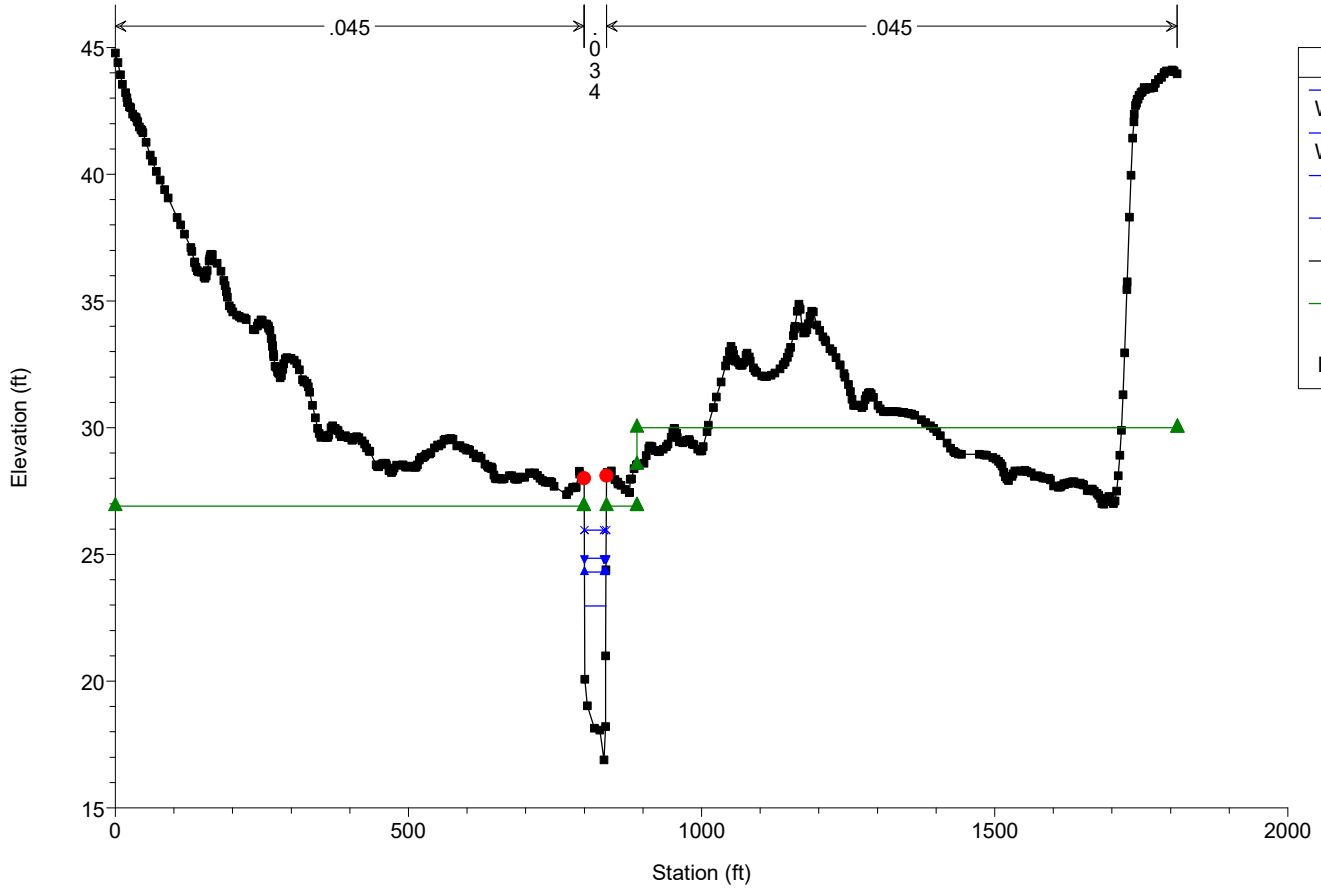


Woonas Plan: 1D_Plan_CE 5/13/2024
Manton Avenue



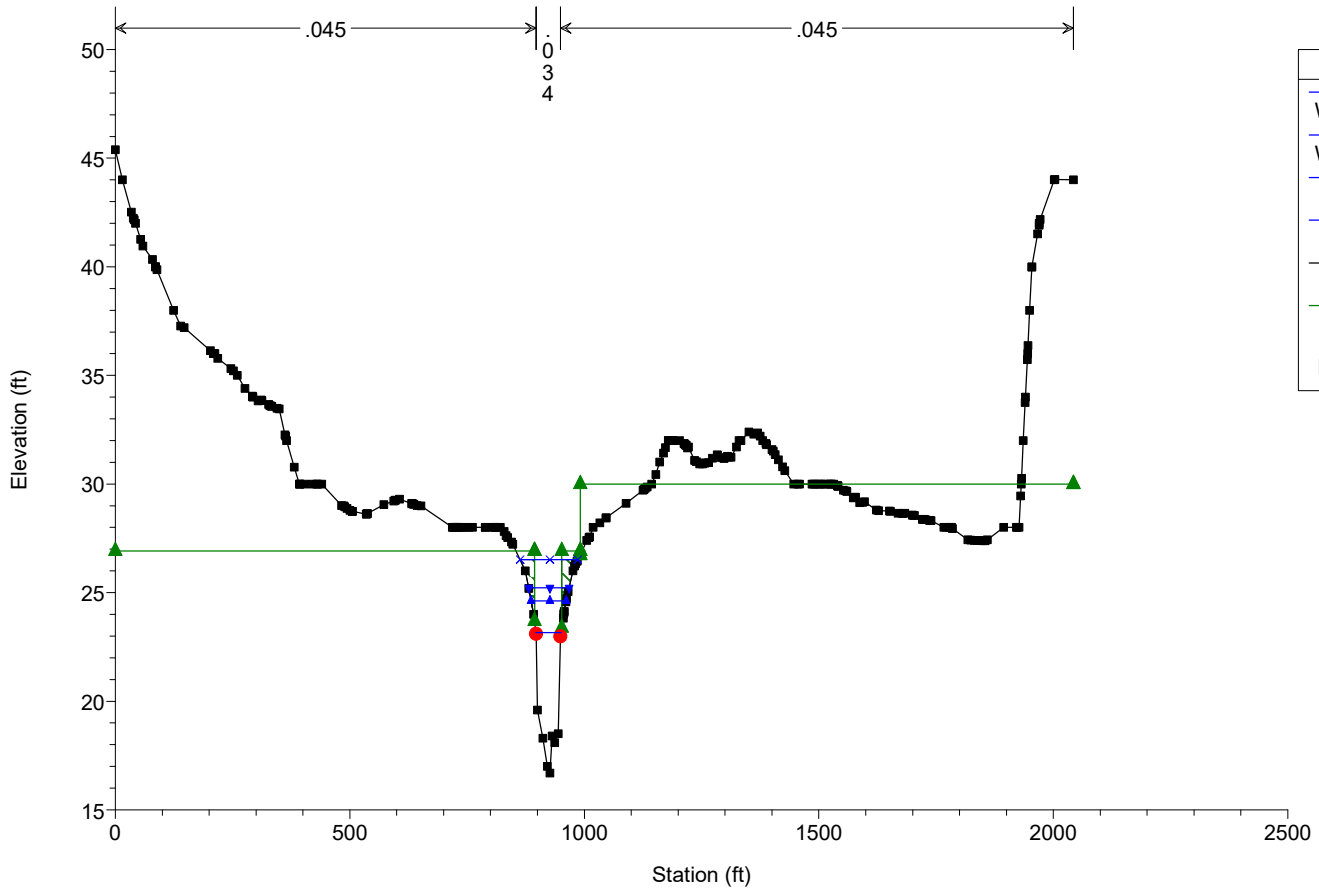
Legend	
WS Q500	Blue cross
WS Q100	Blue inverted triangle
WS Q50	Blue triangle
WS Q10	Blue square
Ground	Black square
Ineff	Green triangle
Bank Sta	Red circle

Woonas Plan: 1D_Plan_CE 5/13/2024
RS 18119



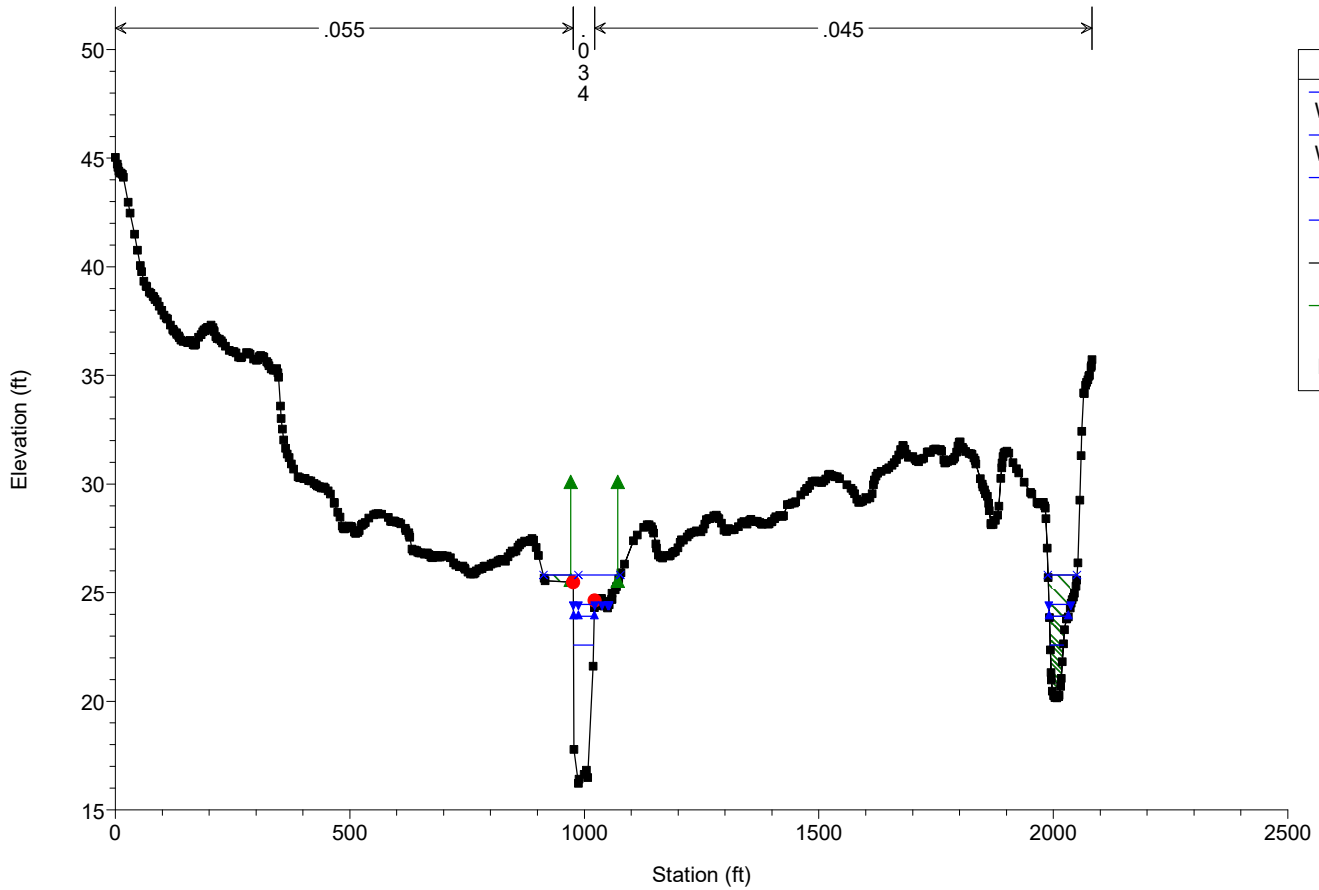
Legend	
WS Q500	Blue cross
WS Q100	Blue inverted triangle
WS Q50	Blue triangle
WS Q10	Blue square
Ground	Black square
Ineff	Green triangle
Bank Sta	Red circle

Woonas Plan: 1D_Plan_CE 5/13/2024
RS 18095



Legend	
WS Q500	Blue x
WS Q100	Blue inverted triangle
WS Q50	Blue triangle
WS Q10	Blue square
Ground	Black square
Ineff	Green triangle
Bank Sta	Red circle

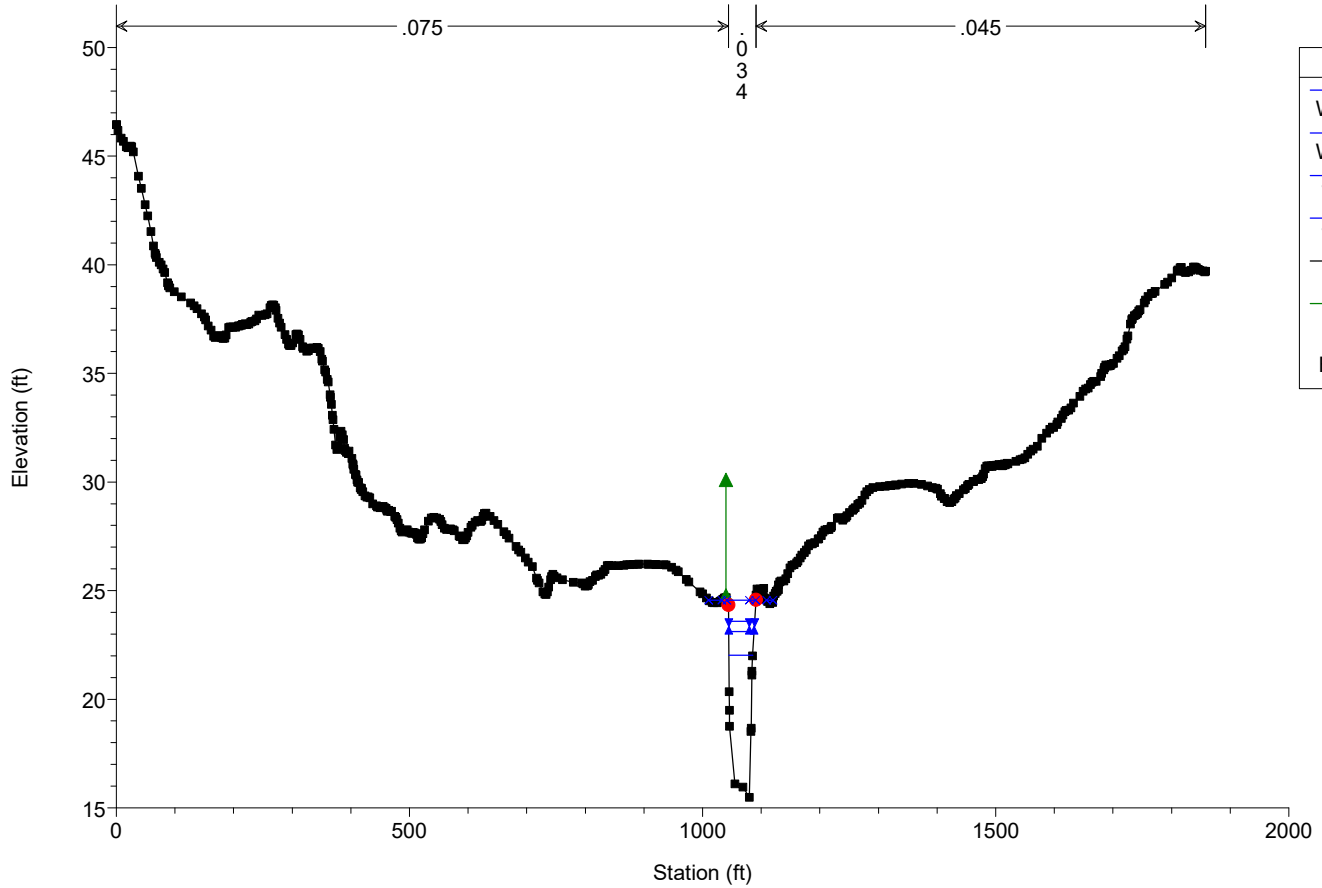
Woonas Plan: 1D_Plan_CE 5/13/2024
RS 17943



Legend	
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WS Q100	Blue inverted triangle
WS Q50	Blue triangle
WS Q10	Blue square
Ground	Black square
Ineff	Green triangle
Bank Sta	Red circle

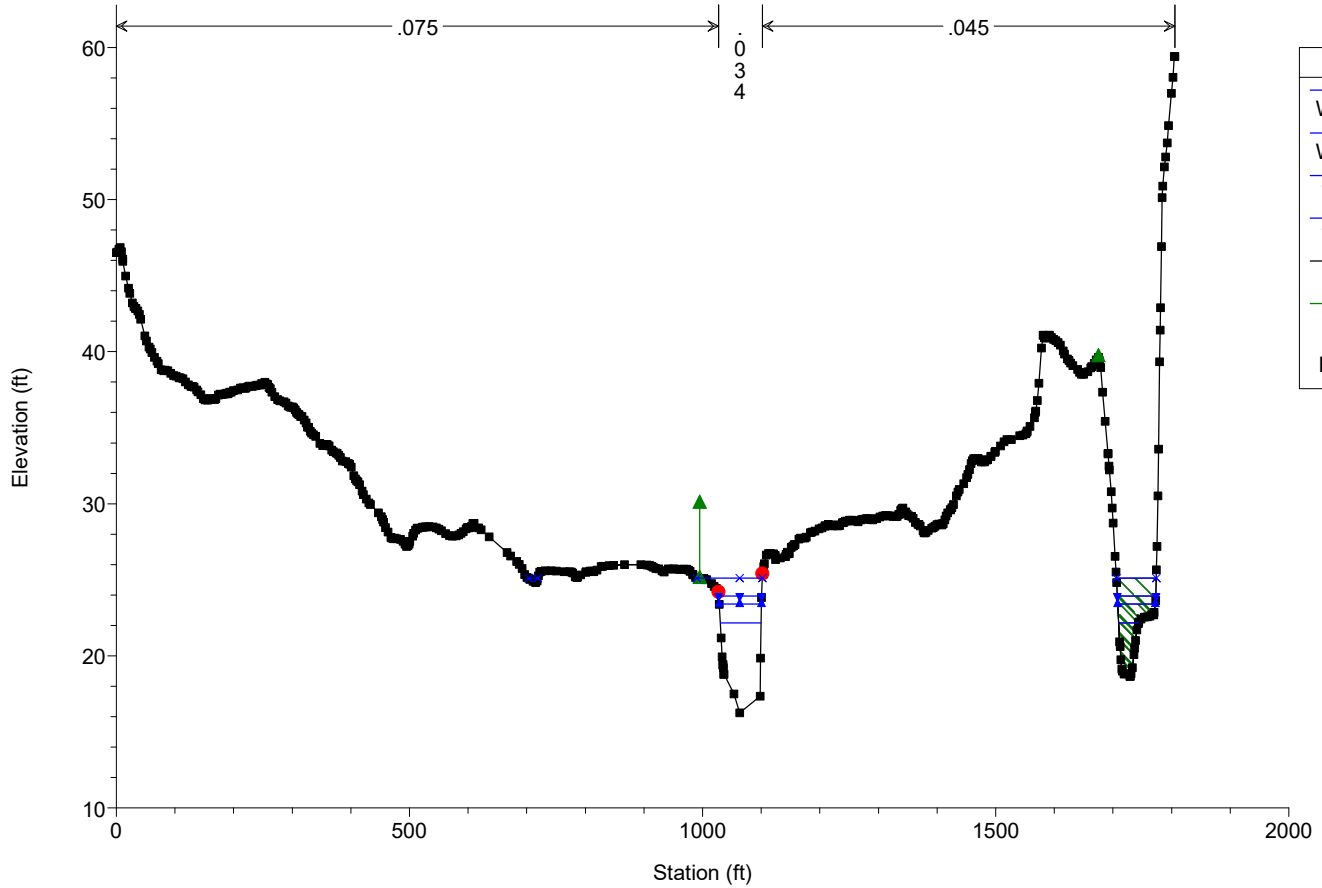
Woonas Plan: 1D_Plan_CE 5/13/2024

RS 17762



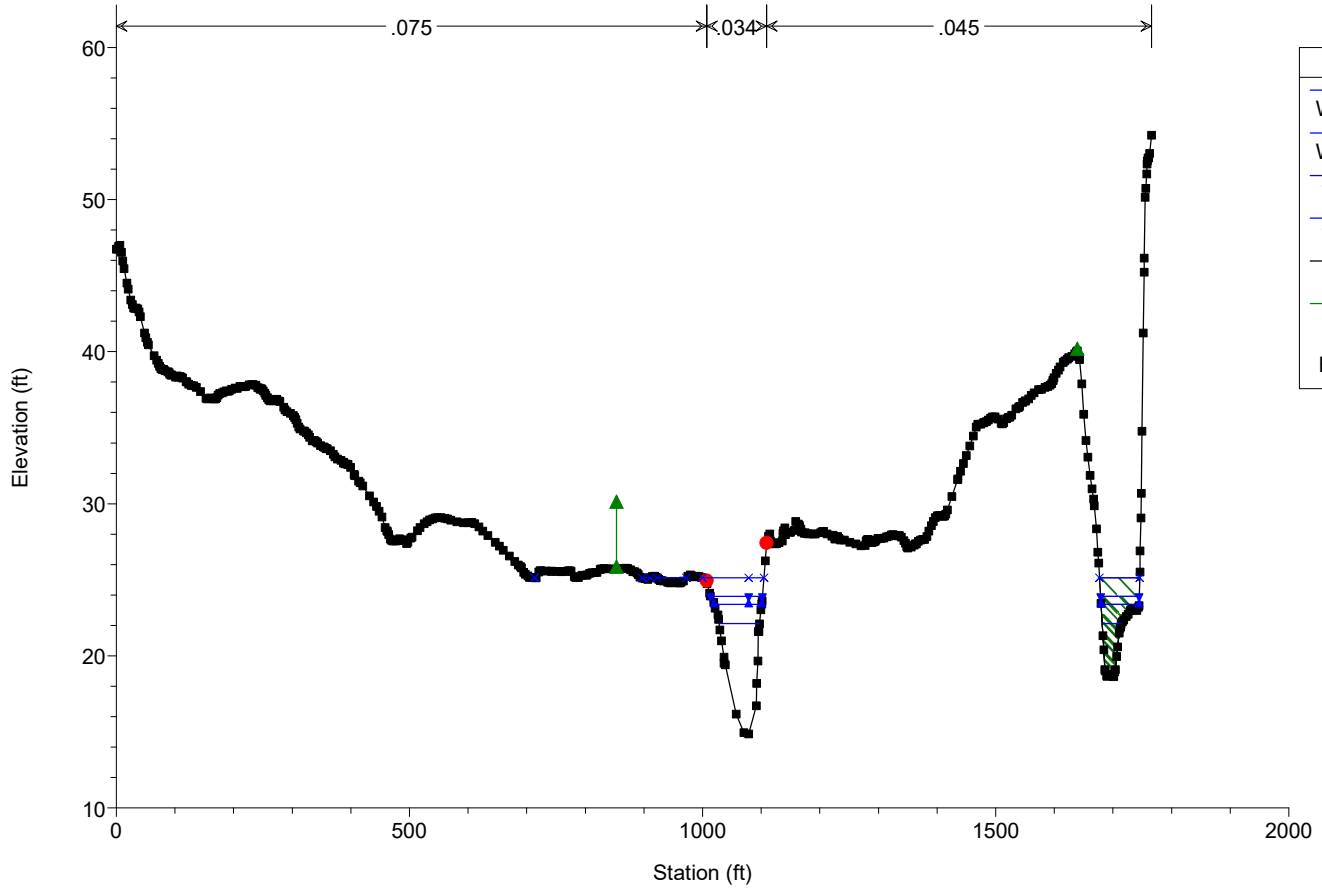
Woonas Plan: 1D_Plan_CE 5/13/2024

RS 17693



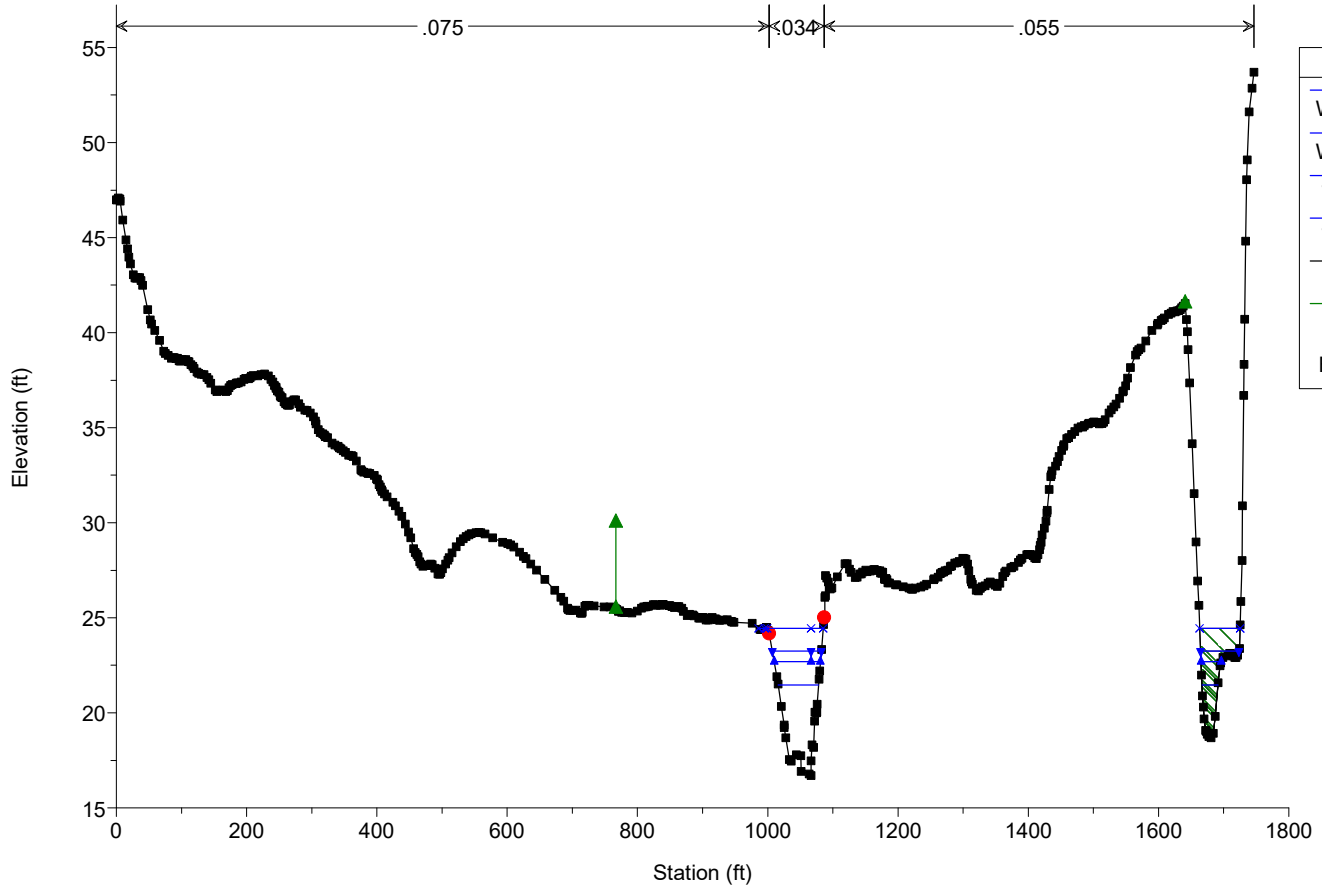
Woonas Plan: 1D_Plan_CE 5/13/2024

RS 17657

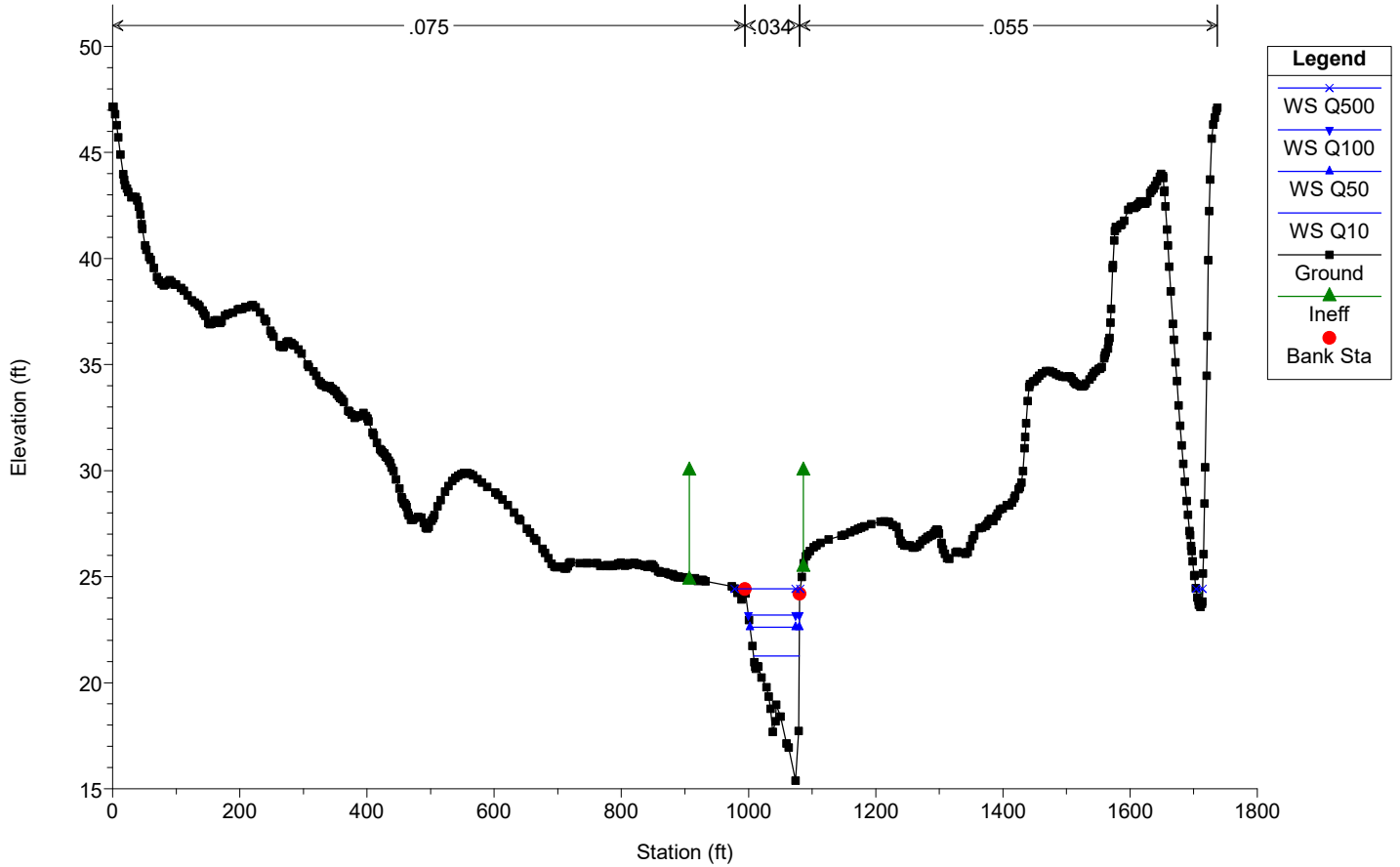


Woonas Plan: 1D_Plan_CE 5/13/2024

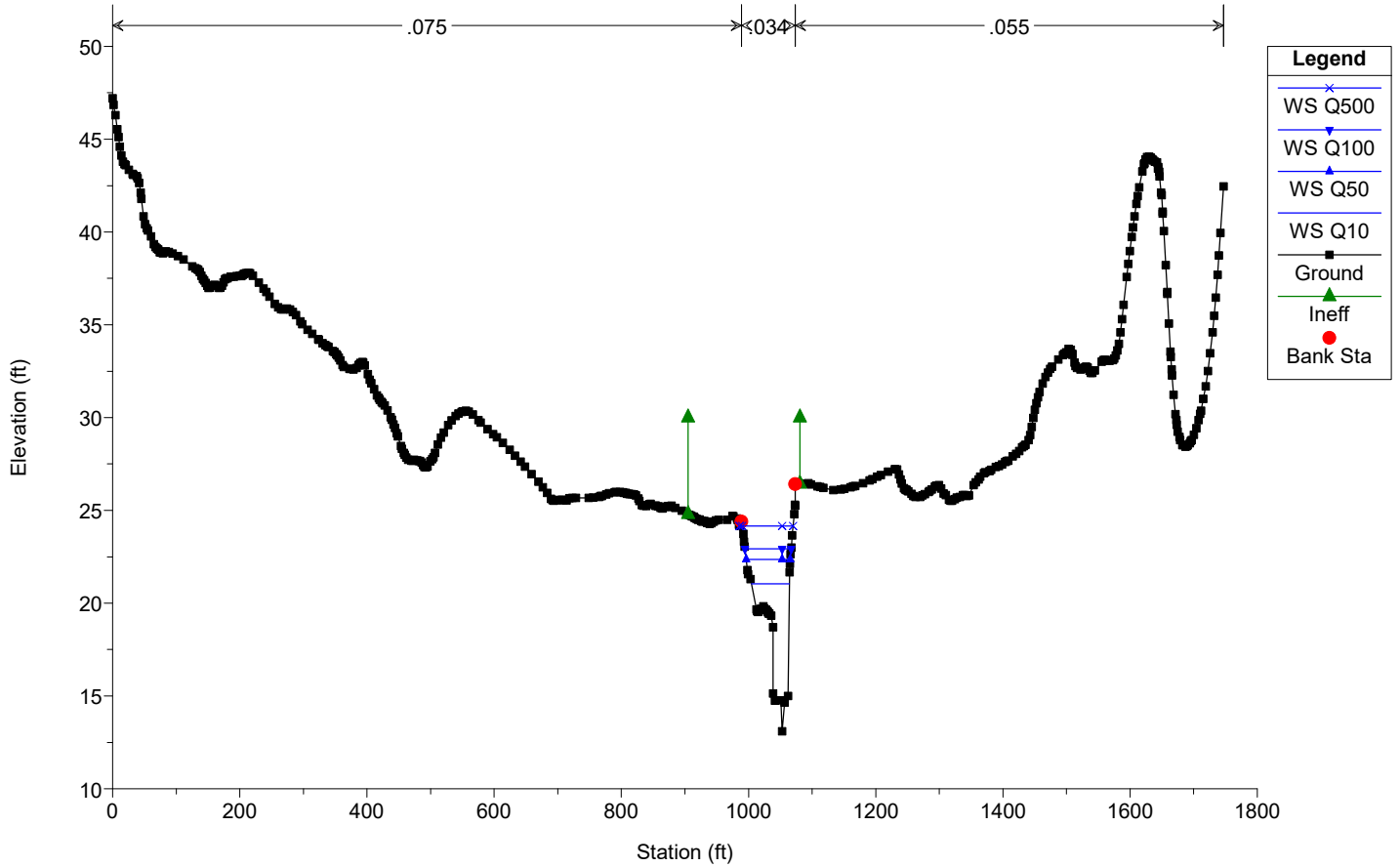
RS 17606



Woonas Plan: 1D_Plan_CE 5/13/2024
RS 17571

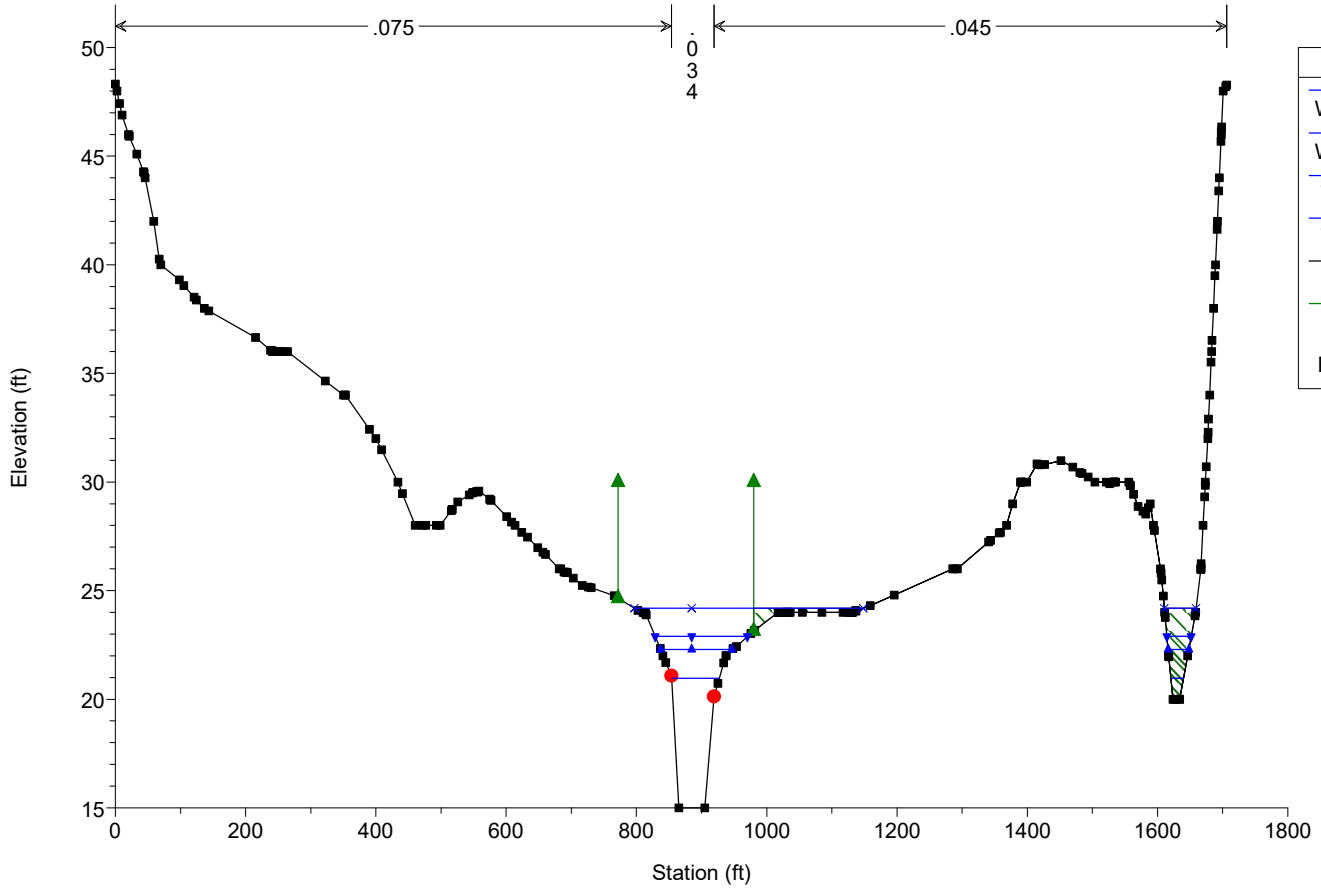


Woonas Plan: 1D_Plan_CE 5/13/2024
RS 17534



Woonas Plan: 1D_Plan_CE 5/13/2024

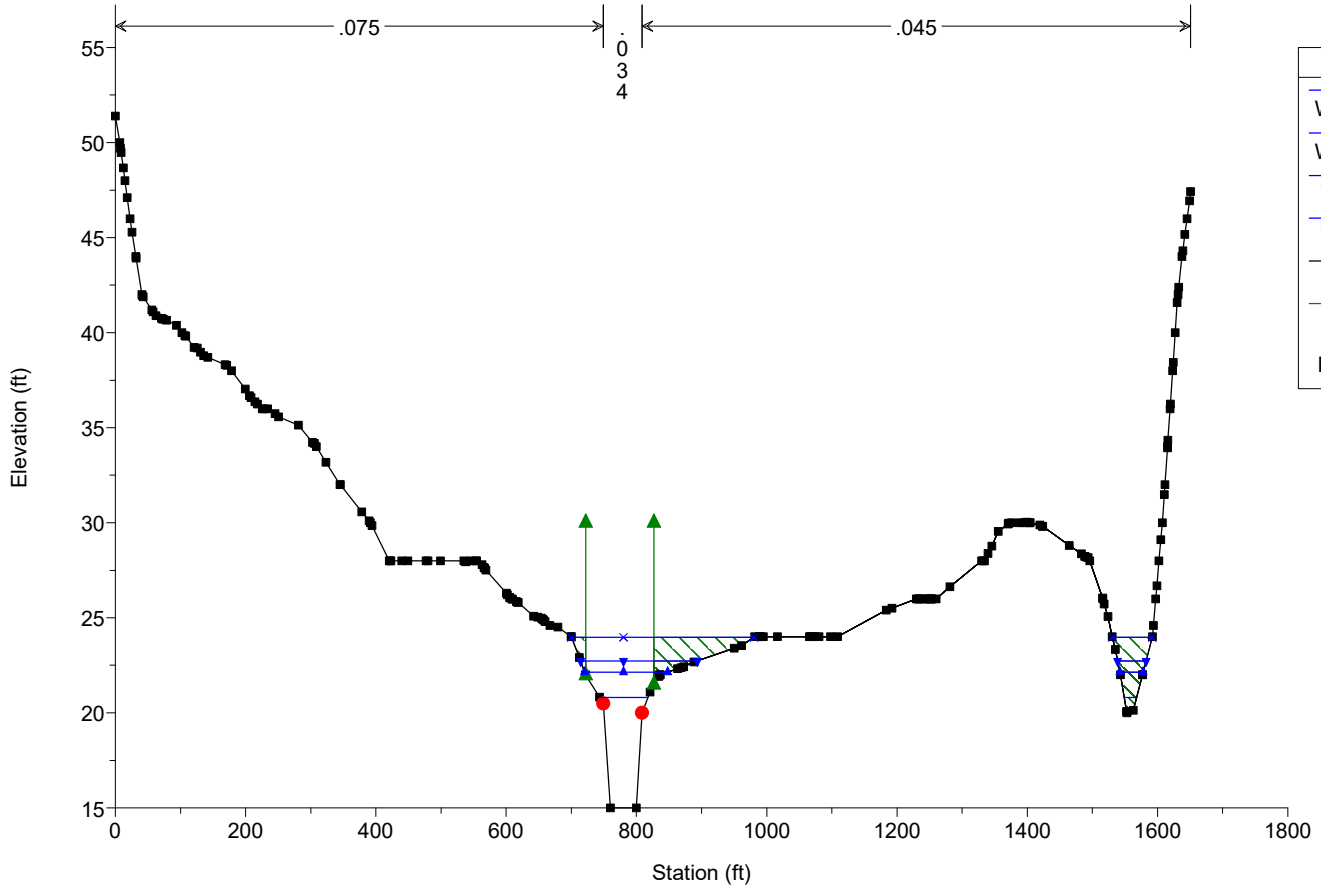
RS 17369



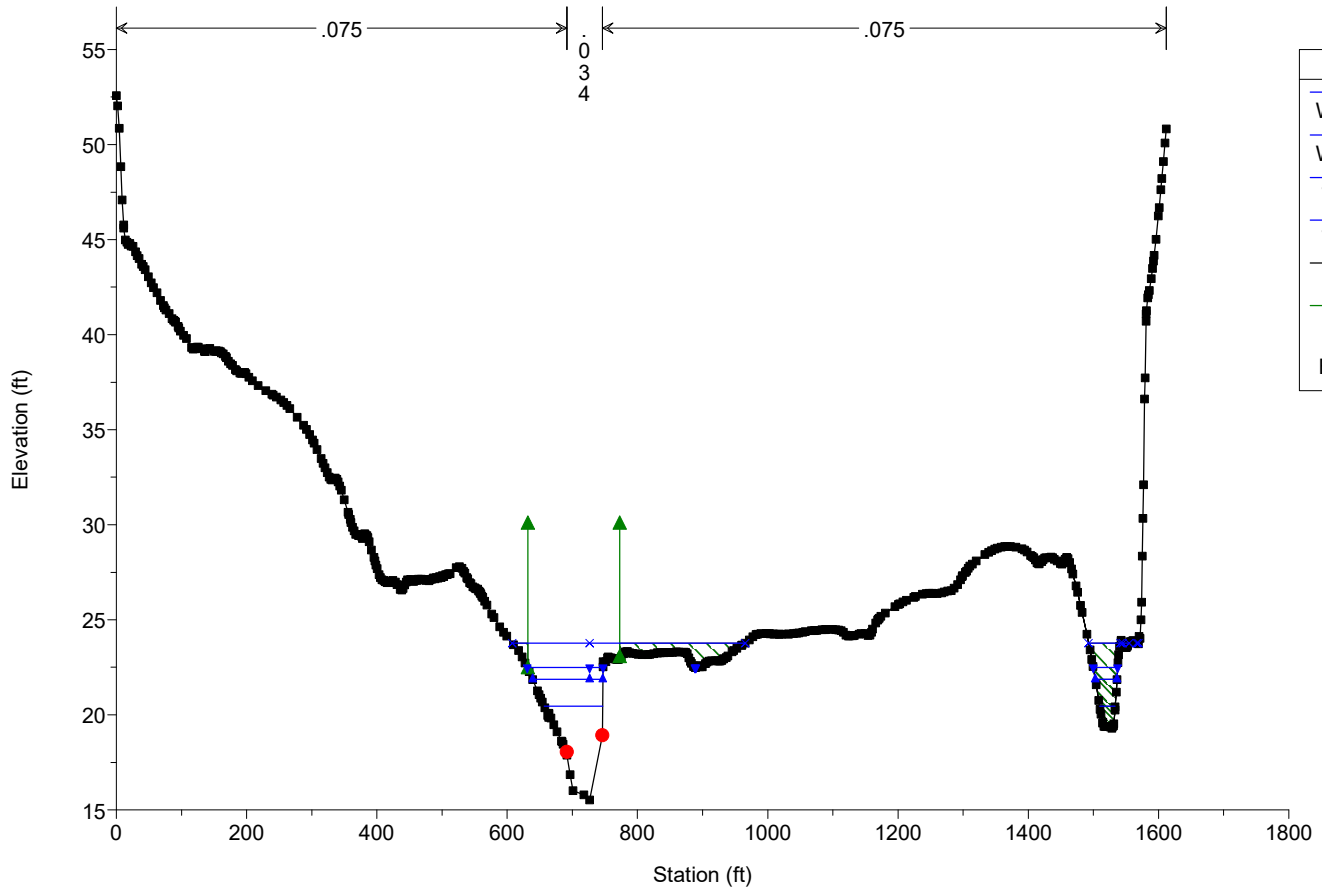
Legend	
WS Q500	Blue line with 'x' markers
WS Q100	Blue line with downward-pointing triangles
WS Q50	Blue line with upward-pointing triangles
WS Q10	Blue line with horizontal dashes
Ground	Black line with square markers
Ineff	Green line with upward-pointing triangles
Bank Sta	Red circle

Woonas Plan: 1D_Plan_CE 5/13/2024

RS 17304

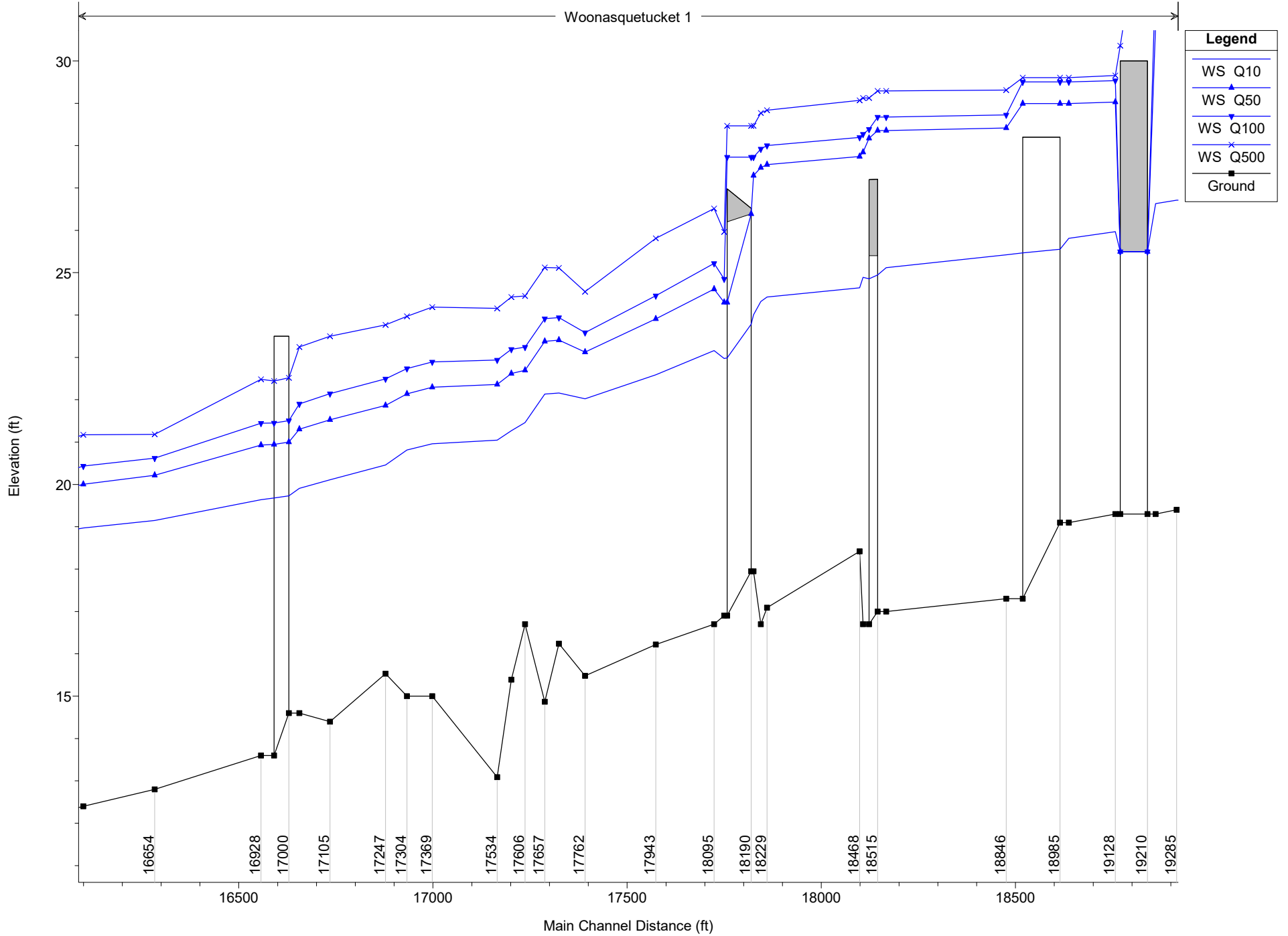


Legend	
WS Q500	Blue line with 'x' markers
WS Q100	Blue line with downward-pointing triangles
WS Q50	Blue line with upward-pointing triangles
WS Q10	Blue line with horizontal dashes
Ground	Black line with square markers
Ineff	Green line with upward-pointing triangles
Bank Sta	Red circle



Legend	
WS Q500	✕
WS Q100	▼
WS Q50	▲
WS Q10	■
Ground	■
Ineff	▲
Bank Sta	●

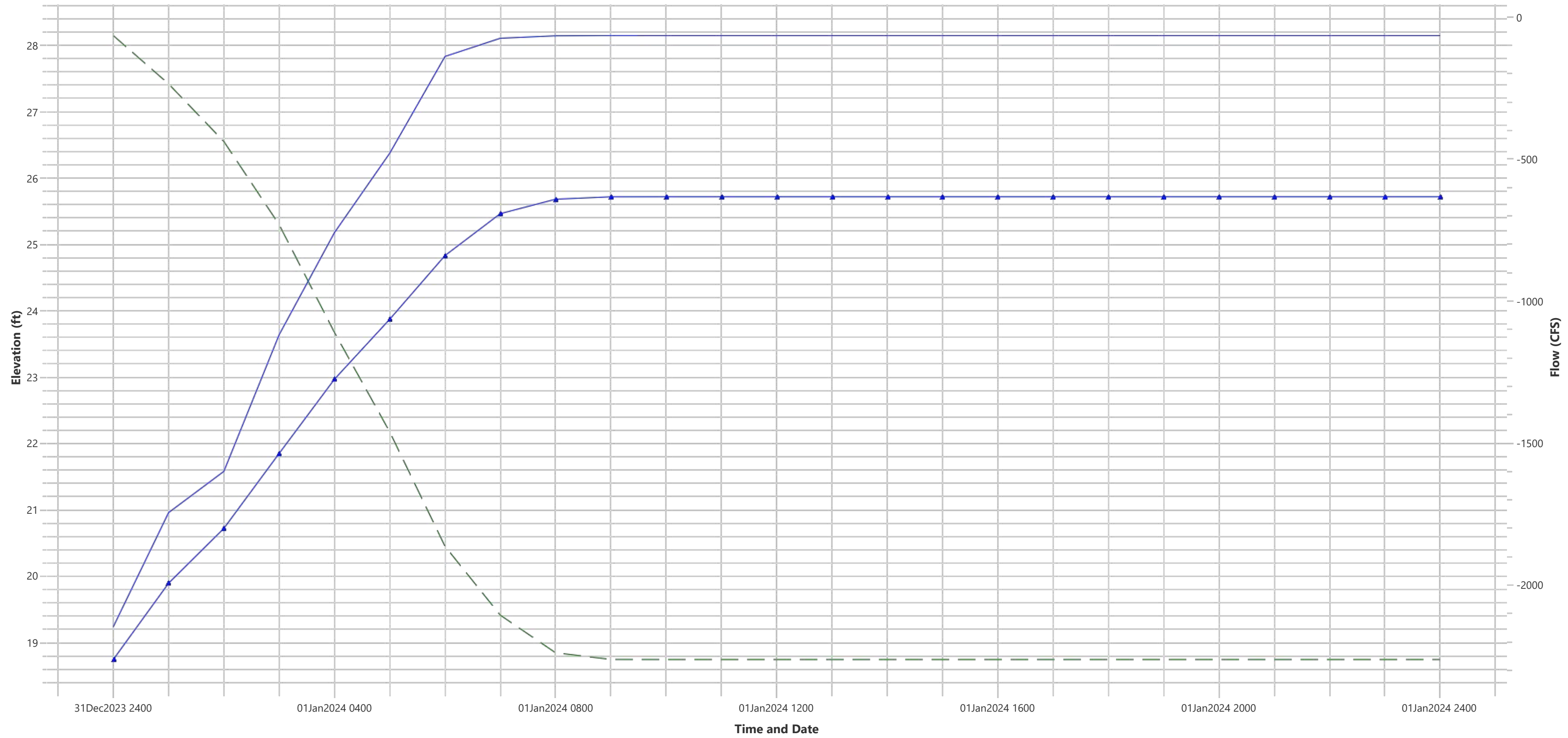
Woonasquettuck 1



HEC-RAS Plan: 1D_Plan_CE Locations: User Defined

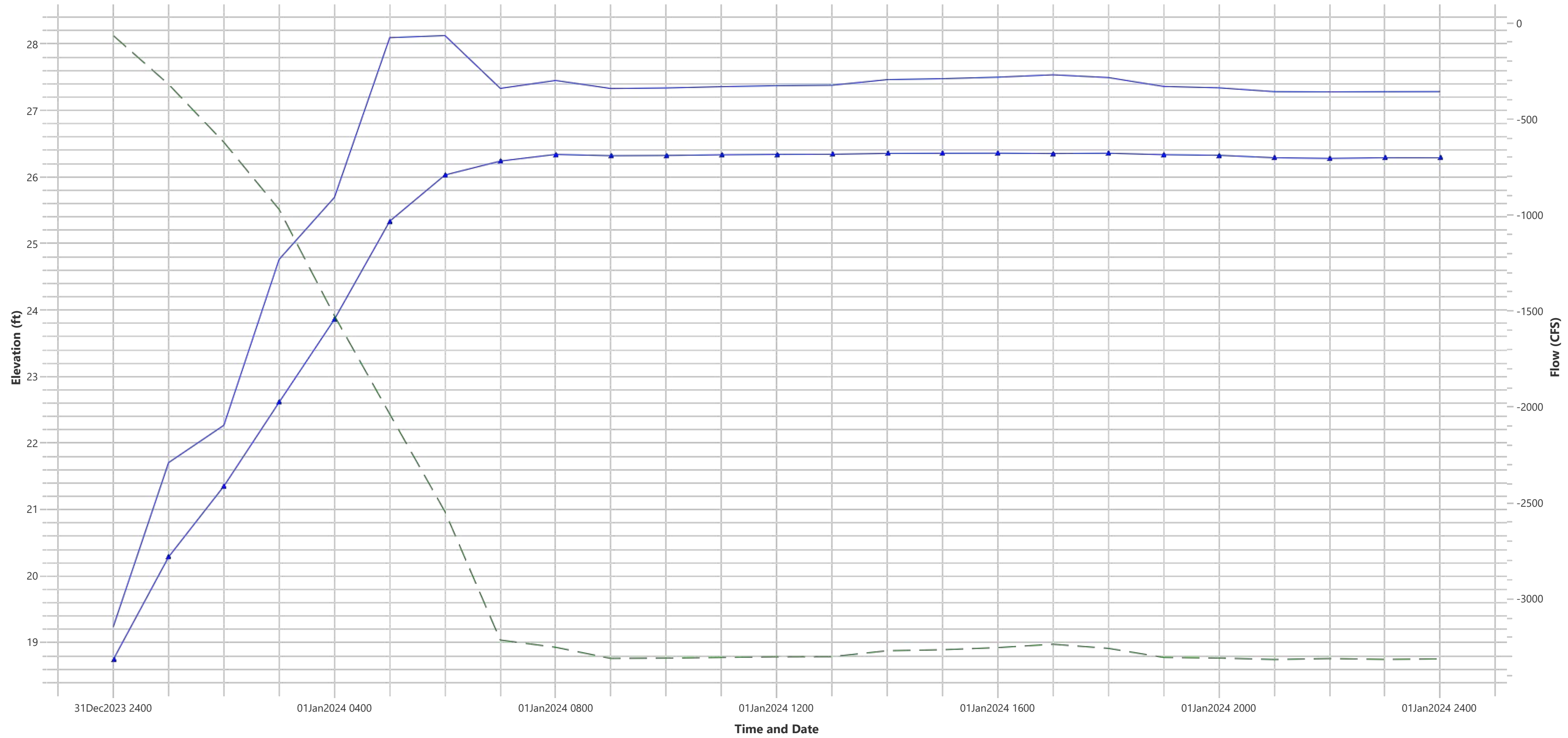
River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Woonasquettucket	1	18468	Q10	1390.00	18.42	24.64		25.12	0.002066	5.53	251.49	49.05	0.43
Woonasquettucket	1	18468	Q50	2100.00	18.42	27.75		27.97	0.000704	4.15	660.14	288.09	0.26
Woonasquettucket	1	18468	Q100	2430.00	18.42	28.19		28.41	0.000658	4.16	796.20	321.05	0.26
Woonasquettucket	1	18468	Q500	3310.00	18.42	29.07		29.27	0.000607	4.28	1140.78	463.28	0.25
Woonasquettucket	1	18229	Q10	1390.00	17.09	24.42	20.99	24.71	0.001082	4.32	321.63	56.73	0.32
Woonasquettucket	1	18229	Q50	2100.00	17.09	27.55	21.96	27.81	0.000646	4.09	517.46	205.99	0.26
Woonasquettucket	1	18229	Q100	2430.00	17.09	28.00	22.37	28.25	0.000622	4.17	690.02	254.27	0.26
Woonasquettucket	1	18229	Q500	3310.00	17.09	28.83	23.36	29.12	0.000671	4.61	923.40	324.48	0.27
Woonasquettucket	1	18215	Q10	1390.00	16.70	24.32	21.18	24.69	0.001427	4.86	286.02	48.71	0.35
Woonasquettucket	1	18215	Q50	2100.00	16.70	27.48	22.16	27.79	0.001014	4.46	475.99	183.07	0.31
Woonasquettucket	1	18215	Q100	2430.00	16.70	27.92	22.58	28.24	0.001050	4.60	596.39	232.79	0.32
Woonasquettucket	1	18215	Q500	3310.00	16.70	28.77	23.60	29.10	0.001034	4.93	835.80	328.11	0.32
Woonasquettucket	1	18194	Q10	1390.00	17.95	24.00	21.95	24.59	0.002738	6.11	227.40	47.06	0.49
Woonasquettucket	1	18194	Q50	2100.00	17.95	27.29	23.03	27.73	0.001284	5.31	395.65	132.19	0.35
Woonasquettucket	1	18194	Q100	2430.00	17.95	27.73	23.48	28.17	0.001307	5.48	495.86	151.56	0.36
Woonasquettucket	1	18194	Q500	3310.00	17.95	28.47	24.57	29.01	0.001546	6.26	637.15	260.04	0.39
Woonasquettucket	1	18190		Bridge									
Woonasquettucket	1	18119	Q10	1390.00	16.90	22.97	21.92	24.04	0.006000	8.31	167.21	36.36	0.68
Woonasquettucket	1	18119	Q50	2100.00	16.90	24.30	23.07	25.77	0.006337	9.73	215.83	36.80	0.71
Woonasquettucket	1	18119	Q100	2430.00	16.90	24.85	23.56	26.50	0.006493	10.29	236.12	36.97	0.72
Woonasquettucket	1	18119	Q500	3310.00	16.90	25.96	24.75	28.18	0.007483	11.93	277.50	37.31	0.77
Woonasquettucket	1	18095	Q10	1390.00	16.70	23.16	21.18	23.67	0.002434	5.74	242.40	53.55	0.47
Woonasquettucket	1	18095	Q50	2100.00	16.70	24.61	22.14	25.28	0.002215	6.56	326.13	74.64	0.47
Woonasquettucket	1	18095	Q100	2430.00	16.70	25.22	22.55	25.95	0.002144	6.87	361.48	86.05	0.47
Woonasquettucket	1	18095	Q500	3310.00	16.70	26.51	23.55	27.44	0.002175	7.78	436.83	123.34	0.48
Woonasquettucket	1	17943	Q10	1390.00	16.22	22.59		23.25	0.003035	6.50	213.96	70.87	0.51
Woonasquettucket	1	17943	Q50	2100.00	16.22	23.91		24.84	0.003442	7.74	271.18	85.22	0.55
Woonasquettucket	1	17943	Q100	2430.00	16.22	24.45		25.50	0.003589	8.22	296.79	105.52	0.57
Woonasquettucket	1	17943	Q500	3310.00	16.22	25.81		27.01	0.003409	8.93	413.44	225.44	0.56
Woonasquettucket	1	17762	Q10	1390.00	15.48	22.02		22.70	0.003004	6.58	211.35	40.43	0.51
Woonasquettucket	1	17762	Q50	2100.00	15.48	23.12		24.16	0.003949	8.16	257.27	43.12	0.59
Woonasquettucket	1	17762	Q100	2430.00	15.48	23.58		24.78	0.004288	8.76	277.37	44.25	0.62
Woonasquettucket	1	17762	Q500	3310.00	15.48	24.55		26.20	0.005254	10.29	322.54	82.09	0.69
Woonasquettucket	1	17693	Q10	1390.00	16.24	22.16	19.70	22.45	0.001370	4.31	322.45	103.09	0.35
Woonasquettucket	1	17693	Q50	2100.00	16.24	23.41	20.48	23.82	0.001491	5.11	410.58	136.05	0.38
Woonasquettucket	1	17693	Q100	2430.00	16.24	23.94	20.81	24.39	0.001525	5.41	448.87	138.93	0.39
Woonasquettucket	1	17693	Q500	3310.00	16.24	25.11	21.62	25.70	0.001623	6.17	545.85	195.20	0.41
Woonasquettucket	1	17657	Q10	1390.00	14.87	22.13	19.02	22.40	0.001163	4.13	336.82	102.03	0.33
Woonasquettucket	1	17657	Q50	2100.00	14.87	23.38	19.95	23.75	0.001456	4.89	429.55	145.80	0.37
Woonasquettucket	1	17657	Q100	2430.00	14.87	23.91	20.34	24.32	0.001570	5.12	474.94	154.83	0.39
Woonasquettucket	1	17657	Q500	3310.00	14.87	25.12	21.26	25.61	0.001606	5.62	601.14	238.05	0.40
Woonasquettucket	1	17606	Q10	1390.00	16.70	21.46	20.68	22.23	0.005895	7.05	197.29	86.44	0.70
Woonasquettucket	1	17606	Q50	2100.00	16.70	22.69	21.58	23.57	0.005064	7.53	279.03	101.81	0.67
Woonasquettucket	1	17606	Q100	2430.00	16.70	23.24	21.95	24.14	0.004679	7.61	319.12	133.81	0.65
Woonasquettucket	1	17606	Q500	3310.00	16.70	24.45	22.86	25.44	0.004115	7.97	416.15	157.84	0.63
Woonasquettucket	1	17571	Q10	1390.00	15.39	21.27		22.00	0.006694	6.87	202.27	71.62	0.72
Woonasquettucket	1	17571	Q50	2100.00	15.39	22.62		23.37	0.004480	6.92	303.29	77.70	0.62
Woonasquettucket	1	17571	Q100	2430.00	15.39	23.19		23.95	0.003974	6.98	348.31	80.32	0.59
Woonasquettucket	1	17571	Q500	3310.00	15.39	24.42		25.26	0.003438	7.33	455.17	113.31	0.56
Woonasquettucket	1	17534	Q10	1390.00	13.09	21.05		21.77	0.005744	6.84	203.15	59.60	0.65
Woonasquettucket	1	17534	Q50	2100.00	13.09	22.36		23.18	0.004894	7.27	289.01	69.30	0.63
Woonasquettucket	1	17534	Q100	2430.00	13.09	22.94		23.78	0.004482	7.37	329.70	72.69	0.61
Woonasquettucket	1	17534	Q500	3310.00	13.09	24.16		25.11	0.004098	7.84	422.29	79.97	0.60
Woonasquettucket	1	17369	Q10	1390.00	15.00	20.96		21.25	0.001255	4.36	321.53	92.45	0.35
Woonasquettucket	1	17369	Q50	2100.00	15.00	22.29		22.69	0.001244	5.09	439.66	141.52	0.36
Woonasquettucket	1	17369	Q100	2430.00	15.00	22.89		23.31	0.001185	5.28	514.80	178.75	0.36
Woonasquettucket	1	17369	Q500	3310.00	15.00	24.19		24.65	0.001090	5.69	722.89	399.79	0.35
Woonasquettucket	1	17304	Q10	1390.00	15.00	20.81		21.16	0.001468	4.73	298.08	93.39	0.37
Woonasquettucket	1	17304	Q50	2100.00	15.00	22.14		22.60	0.001446	5.49	421.25	164.00	0.39
Woonasquettucket	1	17304	Q100	2430.00	15.00	22.73		23.22	0.001380	5.70	483.85	223.50	0.38
Woonasquettucket	1	17304	Q500	3310.00	15.00	23.97		24.55	0.001371	6.34	613.77	341.50	0.39
Woonasquettucket	1	17247	Q10	1390.00	15.53	20.46		21.02	0.003244	6.17	256.88	113.58	0.55
Woonasquettucket	1	17247	Q50	2100.00	15.53	21.86		22.48	0.002437	6.55	396.05	141.17	0.50
Woonasquettucket	1	17247	Q100	2430.00	15.53	22.49		23.11	0.002160	6.64	466.31	155.02	0.48
Woonasquettucket	1	17247	Q500	3310.00	15.53	23.77		24.45	0.001921	7.13	635.13	418.85	0.47

2D Existing Conditions Model Results



Legend

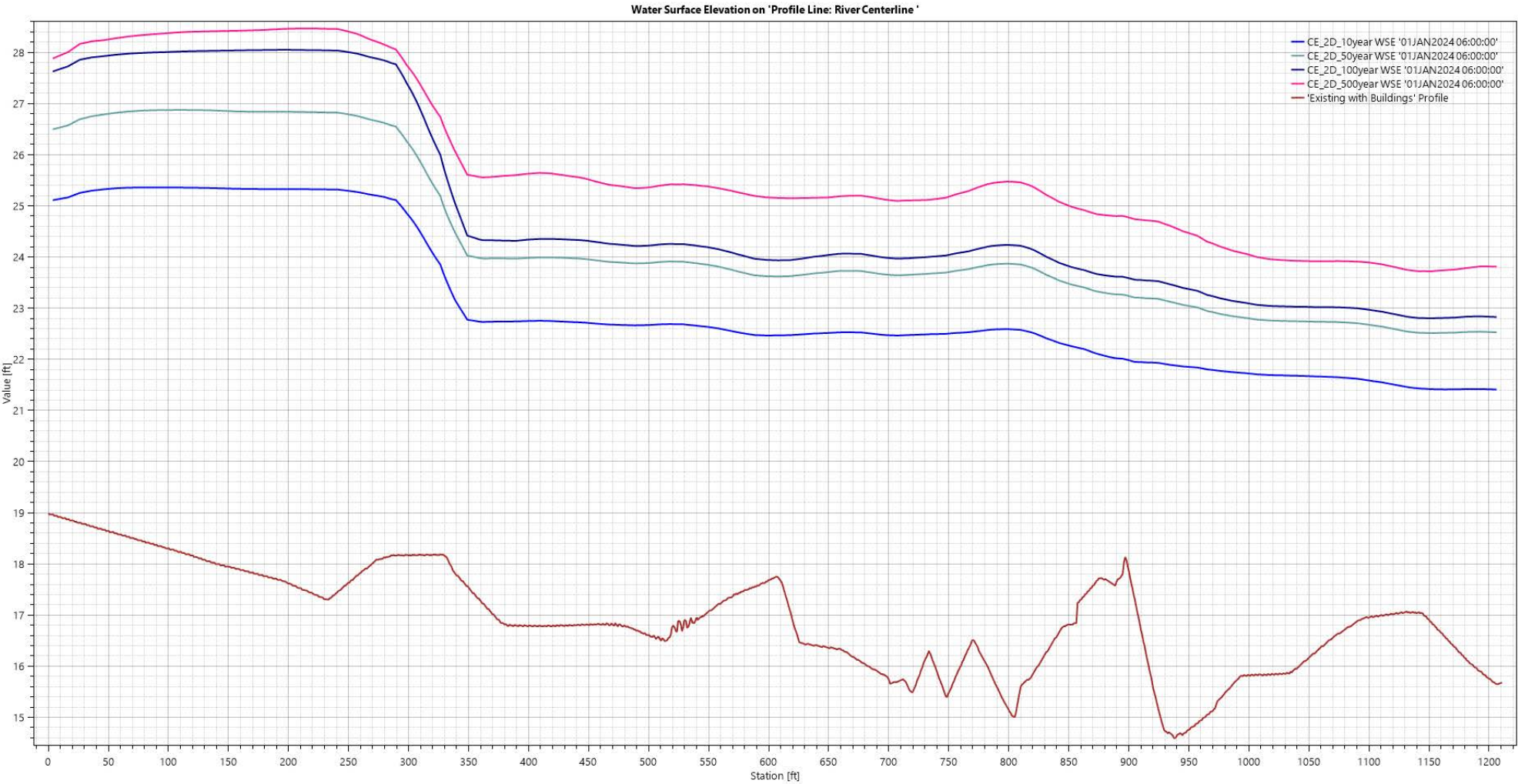
- Stage HW
- Stage TW
- Flow



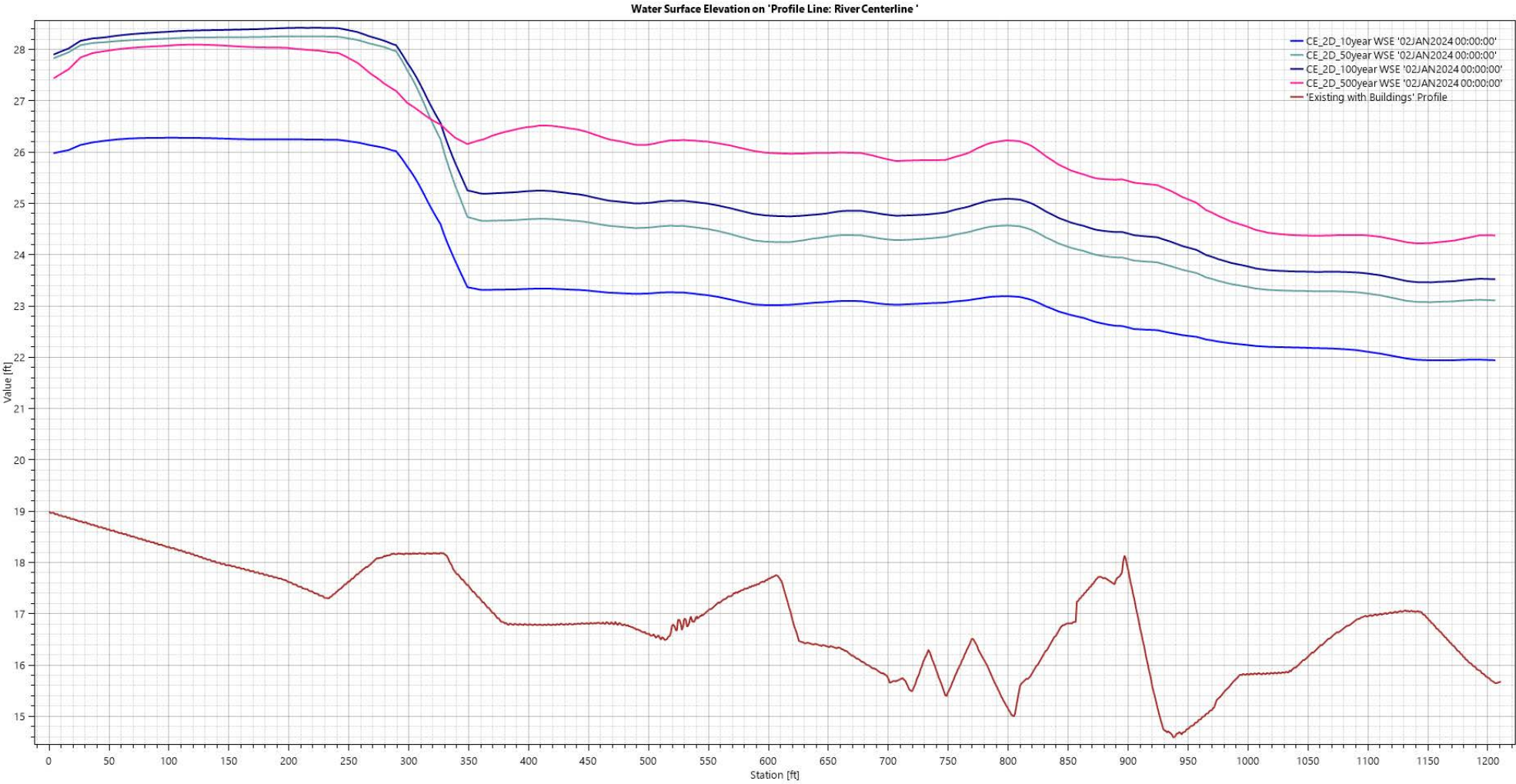
Legend

- Stage HW
- Stage TW
- Flow

Simulation Time - 06:00 hours



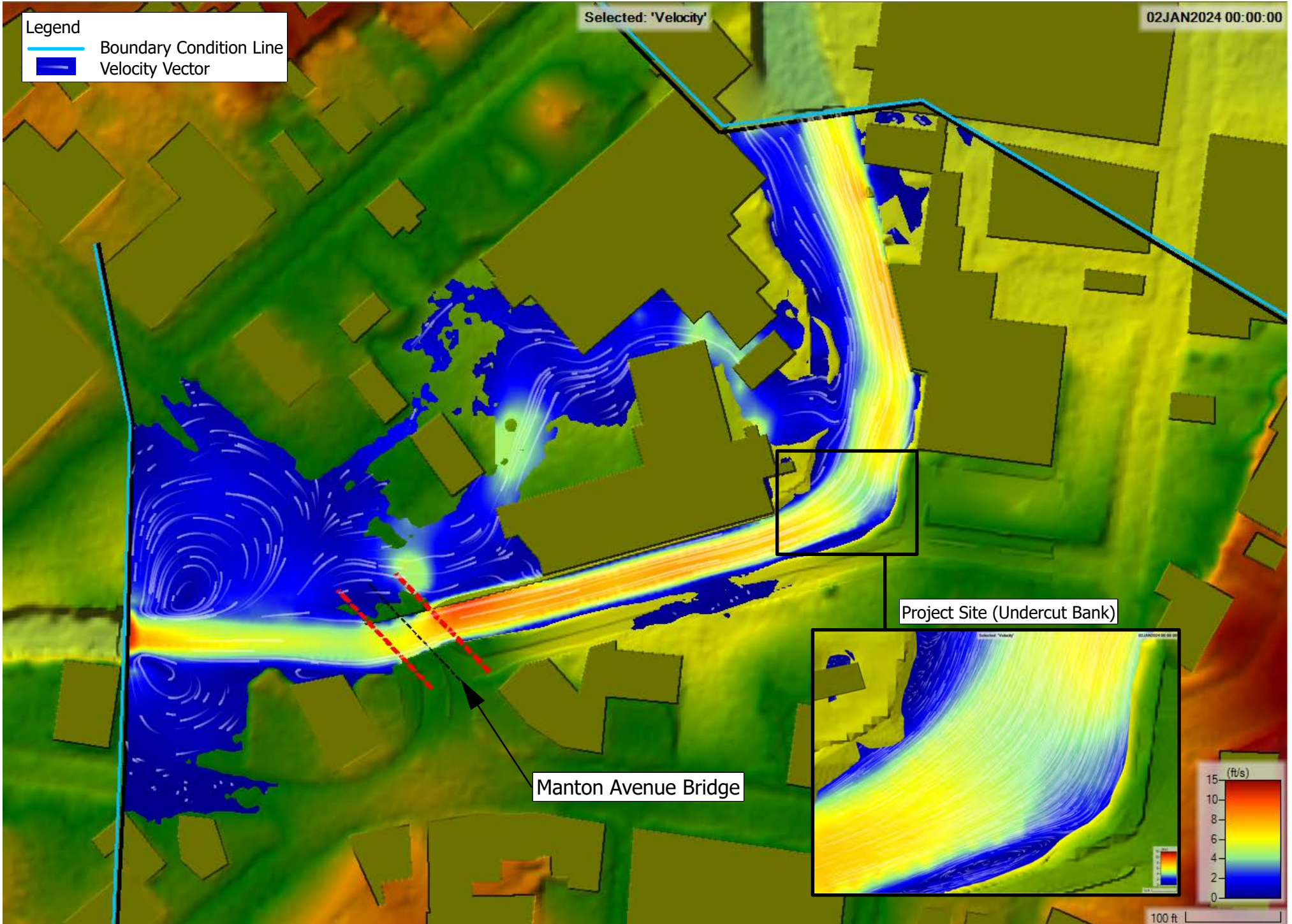
Simulation Time - 24:00 hours



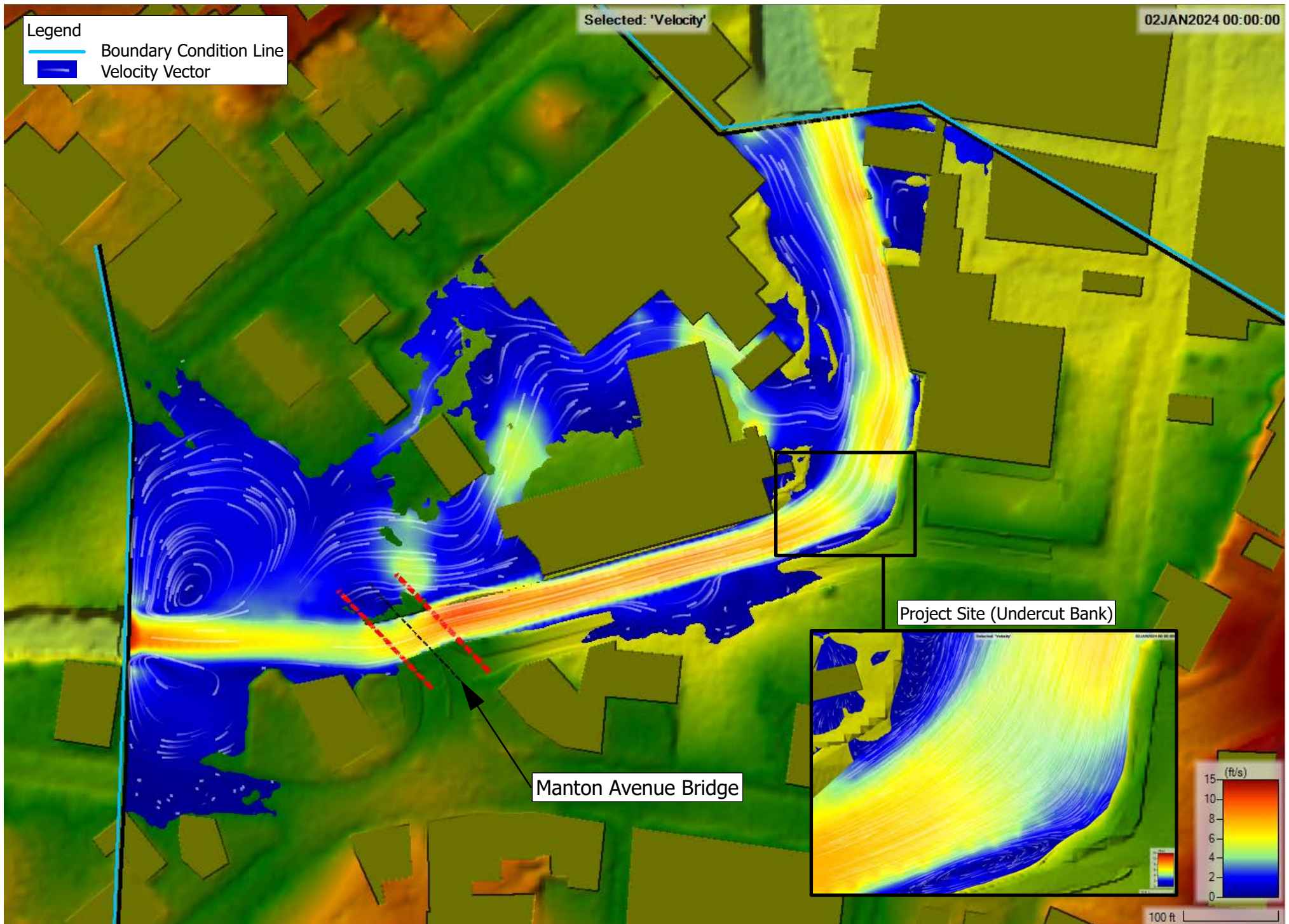
10-year Velocity Map (ft/s)



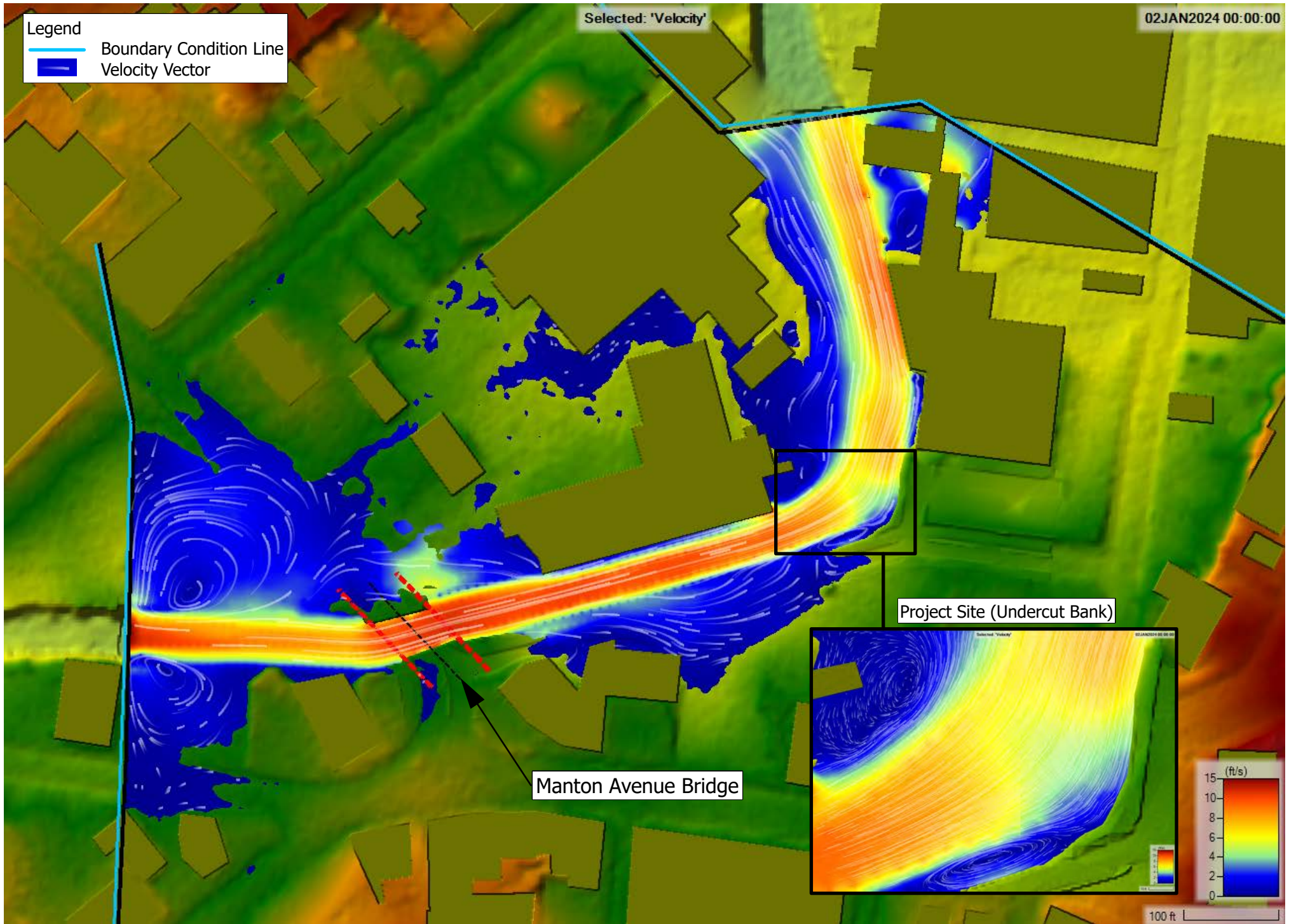
50-year Velocity Map (ft/s)



100-year Velocity Map (ft/s)



500-year Velocity Map (ft/s)



Attachment F
Design Alternative Exhibits

Alternative 1

Armor Protection with Stone Structures

Case Study Photographs – Gabion Baskets

Riverbank Restoration, Leeds



Source: Platipus Anchors. 2022. <https://www.linkedin.com/pulse/riverbank-restoration-leeds-platipus-anchors-ltd/>

Gabion Baskets & Mattresses



Source: Walcoom. <https://www.walcoom.com/solutions/protection/embankment.html>

Case Study Photographs – Geocells

Channel Erosion & Drainage-Related Flooding



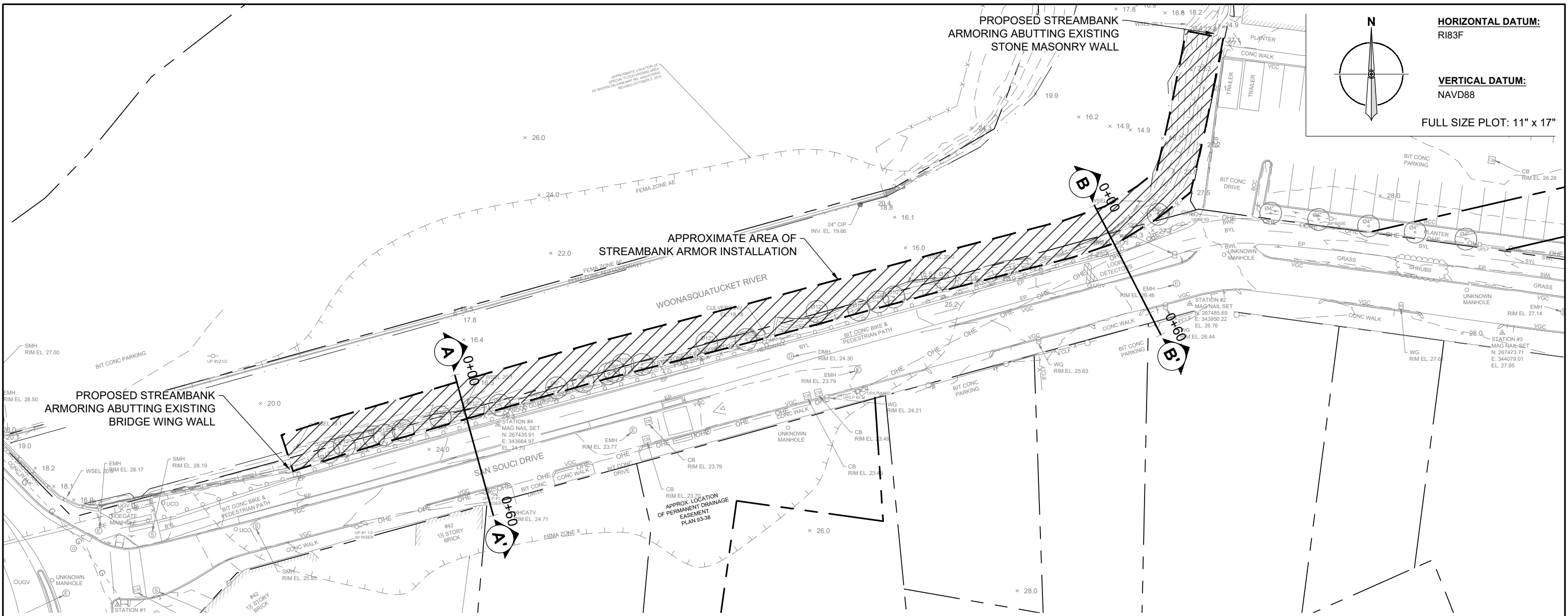
Source: Civil + Structural Engineer Media. 2017. <https://csengineermag.com/vegeated-geocellular-channels-shore-embankments-mitigate-flooding-concerns/>

Vegetated Channel System Protects Eroded Stream Bank



Source: Land and Water. 2002. http://www.landandwater.com/features/vol45no5/vol45no5_2.html

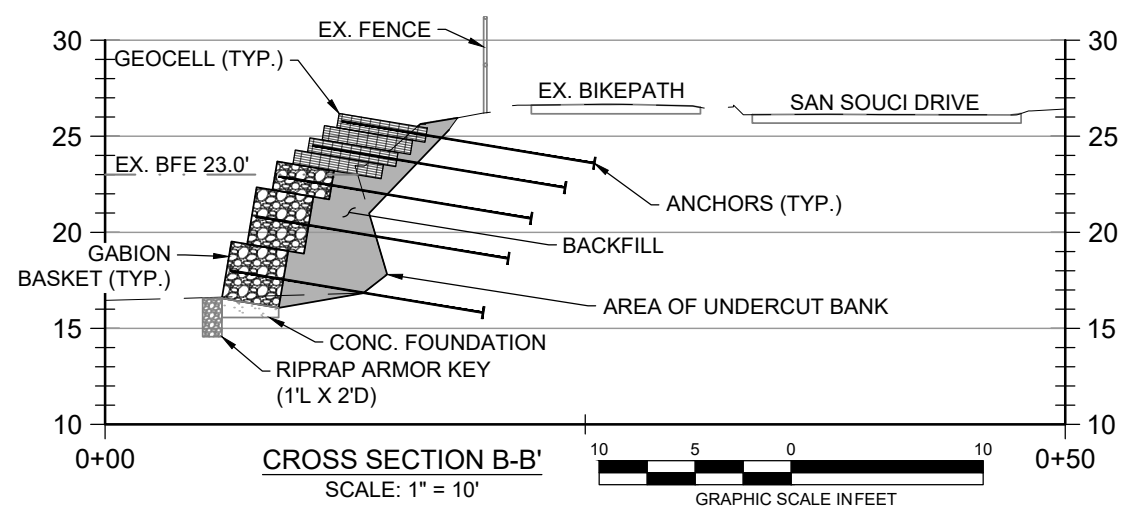
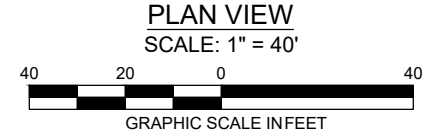
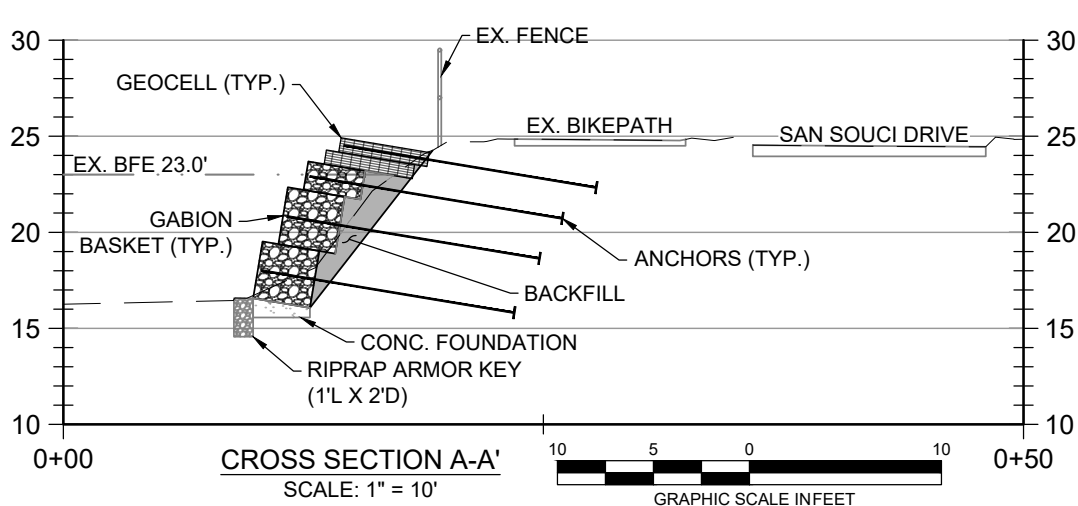
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HORIZONTAL DATUM:
RI83F

VERTICAL DATUM:
NAVD88

FULL SIZE PLOT: 11" x 17"



EA Engineering, Science, and Technology, Inc., PBC

301 Metro Center Blvd, Suite 102
Warwick, Rhode Island 02886
(401) 736-3440

www.eaest.com

SCALE AS SHOWN

DATE: JUNE 2024

PROJECT NAME
WOONASQUATTUCKET RIVER WATERSHED COUNCIL
SAN SOUCI STREAMBANK RESTORATION

PROJECT ADDRESS
SAN SOUCI DRIVE, PROVIDENCE, RHODE ISLAND

FIGURE TITLE
GABION BASKETS AND GEOCELL INSTALLATION
PLAN VIEW AND CROSS SECTIONS

FIGURE NO.
ALTERNATIVE 1

Alternative 2
Redirection Techniques

Case Study Photographs – J-Hook

Seven Mile Creek Trout Stream Improvement Project



Source: Carleton College. 2002.

https://www.carleton.edu/departments/geol/links/alumcontributions/antinoro_03/smcwebsite/FlowStructures.htm

Stream & River Bank Stabilization (Poudre River)



Source: Chaparral Construction, LLC. 2012. <https://chaparralconstructionllc.com/stream-bank-stabilization.html>

Case Study Photographs – Stream Barb

Palouse River Bank Stabilization at Camp Grizzly North of Harvard



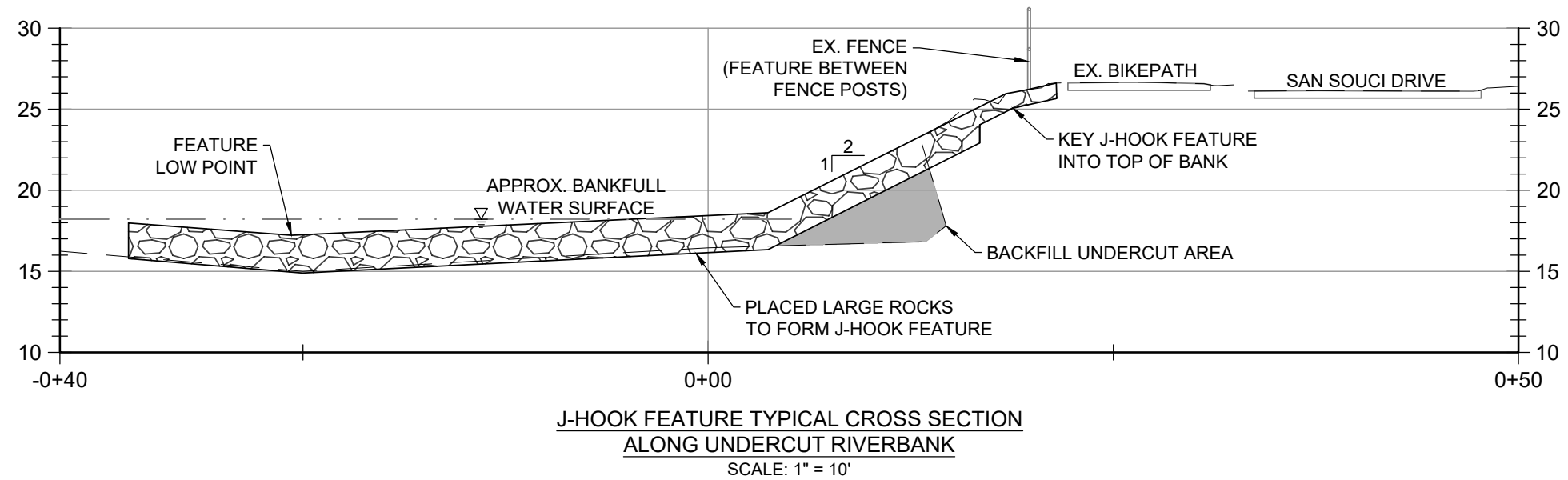
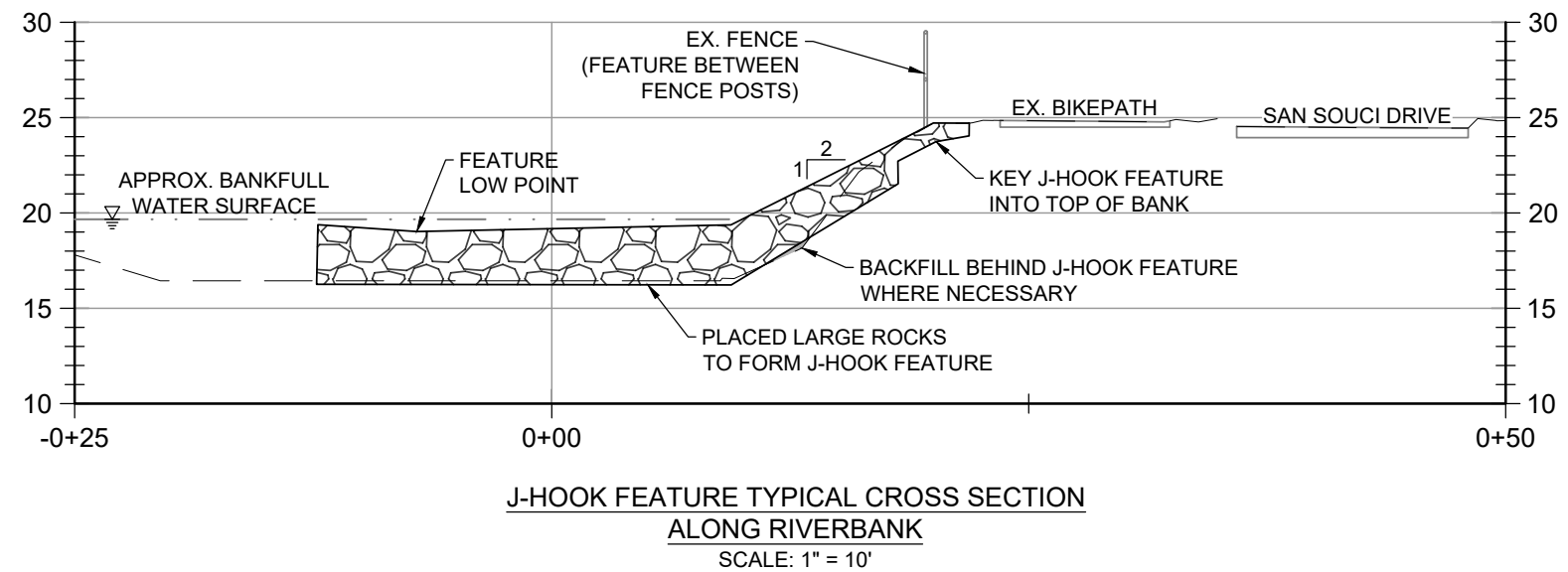
Source: Hatter Creek Earthworks, LLC. 2016. <https://hattercreekearthworks.com/palouse-river-bank-stabilization-at-camp-grizzly-north-of-harvard-2016/>

Stream Restoration – Mallett’s Creek and County Farm Drain



Source: Niswander Environmental. 2011. <https://niswander-env.com/stream-restoration-malletts-creek-and-county-farm-drain/>

FILE PATH: \\WARWICK\PROJECTS\6209207 - WRWC SAN SOUCI STREAMBANK RESTORATION\CAD\PRODUCTION\FIGURES\6209207_CROSS SECTIONS.DWG [ALT 2A] ALLEN, DANIEL 6/10/2024 2:02 PM



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DATE: JUNE 2024

PROJECT NAME

WOONASQUATUCKET RIVER WATERSHED COUNCIL
SAN SOUCI STREAMBANK RESTORATION

PROJECT ADDRESS

SAN SOUCI DRIVE, PROVIDENCE, RHODE ISLAND

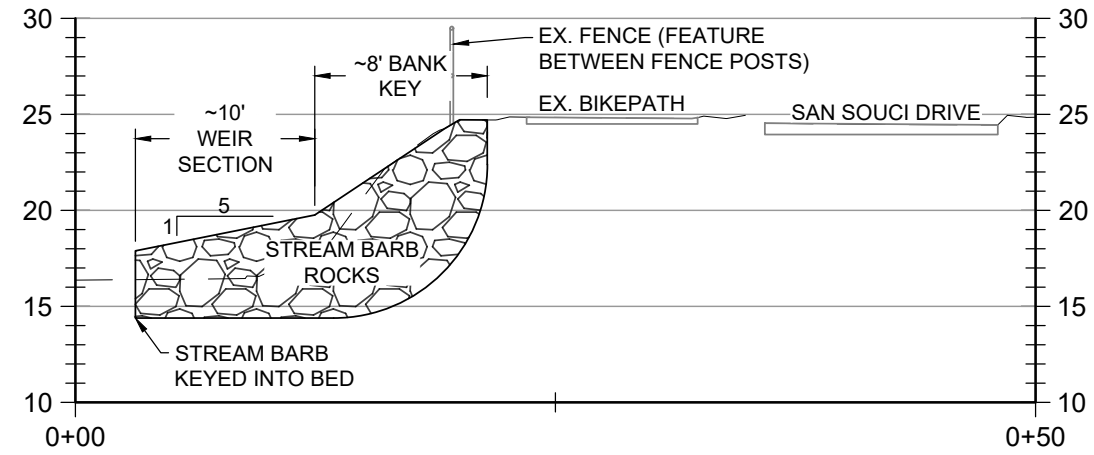
FIGURE TITLE

J-HOOK FEATURE
TYPICAL CROSS SECTIONS

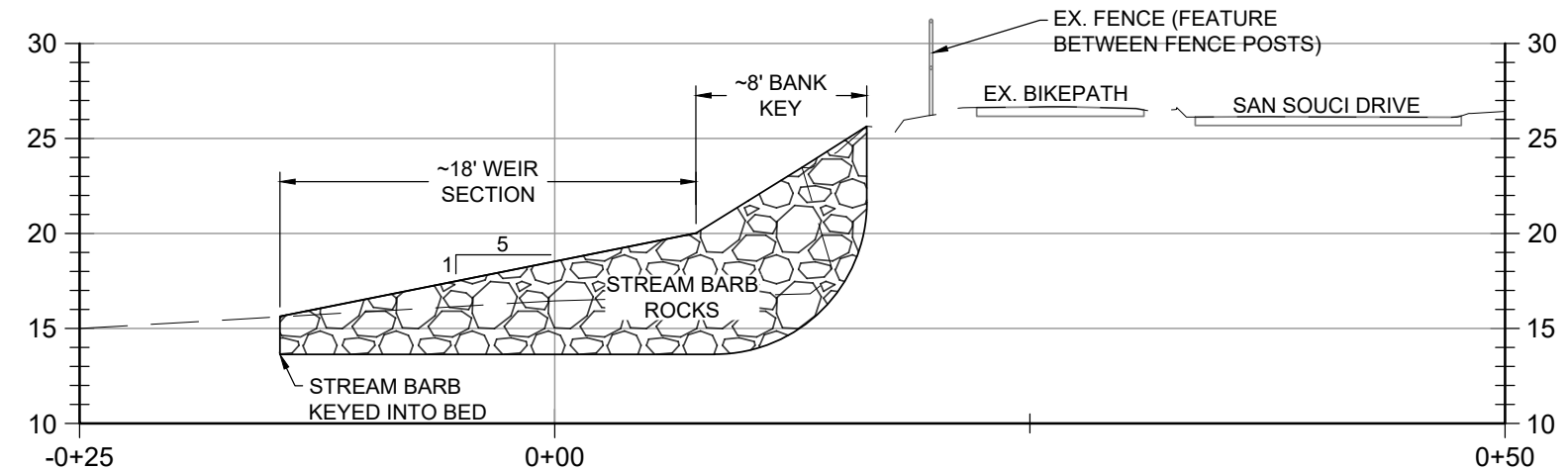
FIGURE NO.

ALTERNATIVE 2A

FILE PATH: \\WARWICK\PROJECTS\6209207 - WRWC SAN SOUCI STREAMBANK RESTORATION\CAD\PRODUCTION\FIGURES\6209207_CROSS SECTIONS.DWG [ALT 2B] ALLEN, DANIEL 6/10/2024 2:02 PM



**STREAM BARB FEATURE TYPICAL CROSS SECTION
ALONG RIVERBANK**
SCALE: 1" = 10'



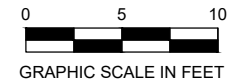
**STREAM BARB FEATURE TYPICAL CROSS SECTION
ALONG UNDERCUT RIVERBANK**
SCALE: 1" = 10'



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DATE: JUNE 2024

PROJECT NAME
WOONASQUATUCKET RIVER WATERSHED COUNCIL
SAN SOUCI STREAMBANK RESTORATION

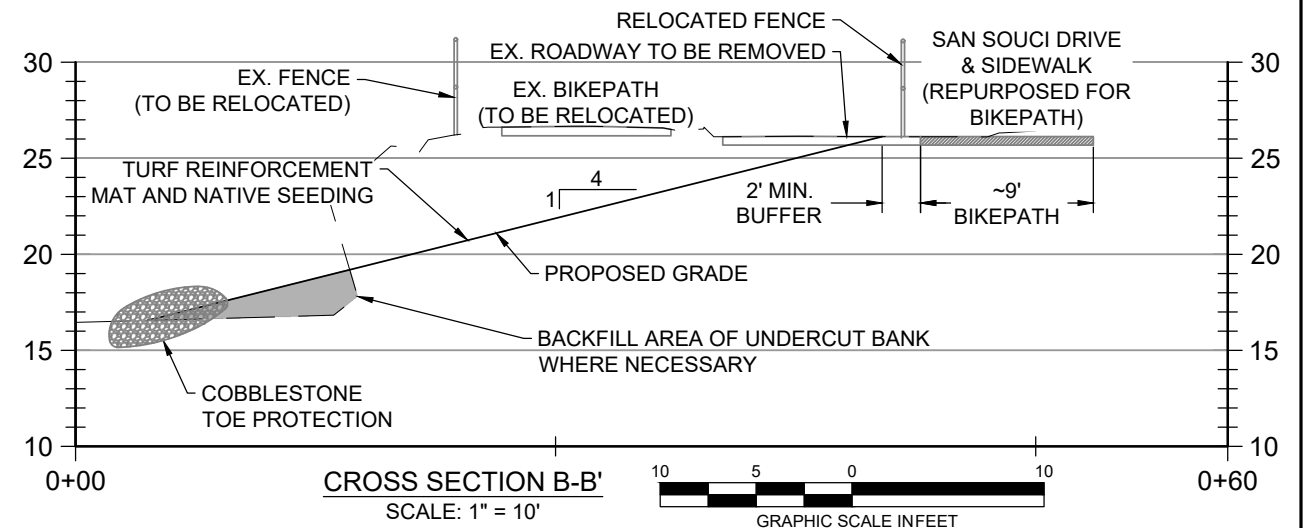
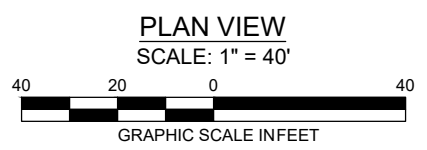
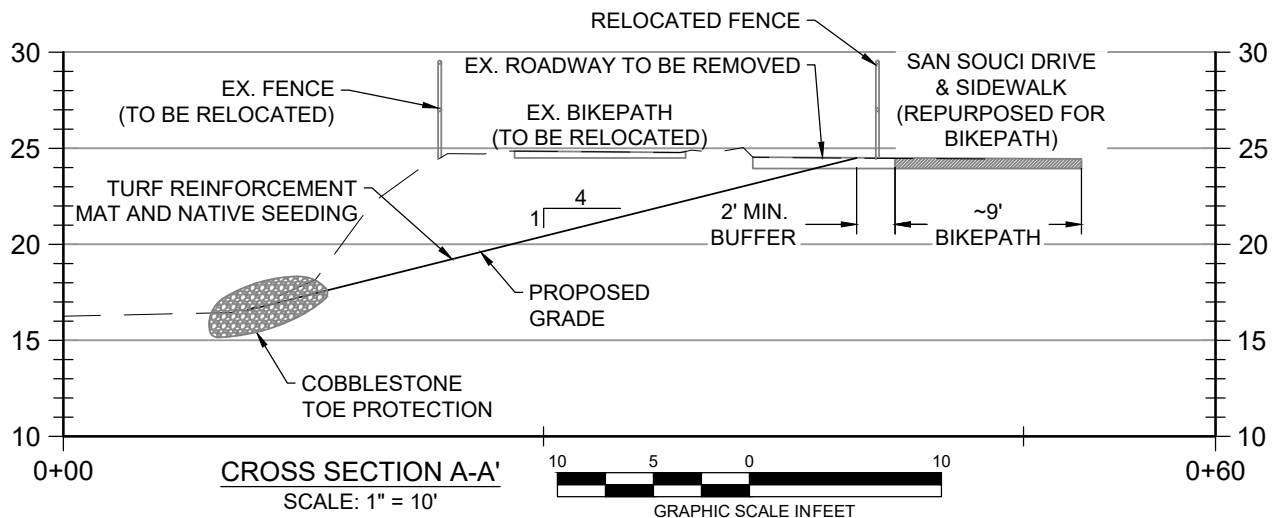
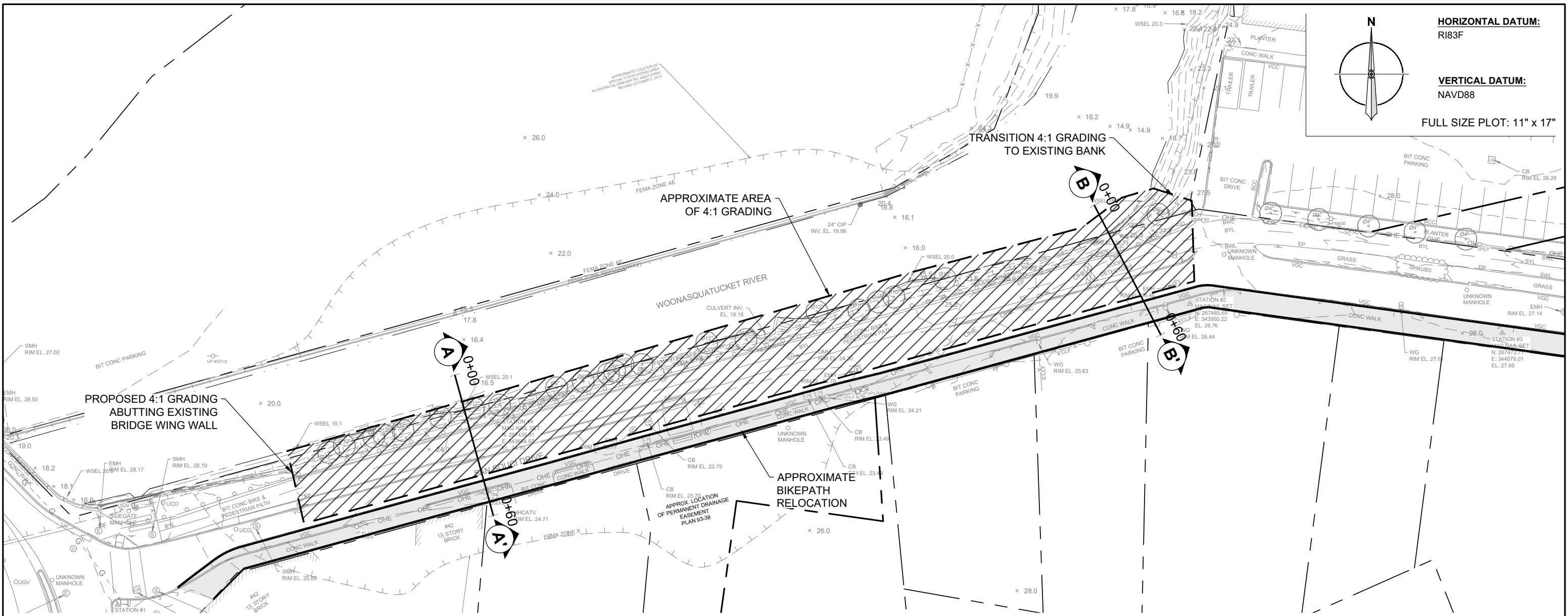
PROJECT ADDRESS
SAN SOUCI DRIVE, PROVIDENCE, RHODE ISLAND

FIGURE TITLE
STREAM BARB FEATURE
TYPICAL CROSS SECTIONS

FIGURE NO.
ALTERNATIVE 2B

Alternative 3
Managed Retreat

FILE PATH: \\WARWICK\PE\PROJECTS\6209207 - WRWC SAN SOUCI STREAMBANK RESTORATION\CAD\PRODUCTION\FIGURES\6209207_CROSS SECTIONS.DWG [ALT 3] ALLEN, DANIEL_6/10/2024 2:03 PM



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SCALE AS SHOWN
 DATE: JUNE 2024

PROJECT NAME
 WOONASQUATUCKET RIVER WATERSHED COUNCIL
 SAN SOUCI STREAMBANK RESTORATION

PROJECT ADDRESS
 SAN SOUCI DRIVE, PROVIDENCE, RHODE ISLAND

FIGURE TITLE
 MANAGED RETREAT
 PLAN VIEW AND CROSS SECTIONS

FIGURE NO.
 ALTERNATIVE 3



CITY OF PROVIDENCE
MAYOR BRETT P. SMILEY

February 27, 2025

Bruce Lofgren
RI Coastal Resources Management Council
Oliver Stedman Government Center
4808 Tower Hill Road
Wakefield, RI 02879

**Re: WRWC Rhode Island Coastal and Estuary Habitat Restoration Fund Grant Proposal –
San Souci Drive Habitat Restoration and Streambank Stabilization Project**

Dear Mr. Lofgren and Grant Review Committee Members:

The City of Providence Department of Public Works (DPW) offers our enthusiastic partnership and support for Woonasquatucket River Watershed Council's (WRWC) application for the Rhode Island Coastal and Estuary Habitat Restoration Fund Grant administered by RIDEM.

The WRWC and DPW have been partners for decades on cleaning up, restoring and improving the Woonasquatucket River and its Greenway in Providence. DPW regularly offers free disposal services for WRWC's cleanup events and together we have also planned and executed some wonderful projects such as the separated multi-use trail on San Souci Drive and installing nature-based stormwater infrastructure on Manton Avenue – both in the Olneyville neighborhood of Providence.

Currently, DPW through our Engineering Department, is an integral partner in developing the San Souci Drive Habitat Restoration and Streambank Stabilization Project. As the property owner of the streambank, we play an active role in the decision-making on the design process for this site. We are impressed with WRWC's ability to include resident community leaders in the decision-making process for how to develop this restoration. After all, they are the ones who will live with it every day.

The DPW could not be happier to support their proposal to complete design and permitting for the project through this Rhode Island Coastal and Estuary Habitat Restoration Fund Grant opportunity. We have previously committed \$5,000, in-kind in staff time to continue our full participation in all aspects of this project on behalf of the City of Providence.



CITY OF PROVIDENCE
MAYOR BRETT P. SMILEY

The DPW cannot think of a better investment than for this San Souci Habitat and Streambank Restoration Project. We have the trifecta of 1) strong, proven, effective non-profit project management, 2) incredible stakeholder support and community decision-making, 3) along with mitigating nonpoint pollution sources, habitat improvement, and resilience to climate hazards. We sincerely hope you choose to fund this neighborhood changing project that will serve as a regional example for so many others.

Sincerely,

A handwritten signature in cursive that reads "Craig Hochman" followed by a long horizontal flourish.

Craig Hochman, PE
Chief Engineer



February 25, 2025

Bruce Lofgren
RI Coastal Resources Management Council
Oliver Stedman Government Center
4808 Tower Hill Road
Wakefield, RI 02879

Re: WRWC Rhode Island Coastal and Estuary Habitat Restoration Fund Grant Proposal – San Souci Drive Habitat Restoration and Streambank Stabilization Project

Dear Mr. Lofgren and Grant Review Committee Members:

United Way of Rhode Island (UWRI) has long partnered with the Woonasquatucket River Watershed Council (WRWC) to improve the quality of life for residents in the Olneyville neighborhood of Providence since we located our state headquarters in the neighborhood in 2008. As a direct result of climate change impacts, we are now partners in restoring both the habitat and a streambank area eroding so severely that it is on the verge of compromising both the street along which UWRI is located, San Souci Drive, and our building itself.

WRWC's commitment to developing leadership among community members directly affected by flooding and urban heat island aligns directly with our mission. In fact, we have funded WRWC directly at \$150,000 through our two-year Community Impact Grant program from 2021 to 2023. They are having remarkable results as we have hosted many of their resident training programs at our facilities and have attended some of the meetings personally. I am impressed with the level of understanding and readiness these residents have shown in decision-making for climate resilience and climate justice in their own neighborhood.

WRWC has hired a design team to develop the conceptual design that the WRWC, the City of Providence, and UWRI will use as the basis of a design solution for this issue that will rapidly get worse if unaddressed.

UWRI is a committed partner and stakeholder with WRWC in the San Souci Drive Habitat Restoration and Streambank Stabilization Project. Unfortunately, our fiscal year 2024 budget that included \$50,000 to support complete design and permitting costs for the WRWC's streambank restoration project was reallocated to United Way's emergency retaining wall repair project. The retaining wall was in imminent danger of falling into the Woonasquatucket River and comprising the United Way's Providence building on Valley Street. Therefore, financial resources were needed to address the emergency design and construction for the wall repair. However, we will continue to support the WRWC with their streambank restoration project, provide updates on the wall repair project, and continue to communicate as the streambank restoration project continues. You may also want to consider the work we are doing along the adjacent portion of streambank as match to WRWC's project, a total investment of \$1,500,000.

UWRI urges RIDEM to invest in WRWC's application to the Rhode Island Coastal and Estuary Habitat Restoration Fund Grant opportunity. We have no doubts that your investment in their proposal will help mitigate nonpoint pollution sources from the eroding streambank and improve the habitat.

Sincerely,

A handwritten signature in blue ink, appearing to read "Robert L. Bush".

Robert L. Bush
Chief Operating Officer

Uniting our community and resources to build racial equity and opportunities for all Rhode Islanders

**PROVIDENCE EMERGENCY MANAGEMENT AGENCY**

February 24, 2025

Bruce Lofgren
RI Coastal Resources Management Council
Oliver Stedman Government Center
4808 Tower Hill Road
Wakefield , RI 02879

Re: WRWC Rhode Island Coastal and Estuary Habitat Restoration Fund Grant Proposal – San Souci Drive Habitat Restoration and Streambank Stabilization Project

Dear Mr. Lofgren and Grant Review Committee Members:

The Providence Emergency Management Agency (PEMA) offers our enthusiastic partnership and support for Woonasquatucket River Watershed Council's (WRWC) application to the Rhode Island Coastal and Estuary Habitat Restoration Fund Grant opportunity.

No agency understands the climate hazards faced by the Olneyville neighborhood of Providence more than PEMA. Olneyville was ground zero for sustained, expensive and damaging flooding in 2010. Today, with the December 2023 and January 2024 storms, the Woonasquatucket River has overtopped its banks in Olneyville. Olneyville will continue to experience climate related hazards that will only be more frequent and more damaging as time goes on.

That's why PEMA has been a partner with WRWC on helping to educate residents and prepare them for hazards like flooding, urban heat island and other emergencies since they began their Nuevas Voces (NV) program in 2021. Every year, one of the core learning sessions for NV is emergency preparedness. We train our resident leaders in using Code Red and how to find out what to do in an emergency. We are also planning on training NV leaders and grads through our Community Emergency Response Team (CERT) program and have had an integral role in helping to develop Providence's pilot Resilience Hub in Olneyville.

PEMA urges the Rhode Island Department of Environmental Management to fund WRWC's San Souci Drive project that will help mitigate flooding issues and provide for streambank stability, habitat health, and overall climate resiliency.

Very respectfully,

Clara Decerbo, PhD, CEM®
Director

DIRECTOR CLARA F. DECERBO



MAYOR BRETT P. SMILEY

PROVIDENCE EMERGENCY MANAGEMENT AGENCY

Providence Emergency Management Agency
Providence, Rhode Island



MAYOR BRETT P. SMILEY
CITY OF PROVIDENCE

February 28, 2025

Bruce Lofgren
RI Coastal Resources Management Council
Oliver Stedman Government Center
4808 Tower Hill Road
Wakefield , RI 02879

Re: WRWC Rhode Island Coastal and Estuary Habitat Restoration Fund Grant Proposal – San Souci Drive Habitat Restoration and Streambank Stabilization Project

Dear Mr. Lofgren and Grant Review Committee Members:

The City of Providence’s Department of Sustainability is a committed partner with the Woonasquatucket River Watershed Council (WRWC) on their Application to the Rhode Island Coastal and Estuary Habitat Restoration Fund Grant opportunity.

The Department of Sustainability and WRWC have worked together since 2017 on climate justice in Olneyville, one of the most underserved neighborhoods in the City of Providence, prioritized in the City’s Climate Justice Plan, to develop frontline power and leadership among residents already experiencing the impacts of climate-related hazards such as eroded streambanks due to flooding and urban heat island. The Department helped WRWC develop the parameters for WRWC’s innovative model Nuevas Voces (NV) Program. This program, now in its fourth year, has been wildly successful, and our current cohort is 22 activated resident leaders.

With this strong partnership in mind, the City, through our department, has invested in the first pilot Resilience Hub in RI in the Olneyville neighborhood of Providence. The Resilience Hub, launched in February 2024, serves residents by facilitating education, workforce development, emergency response services, and provides a space for community engagement and empowerment. WRWC is a backbone partner for the Hub, and the City has directed the first two years of salary for a fulltime Resilience Hub Manager position to WRWC. Additionally, the City of Providence is in the final stages of securing millions of dollars of funding from the State of Rhode Island’s Capital Project Fund and the RI Office of Energy Resources’ Efficient Building Fund to invest in building improvements at Joslin Recreation Center – the physical site of the Hub. As a partner on this grant, the City will work closely with WRWC to provide robust public engagement opportunities relating to the San Souci project via the Resilience Hub.

Department of Sustainability
25 Dorrance Street, Providence, Rhode Island 02903
Phone: 401.680.5476



MAYOR BRETT P. SMILEY
CITY OF PROVIDENCE

The Department of Sustainability urges RIDEM to fully fund WRWC's proposal. They are the right leaders for this project, with the right partners, with frontline community resident leaders poised to step into the opportunity that WRWC's proposed project can provide with the Rhode Island Coastal and Estuary Habitat Restoration Fund Grant investment.

Sincerely,

A handwritten signature in blue ink, appearing to read "Priscilla", followed by a horizontal line.

Priscilla De La Cruz
Director of Sustainability

**Rhode Island Coastal and Estuary Habitat Restoration Fund
Small Project Proposal Form 2024/2025***

***This application form may be used for projects whose total cost is less than \$5,000.**

I. PROJECT SUMMARY

1. **Project Title :** Restoring a Coastal Buffer and Marsh Migration Corridor along Winnapaug Pond
 2. **Project Location** (*include map*): Southern side of Winnapaug Pond, Westerly, RI
 3. **Project type** (*Planning, Design, Construction or Other*): Permitting and implementation
 4. **If other, please specify:**
 5. **Habitat type** (*River System, Salt Marsh, Seagrass Bed, Shellfish Bed or Other*): Brackish and salt marsh and maritime scrub shrub
 6. **If other, please specify**
 7. **Total acreage of habitat to be restored :** 0.25 acres
-

II. PROJECT MANAGER CONTACT INFORMATION

1. **Name:** Julia Beasley, Westerly Recreation Department Director
2. **Organization:** Town of Westerly
3. **Address:** 45 Broad St.
4. **City:** Westerly 5. **State:** RI 6. **Zip:** 02891
7. **Phone:** 401-348-2620 8. **Email:** jbeasley@westerlyri.gov
9. **Property Owner(s):** Town of Westerly

X The applicant can document ownership of project site or permission to perform all proposed restoration, maintenance and monitoring activities (Proof of ownership or property owner permission will be required as part of the full project proposal.)

III. PROJECT DESCRIPTION

1. Justification and Purpose

Describe the human impacts and previous restoration activities at the proposed project site. (Planning project areas may include multiple impacted sites. Please describe the impacts and previous restoration activities at each). Briefly describe the proposed project, its restoration goals, long-term and short-term outcomes.

This native planting project entails restoring native vegetation between Winnapaug Pond and two parcels owned by the Town of Westerly, the Town Beach parking lot and a recently acquired lot at 330 Atlantic Avenue (Figure 1). Both of these lots are on the barrier spit between Block Island Sound and Winnapaug Pond and have been altered by removal of vegetation for parking and recreational activities. The barrier is considered by the Rhode Island Coastal Resources Management Program as a developed barrier.

At the Town Beach parking lot on the northern side of Atlantic Avenue (Parcel 167 Lot 045 and 046), the parking lot will be reconfigured to allow space for the restoration plantings in a section of the lot that experiences frequent flooding during king tides and storm events from Winnapaug Pond (Figures 2 and 3). The second planting area will be on a lot (Parcel 166 Lot 019) that was recently purchased by the Town with NOAA funding through a grant secured by the RI Department of Environmental Management. This parcel was the site of the former water slide and the proposed planting area is along the northern edge of the parcel in a low lying section subject to coastal flooding. This planting project will act as a pilot project for future restoration efforts being developed by RIDEM and the Town of Westerly for the newly acquired parcel.

The Town has been involved in other restoration activities on the barrier beach including planting beach grass at the two town beaches directly to the south of these parcels for many years including a larger effort after winter storms including the 2023 and 2024 storms. These planting efforts have helped to create dune habitat while stabilizing the sand to provide protection of the parking area, the beach pavilion and Atlantic Avenue. The Town of Westerly will continue to engage volunteers and community partners like Save The Bay in future dune grass plantings as an annual maintenance effort with funding from the Town.

The proposed grant request will support restoration of native vegetation and a natural buffer area between the two town-owned properties along Winnapaug Pond. The project will include plantings native vegetation in low lying areas to restore salt and brackish marsh habitat or maritime scrub shrub habitat. The plantings will enhance Winnapaug Pond's marsh migration corridor (Figure 4). In addition to providing long-term protection and restoration of scrub shrub habitat and back barrier wetlands, this project can act as a pilot project for a larger restoration effort on the recently protected parcel by RIDEM and the Town. The project will also bring additional attention to the salt pond and the need for restoration and taking steps to increase resilience.

The Town's Recreation Department leads a summer camp and will highlight the planting projects to the youth participating in the summer camp program. Additionally the town will install multiple signs along the planting area to inform the public about the restoration planting area.

2. Project Activities, Schedule and Work Plan

Describe the planned on-the-ground project activities, and explain how each activity will help to restore ecosystem functions. List specific project activities and when they will occur (month and year). Indicate when annual and final project reports will be submitted.

The Town of Westerly will collaborate with Save The Bay on developing the native planting plan for the Town owned parcels along Winnapaug Pond (Figure 1). The native plants will include salt tolerant plants such as switch grass (*Panicum virgatum*), seaside goldenrod (*Solidago sempervirens*), and *Baccharis halimifolia*) in the higher elevation areas and salt marsh grasses in the lower elevation areas that are subject to more regular flooding. The plan will include installation of rope fencing to protect the native planting areas between the parking and the restoration areas, similar to what has been installed at the Wuskenau Beach parking area (Figure 5). Save The Bay will assist the Town in preparing the CRMC permit application for the restoration planting.

Save The Bay will coordinate the recruitment and coordination of the volunteers for the planting. In 2024, the Town collaborated with Save The Bay on a dune grass planting with over 40 volunteers. The Town's Recreation Director and Save The Bay's habitat restoration staff and South CoastKeeper will coordinate the volunteer planting.

The proposed restoration activities will include planting of native salt tolerant grasses and shrubs-in the fall of 2025 and/or the spring 2026 after a CRMC Assent is received.

Schedule of Activities:

Spring - Summer 2025

- Finalize planting plan and develop permit application.

Fall 2025

- Scarify the soil by hand and conduct native, salt tolerant grasses and shrub plantings.

Spring 2026

- Install appropriate fencing and interpretive signage at planting areas.
- Remove if needed trash from storm debris.
- Submit interim report to CRMC.

Summer 2026

- Manage public use of the planting areas.

Fall 2026

- Assess plant survival and conduct additional plantings if needed.
- Submit final report to CRMC.

3. Minimization of Adverse Impacts

What are the potential impacts resulting from project activities (e.g. the disturbance of sensitive species by construction activities), and how will these impacts be minimized (e.g. scheduling construction to avoid disturbance of sensitive species).

The planting will not cause any potential impacts to the restoration area since the area is currently disturbed. Adverse impacts to the plants will be minimized by planting the vegetation either at the

beginning or end of the growing season when temperatures are cooler and there is a likelihood of regular precipitation. The planting will also occur before or after the bird nesting season in case the area is used by killdeer for nesting.

4. Coastal Resiliency

Describe how the proposed project addresses an impact of climate change or how the proposed project helps to improve the resiliency of the target habitat to climate change and sea level rise.

The Winnapaug Pond barrier spit is experiencing more regular flooding during king tides and storm events due to accelerated sea level rise and more intense storm events. By planting native, salt tolerant plants in the town owned lots along Winnapaug Pond, the area will be more resilient to coastal flooding. Additionally, removing impediments to the marsh migration corridor will provide areas for salt marsh habitats and intertidal habitat to migrate inland under future sea level rise scenarios.

5. Additional Documentation

Please attach additional information including a site map and ground-level photographs, if applicable. If proposing the purchase of equipment, please include a detailed description and vendor information.

Please see attached maps, parcel data and photographs of the existing conditions of the proposed native plant restoration area along Winnapaug Pond.

6. Planning Consistency and Restoration Priority

Is the proposed project consistent with the goals of a local, state or regional planning initiative? Please specify initiative and explain (see [CRMC website](#) for guidance). Does the proposed project involve a state, regional or federal priority habitat restoration need or special consideration? Please specify and explain (see [CRMC website](#) for guidance).

The project is consistent with the Salt Pond Region Special Area Management Plan's goal of integrating and coordinating protection of natural resources and with Rhode Island's Coastal Wetland Restoration Strategy (2018) that highlights marsh migration facilitation as an example of an ecological intervention that allows a marsh to sustain function and ecosystem services on adjacent lands.

The project is also consistent with the Westerly Comprehensive Plan's Wetlands (Section 1.6.1), Buffer Zone (Section 1.6.2), Barrier Beaches, Sandy Beaches and Dunes (Section 1.6.4), Rare Species and Unique Habitats (Subsection 1.6.7), Coastal Environment (Subsection 1.6.10), and Habitat Protection (Subsection 1.6.11) sections.

V. SUSTAINABILITY (one page maximum)

1. Maintenance

What is the estimated “lifespan” of each planned restoration activity? What are the anticipated short-term and long-term (beyond the funding period) operation and maintenance requirements of the project? Specify who will be responsible for funding and carrying out each O & M activity. Indicate when and with what frequency activities will occur.

Maintenance activities will include removal of any woody invasives in the planting area and trash removal including trash deposited in the wrack line from storm tides. Maintenance activities will be outlined in the CRMC Assent application. The Town’s Recreation Department working in conjunction with staff from the Department of Public Works will be responsible for the maintenance activities. Trash removal will be conducted in the spring and fall each year. Woody invasive removals will be conducted every 2 to 3 years based on assessment of invasive plant colonization in coordination with Save The Bay.

2. External Factors

Identify existing external (off-site) factors that could reduce the chances of achieving the project goals (e.g. stormwater inputs to the site from the surrounding drainage area). Explain how these external factors will be addressed. Describe any additional measures taken to help ensure long-term success of the project (e.g. installation of stormwater management practices or securing of conservation easements). What are the likely future effects of climate change and future sea level rise on the proposed project and how will these be addressed?

Sections of the planting area will receive flooding during larger king tides and higher elevation areas will experience flooding during coastal storms. The Town will plant salt-tolerant species that can grow in a range of salinity conditions based on the elevations at which they are planted. Also the site has a high water table and some areas experience freshwater inundation in the winter and spring. These areas will be planted with brackish vegetation that can tolerate saturation. Some stormwater runoff from the gravel parking area flows toward these lower lying areas in the proposed planting area. Flow paths will be identified and native plants that can tolerate a range of salinities will be planted.

IV. PROJECT BUDGET TEMPLATE

BUDGET ITEM	CRMC REQUEST	MATCH	MATCH PENDING OR SECURED?	SOURCE OF MATCH	TOTAL
Native plant material and delivery	3,900				\$3,900
Save The Bay staff (planting coordination)	1,100		Secured	Save The Bay	\$1,100
Save The Bay staff (permit preparation, plant ordering, volunteer recruitment)		2,285	Secured	Save The Bay	\$2,285
Town of Westerly staff Recreation Director 20 hours @ \$42.84/hour (salary & fringe) Grant Administrator 10 hours @ \$39.65/hour rate (salary & fringe)		1,252	Secured		\$1,252
T					
Save The Bay interns/volunteers		2,386	Pending	Save The Bay	\$2,386
TOTAL	\$5,000			TOTAL PROJECT COST	\$10,923

V. BUDGET NARRATIVE (one page maximum)

The Coastal and Estuarine Habitat Restoration Trust Fund request will be used to fund:

- Native plants
- Save The Bay's staff time to coordinate the planting including ordering the plants and overseeing the volunteers.

In-kind services will be provided by the Town of Westerly's Recreation Director, the Town Planner, Save The Bay staff time, and Save The Bay volunteers.

Line 1: Native plants will cost \$3,600 plus \$300 for delivery for a total of \$3,900.

Line 2: Save The Bay's staff time to coordinate the planting including ordering the plants and recruiting and overseeing the volunteers will be \$1,100. The staff cost for Wenley Ferguson and Catie Alves at an hourly rate of \$49.45 (salary and fringe) for a total of 20 hours and overhead rate of 10%.

Line 3: Save The Bay staff time for planning, permit preparation and volunteer recruitment is estimated at 42 hours and is valued at \$2,285. These hours will be provided as match for the project.




Line 4: The Town of Westerly's Recreation Director will coordinate the project and will be responsible for the installation of the fencing and ongoing maintenance. The Town Planner will conduct the project reporting. The value of the Westerly' staff time is \$1,252 (Recreation Director for 20 hours at \$42.84 per hour and the Grant Administrator for 10 hours at \$39.65 per hour. Their time will be provided as match for the project.

Line 5: Save The Bay volunteers will assist with the planting. The volunteer time is estimated at 72 hours and is valued at the federal volunteer rate of \$33.49 per hour for a total of \$2,386.

Town of Westerly's Proposed Restoration Plan

-proposed restoration planting areas along Winnapaug Pond's marsh migration corridor

Legend

-  Back barrier dune planting
-  Native coastal plantings
-  Town owned parcels

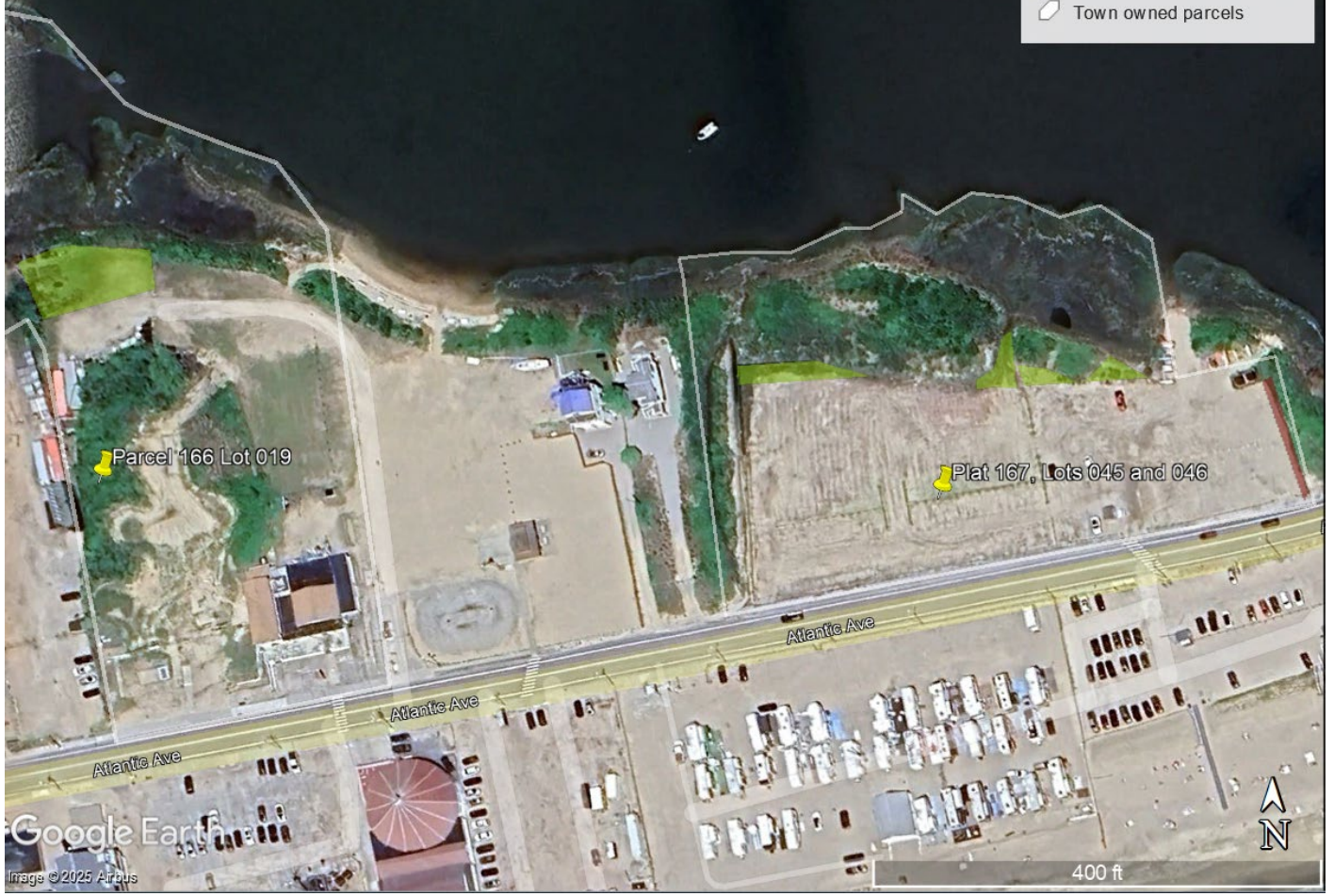


Figure 1: Aerial imagery of proposed planting areas on the two town-owned parcels along Winnapaug Pond.



Figure 2: Low lying area of Town Beach parking lot to be planted with native salt tolerant plants.



Figure 3: Proposed planting area along north side of Westerly Town Beach parking area along Winnapaug Pond's marsh migration corridor.



Figure 4: URI's SLAMM map (2021) highlighting marsh migration corridor at 2.8' of Sea Level Rise.



Figure 5: Example of rope fencing to be installed to protect planting area and restore marsh migration corridor.



AUTHORIZED AGENT OF LEAD ORGANIZATION

March, 3, 2025

Please include the following with your pre-proposal:

- X** Map indicating proposed project location
- X** Ground-level photograph(s) of existing site conditions
- X** Letters of support: Salt Pond Coalition

Return your completed proposal by 4:00 p.m. on **March 3, 2025** to:

Bruce Lofgren
RI Coastal Resources Management Council
Oliver Stedman Government Center
4808 Tower Hill Road
Wakefield , RI 02879
blofgren@crmc.ri.gov

Applicants are required to submit one (1) signed hard copy of the proposal form and one (1) electronic copy in Adobe PDF format. ****Please submit electronic copy as a SINGLE PDF FILE containing all application materials.****

Contact Bruce Lofgren at by email or **401-782-4196** with any questions.



Salt Ponds Coalition

50 Bend Road, P.O. Box 875

Charlestown, RI 02813

(401)-322-3068

saltpondscoalition.org

Feb. 28, 2025

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Angela Brunetti
ADVANCEMENT COORDINATOR

Bruce Lofgren

Coastal Policy Analyst, RI Coastal Resources Management Council
4808 Tower Hill Road, Wakefield, RI 02879

Dear Mr. Lofgren,

I am the Executive Director of the Salt Ponds Coalition, the state-designated watershed group for the Washington County Coastal Ponds Region. This letter is in support of the Town of Westerly's application entitled "**Restoring a Buffer and Migration Corridor along Winnapaug Pond**" for funding from Rhode Island Coastal and Estuary Habitat Restoration Fund 2025 grant. This planting project entails restoring native vegetation between Winnapaug Pond and two lots owned by the Town of Westerly, the Town Beach parking lot and a recently acquired lot at 330 Atlantic Avenue. Both lots are on the barrier beach between Block Island Sound and Winnapaug Pond and have been altered by removal of vegetation for parking and recreational activities.

The long-term resiliency of this area is threatened by sea level rise as it is already prone to flooding during King Tides and intense storm events. Sea level rise will only compound these issues in the future. Planting native, salt-tolerant plants in the town-owned lots along the pond will help to improve resiliency, restore native vegetation, and create a natural buffer between these properties and the adjacent salt pond.

Additionally, planting native vegetation in low-lying areas will restore salt and brackish marsh habitat or maritime scrub shrub habitat and will enhance Winnapaug Pond's marsh migration corridor. Hopefully this will lead to other similar projects at the town's beaches and bring attention to the need to conserve this fragile habitat.

Sincerely,

Alicia Schaffner, SPC Executive Director

March 3, 2025

Bruce Lofgren
RI Coastal Resources Management Council
Oliver Stedman Government Center
4808 Tower Hill Road
Wakefield, RI 02879

Dear Bruce,

I am writing on behalf of Save The Bay in support of the Town of Westerly's proposal "" to the Rhode Island Coastal and Estuarine Habitat Restoration Fund. This project will conduct native coastal plantings in the marsh migration corridor along the southern shoreline of Winnapaug in areas that are currently parking areas on two town-owned lots.

Save The Bay has been partnering with the Town of Westerly on a dune grass planting project on the Winnapaug Pond barrier spit over the past 2 years and we jointly identified this potential marsh migration restoration area along Winnapaug Pond during one of our site visits. The Town plans to reconfigure their parking areas to allow room for the restorative plantings in a low lying area that experiences frequent flooding during king tides and storm events.

Save The Bay will continue to collaborate with the Town by providing in-kind services of staff time on the restoration plan development, writing the CRMC permit application and volunteer recruitment. Save The Bay is also written into the budget to coordinate the planting and oversee the community volunteers to conduct the planting project.

We look forward to continuing our partnership with ASRI on this and other salt marsh restoration projects.

Sincerely,



Wenley Ferguson
Director of Restoration

Rhode Island Coastal and Estuary Habitat Restoration Fund
Full Proposal Form for Planning Projects 2024/2025
****for design or construction projects please use Full Proposal Form**

I. PROJECT SUMMARY

1. **Project Title:** Succotash and Potter Pond Marsh Restoration
 2. **Project Location and coordinates** (*include map*): Succotash Road, South Kingstown, RI
 3. **Habitat type** (*River System, Salt Marsh, Seagrass, Shellfish Bed, other*): Salt marsh
 4. **If other, please specify:**
 5. **Targeted restoration technique** (*e.g. re-vegetation, tidal restoration, etc.*): Marsh surface elevation enhancement via sediment placement
 6. **Potential future benefits resulting from proposed planning project:** Increased area and level of function of low and high marsh habitat.
 7. **Project partners** (*organizations providing financial or other support to the project*): Save The Bay
 8. **Is this is an ongoing project that has previously received funds from the CRMC Coastal and Estuarine Habitat Restoration Fund?** no **If yes, year(s) funding was awarded:**
-

II. PROJECT MANAGER CONTACT INFORMATION

1. **Name:** Caitlin Chaffee
2. **Organization:** RIDEM, Narragansett Bay National Estuarine Research Reserve (NBNERR)
3. **Address:** 235 Promenade St.
4. **City:** Providence 5. **State:** RI 6. **Zip:** 02908
7. **Phone:** 401-537-4056 8. **Email:** Caitlin.chaffee@dem.ri.gov
9. **Property Owner(s):** RIDEM (Division of Fish and Wildlife)

III. BUDGET SUMMARY

(List individuals or organizations providing financial or in-kind support to the project under Project Partners)

Amount Requested from Trust Fund	\$65,000	
Matching Funds	Project Partner(s)	Amount of Match
	NBEP Restoration Funding	\$200,00
	TOTAL PROJECT COST	\$265,000

IV. PROPOSAL NARRATIVE

1. Justification and Purpose

Briefly describe the proposed planning project. What questions does it propose to answer? What are the restoration goals and anticipated long-term and short-term outcomes. Describe the human impacts and previous restoration activities within the proposed study area. If the project area includes multiple impacted sites, please describe the impacts and previous restoration activities at each.

Succotash marsh is located within Potters and Point Judith Ponds in South Kingstown, RI, and is designated as a RI DEM Wildlife Management Area. The 182-acre salt-marsh system is composed of open water, tidal flat, high marsh, and low marsh zones and is bisected by Succotash Road. Areas around the marsh perimeter include developed residential and commercial areas, a state beach, upland grassland and coastal shrubland. Within the marsh complex, small islands vegetated with shrub and tree species, tidal creeks, and intertidal flats provide a diverse habitat. The marsh provides breeding grounds for a diverse assemblage of birds, including salt marsh sparrows, and supports local commercial (e.g., aquaculture) and recreational (e.g., hunting, kayaking, birding) interests. The site has been identified by the Atlantic Coast Joint Venture (ACJV) as a priority habitat area for saltmarsh sparrow.

Tidal wetlands buffer against storm surge, reduce erosion, improve water quality, store carbon, and provide biologically productive breeding habitat, refuge and food for fish and wildlife, including many species of greatest conservation need (SGCN). As sea-level rise rates have increased and other impacts have been exacerbated by climate change, tidal wetlands face an existential challenge, especially along the East coast where sea level is rising faster than the global average. To persist, tidal wetlands must build up elevation in place or migrate inland, but research suggests that accretion rates leave many marshes vulnerable to accelerating sea level rise.

Sea-level rise threatens Succotash Marsh by subjecting it to more frequent flooding. The marsh is already exhibiting signs of degradation including vegetation die-off and the increase in size of shallow pools on the marsh platform, while adjacent development and infrastructure prevent the marsh from migrating inland. Since conserving adjacent uplands to facilitate marsh migration is not a feasible strategy at this location, we propose adding sediment to raise the elevation of the system to restore vegetation communities and make it more resilient to climate change and other anthropogenic impacts. Sediment placement is a feasible strategy in this case because: 1) the site is owned by the RI Dept. of Environmental Management and part of a state management area that is intended to be managed for fish and wildlife, 2) the marsh is part of a back barrier system, which is a natural community adapted to large-scale, high-energy events such as coastal storms that can deposit large volumes of sediment in a short amount of time. The project partners have had previous success implementing sediment placement projects in this type of marsh environment.

3) there is a nearby source of sandy sediments within shoaled areas of Point Judith and Potter Ponds, and local businesses and residents have expressed a desire to dredge specific areas to improve boater access.

2. Project Activities, Schedule and Work Plan

Describe the planned project activities, and explain how each activity will help to plan for restoration of ecosystem functions. List specific project activities and when they will occur (month and year). Indicate when annual and final project reports will be submitted.

An environmental consulting firm with experience in coastal wetland projects will be hired via a competitive bid process to be initiated by NBNERR. The project team will work with the selected firm to develop conceptual and 60% project plans based upon preliminary data collection and site assessment.

Deliverables:

- Consultant scope of work developed by NBNERR in consultation with project team (in progress)
- Request for Proposals issued by RI Division of Purchases
- Bids evaluated and consultant selected
- Initial kickoff meeting with project team and consultant
- Conceptual plans developed by consultant and reviewed by project team
- 60% plans developed by consultant and reviewed by project team
- Project permit application development (dependent on available funds)

Estimated project duration 18 months, after which a final report will be submitted.

3. Coordination and Public Support

How will the project lead organization coordinate with other stakeholder groups, and which groups will be included? Describe planned or completed community / stakeholder education and outreach efforts.

The project team is currently comprised of RIDEM (NBNERR and Division of Fish and Wildlife), the US Fish and Wildlife Service Coastal Program, Save The Bay, the RI Natural History Survey, US Environmental Protection Agency, and the NOAA Restoration Center. We anticipate engaging with additional partners as the project moves forward. The environmental consulting firm will assist RIDEM in development of project visuals (maps, renderings) to be presented at two public meetings coordinated by RIDEM and the project team.

4. Planning Consistency and Restoration Priority

Is the proposed project consistent with the goals of a local, state or regional planning initiative? Please specify initiative and explain (see [CRMC website](#) for guidance). Does the proposed project involve a state, regional or federal priority habitat restoration need or special consideration? Please specify and explain (see [CRMC website](#) for guidance).

Succotash Marsh complex contains habitat types that are considered a priority for protection as detailed in the [RI Coastal and Estuarine Land Conservation Plan](#). This project is aligned with the priorities outlined in the [Rhode Island Coastal Wetland Restoration Strategy](#) (2018), which recognizes elevating the marsh surface with sediments to delay marsh drowning as a vital management action to offset future wetland losses due to climate change. The Town of South Kingstown's [2021 Comprehensive Plan](#) identifies marshes as critical habitat that provides significant ecosystem services to the community including protection from coastal storms and flooding events.

5. Species of Concern

Does the planning project address threats to wildlife species listed as federally or state endangered, threatened, or species of concern within Rhode Island? Please specify which species will benefit and how. For a list of species, see the Rhode Island National Heritage Program's listing of animals at: http://www.rinhs.org/wp-content/uploads/ri_rare_animals_2006.pdf or a listing of plants at: http://www.rinhs.org/wp-content/uploads/ri_rare_plants_2007.pdf

The salt marsh complex supports improved water quality, nursery grounds, and foraging habitat for species of fish, shellfish, birds, and mammals, many of which are listed as Species of Greatest Conservation Need through Rhode Island's [2015 Wildlife Action Plan](#). Habitat restoration in this area has a good potential to have long term benefits for the Diamondback Terrapin, a state endangered species, and in the review process for evaluation of a listing petition by USFWS. Succotash Marsh was identified as having a high probability of serving as suitable nesting habitat for Diamondback Terrapin in [The Northern Diamondback Terrapin in the Northeastern United States: A Regional Conservation Strategy](#) (Egger, S., 2016). In addition, restored salt marsh habitat would serve as beneficial foraging and overwintering habitat for juvenile and adult terrapins. The [Atlantic Coast Joint Venture](#) has ranked Succotash Marsh in the top 50% of RI salt marsh patches with potential to provide high quality, resilient habitat to support the Saltmarsh Sparrow population long term. Restoration of salt marsh habitat and creation of marsh migration corridors for the Saltmarsh Sparrow, likely to be listed by USFWS, is critical. Saltmarsh Sparrows have been detected in high marsh on both sides of Succotash Road, but are at risk of increasing rates of nest inundation if the marsh is not elevated.

6. Climate Change and Coastal Resiliency

How will present and future impacts of climate change be considered during the project planning and design phases? What impact will the final project have on resilience of coastal or estuarine habitat to climate change?

The objective of the proposed project is to increase the resilience of salt marsh habitats to climate change impacts, particularly accelerated sea level rise. Increasing marsh surface elevations will allow for recovery of degraded marsh areas and reestablishment of native marsh vegetation, which will improve accretive processes that will help the marsh to sustain itself in the face of continued sea level rise.

7. Environmental Justice

Will the proposed project take place within or otherwise benefit environmental justice "priority areas" as defined by the Narragansett Bay Estuary Program's analysis of [Environmental Justice in the Narragansett Bay Region](#)? Does the proposed project incorporate Environmental Justice concerns as defined by the US EPA's Guidance on [Environmental Justice and Equitable Development](#)?

The project location in South Kingstown is located only 2 miles from an environmental justice priority area (Narragansett Block Group 440090515042) identified by the Narragansett Bay Estuary Program, where approximately 56% of the residents are low-income and historically have received unequal access to a clean environment and basic environmental resources including access to nature and open space. In addition to restoring marsh habitat that people rely on for fishing and recreation access, this project will increase ecosystem benefits and enhance climate resilience for surrounding communities, including the nearby environmental justice priority area.

8. Permitting

List any federal, state or local permits required to complete the project and the permit application status for each.

The project team will work with an environmental consulting firm to develop applications for required state and federal permits, including an Environmental Assessment to address NEPA compliance. The project team will request pre-application meetings with relevant state and federal agencies to review partial designs prior to permit application submittal. Required permits are anticipated to include:

- RI CRMC Coastal Assent
- US Army Corps of Engineers CWA Section 404 permit (General Permit Self-Verification or Pre-Construction Notification)
- RIDEM Water Quality Certification

9. Capacity of Lead Organization (attach additional materials if necessary)

Demonstrate the capacity of the lead and/or partner organizations to successfully complete the proposed project by providing any or all of the following: a) a description of the organization(s) b) resume(s) or summary of qualifications of involved personnel c) evidence of successfully completed habitat restoration or conservation planning projects.

RIDEM has a demonstrated history of prior experience with complex public access and habitat restoration projects on state land, including marsh habitat restoration and public access resilience work at Quonochontaug Breachway in Charlestown, RI. NBNERR is a NOAA-funded state federal partnership based within RIDEM that manages over 4,000 acres of state conservation land where it conducts monitoring, stewardship, restoration, and educational programs. NBNERR staff have expertise in coastal and estuarine habitats and ecological restoration that is key for this project. Restoration partner Save The Bay's Habitat Restoration team has decades of experience increasing the resilience of coastal habitats throughout RI.

10. External Factors and Climate Change

Identify existing external (off-site) factors that may be affecting habitat within the study area. How will external factors be considered? What are the likely effects of climate change and sea level rise within the study area and how will these be considered?

Sea level rise due to climate change is the driving motivator behind this thin layer deposition marsh restoration project. If left unrestored, Succotash Marsh will succumb to further degradation and inundation, jeopardizing the future of species like the Saltmarsh sparrow. There have been a series of efforts within Rhode Island that have sought to address coastal impacts related to climate change and sea level rise. High resolution modeling of sea level rise and coastal storm scenarios has been completed for all of Rhode Island's 21 coastal municipalities and is accessible via the state's [STORMTOOLS](#) suite of maps and tools. Vulnerability analyses have been completed for coastal municipalities to identify areas most at-risk ([Shoreline Change Special Area Management Plan](#)), and modeling has been completed to demonstrate potential impacts to coastal habitats ([Land Preservation for Salt Marsh Migration project](#)). [Resilient Rhody, An Actionable Vision for Addressing the Impacts of Climate Change in Rhode Island](#) was released by the Office of the Governor in 2018 and outlined a series of actions to improve shoreline resilience.

V. EVALUATING PROJECT SUCCESS (one page maximum)

1. Performance Measures and Deliverables

How will the success of the project be measured in relation to the restoration goals set forth in this proposal? List all deliverables (e.g. reports, updates, websites, etc.) associated with the project.

The environmental consulting firm will work with the project team to compile and evaluate existing data including elevation, bathymetry, salt marsh vegetation, tidal elevation and inundation data collected by URI Environmental Data Center. They will collect additional information necessary to complete the engineering design and permitting for the salt marsh restoration project.

2. Monitoring Plan

Describe any monitoring activities that are part of the planning project. For each monitoring activity list the frequency and month/year of start and end date and the parameters measured. List the entity or entities responsible for funding and carrying out each monitoring activity, and describe how results will be made available to CRMC and the public. If using an established monitoring protocol, please provide references (see CRMC website for information on established monitoring protocols).

The project team and monitoring team will convene to determine which parameters will be monitored at the Succotash Marsh site. It is anticipated that the project and monitoring plan will follow a before / after / control / impact (BACI) design, to allow for statistical analysis of results.

Deliverables:

- Monitoring plan that includes details on parameters to be monitored, frequency, established protocols and responsible entities
- Establishment of a control site
- Maps of control and impact sites with georeferenced transects
- Georeferenced photo stations at control and impact sites
- One-year of “before” monitoring data collected
- Capacity and framework added to existing data portal to house Succotash Marsh project information

VI. PROJECT BUDGET TEMPLATE

BUDGET CATEGORY	CRMC REQUEST	MATCH	MATCH PENDING OR SECURED? (select one)	SOURCE OF MATCH	TOTAL
Data Collection & Mapping		\$115,000	Secured	NBEP Restoration Funding	\$115,000
Contractual design & engineering	\$65,000	\$85,000	Secured	NBNEP Restoration Funding	\$150,000
TOTAL	\$65,000	\$200,000		TOTAL PROJECT COST	\$265,000

VII. BUDGET NARRATIVE (one page maximum)

Please provide a description and justification for each line item included in the project budget form (e.g. for personnel costs, provide hourly and fringe rates, for travel specify rate and estimated number of miles). Please specify any match requirements for each source of funding. Please include costs associated with required annual and final reports to CRMC. Be sure to detail how CRMC funds will be used.

Total cost of restoration design and permitting is anticipated to be \$150,000. We are requesting \$65,000 from the CEHRTF, which will be matched by \$85,000 in federal funds from the Narragansett Bay Estuary Program. Additionally, this request will leverage approximately \$115,000 in federal funding previously spent on data collection, mapping, and monitoring efforts at the site. The requested funds will support a contract with an environmental consulting firm for design and engineering services. The contractor will be selected via a competitive bid process through the RI Division of Purchases.

IX. ADDITIONAL MATERIALS

Please include the following with your application:

Site and Locus Maps

Ground-level photographs of existing site conditions

Aerial photographs, if available

Preliminary design drawings, maps or engineering plans, if available

- East Side Conceptual Design
- Potters Pond Conceptual Design

Pertinent physical, ecological, biological, and cultural / historical survey data

- Potter Pond Potential Salt Marsh Restoration Sites
- Succotash Potential Salt Marsh Restoration Sites

Letters of support

AUTHORIZED SIGNATURE

AUTHORIZED AGENT OF LEAD ORGANIZATION

Signature

Date

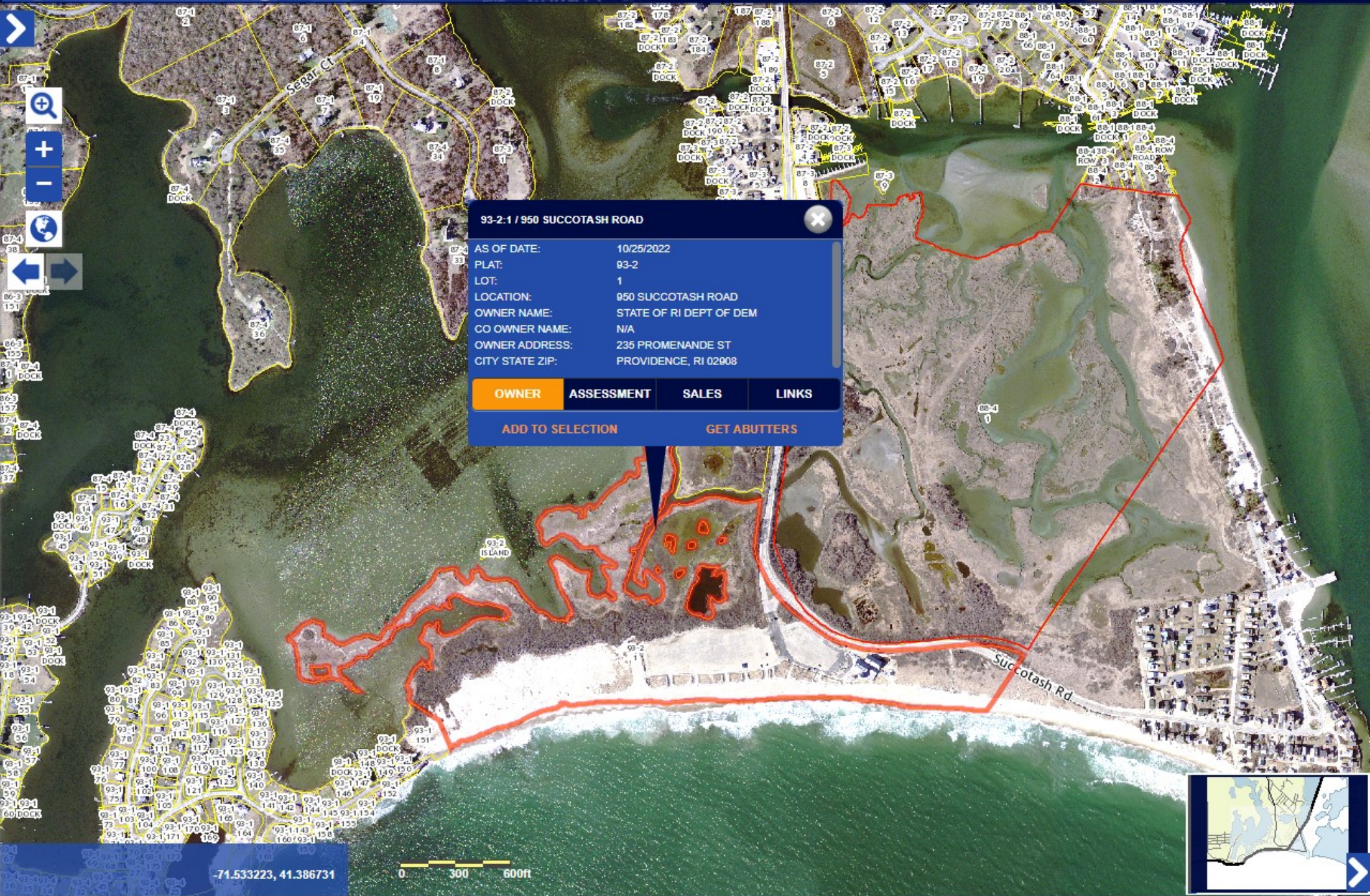
Return your completed proposal by 4:00 p.m. on **March 3, 2025** to:

Bruce Lofgren
RI Coastal Resources Management Council
Oliver Stedman Government Center
4808 Tower Hill Road
Wakefield , RI 02879
blofgren@crmc.ri.gov

Applicants are required to submit one (1) signed hard copy of the proposal form and one (1) electronic copy in Adobe PDF format. ****Please submit electronic copy as a SINGLE PDF FILE containing all application materials.****

Contact Bruce Lofgren at by email or **401-782-4196** with any questions.





93-2-1 / 950 SUCCOTASH ROAD

AS OF DATE: 10/25/2022
 PLAT: 93-2
 LOT: 1
 LOCATION: 950 SUCCOTASH ROAD
 OWNER NAME: STATE OF RI DEPT OF DEM
 CO OWNER NAME: N/A
 OWNER ADDRESS: 235 PROMENANDE ST
 CITY STATE ZIP: PROVIDENCE, RI 02908

OWNER	ASSESSMENT	SALES	LINKS
ADD TO SELECTION		GET ABUTTERS	

-71.533223, 41.386731





24

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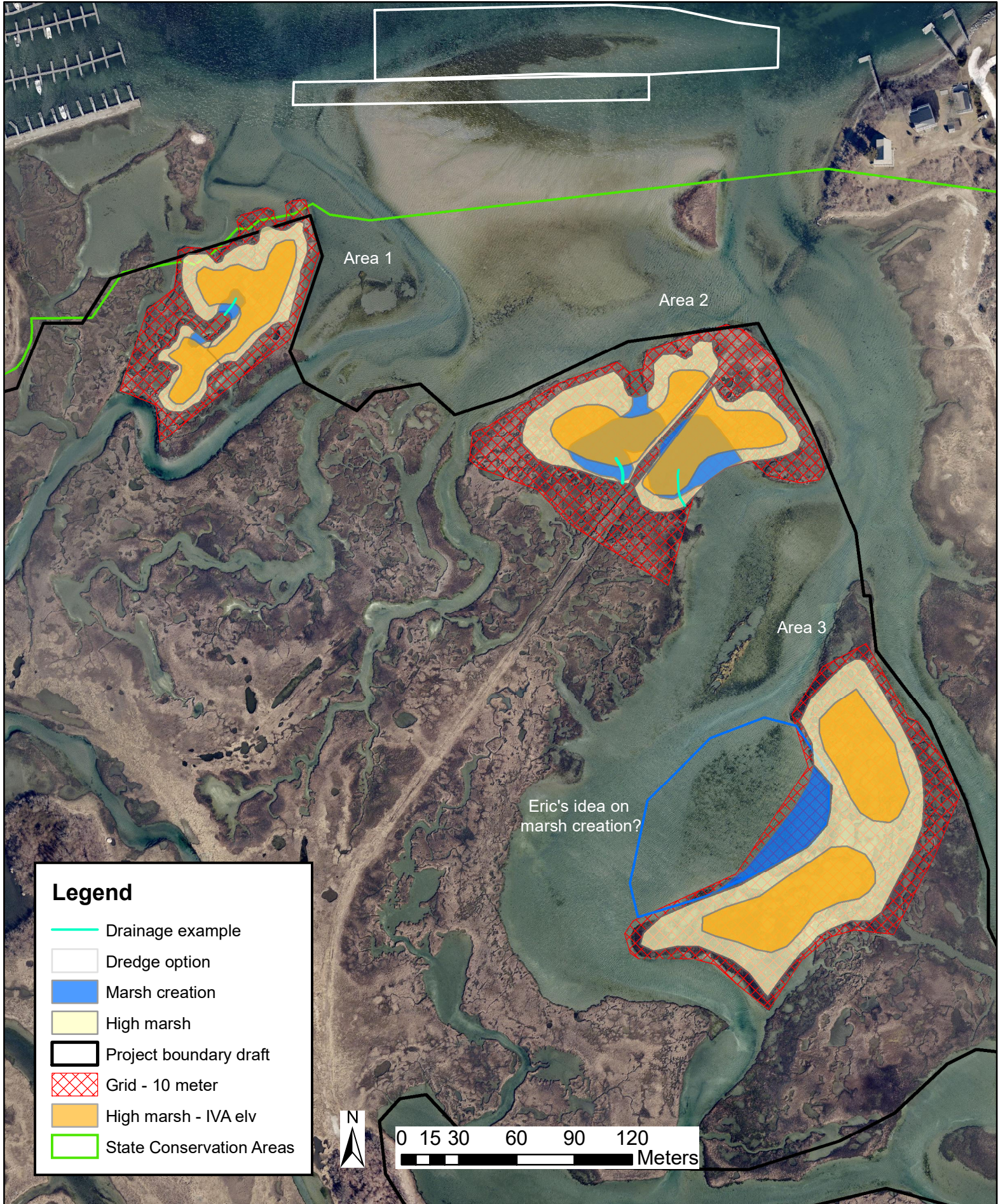
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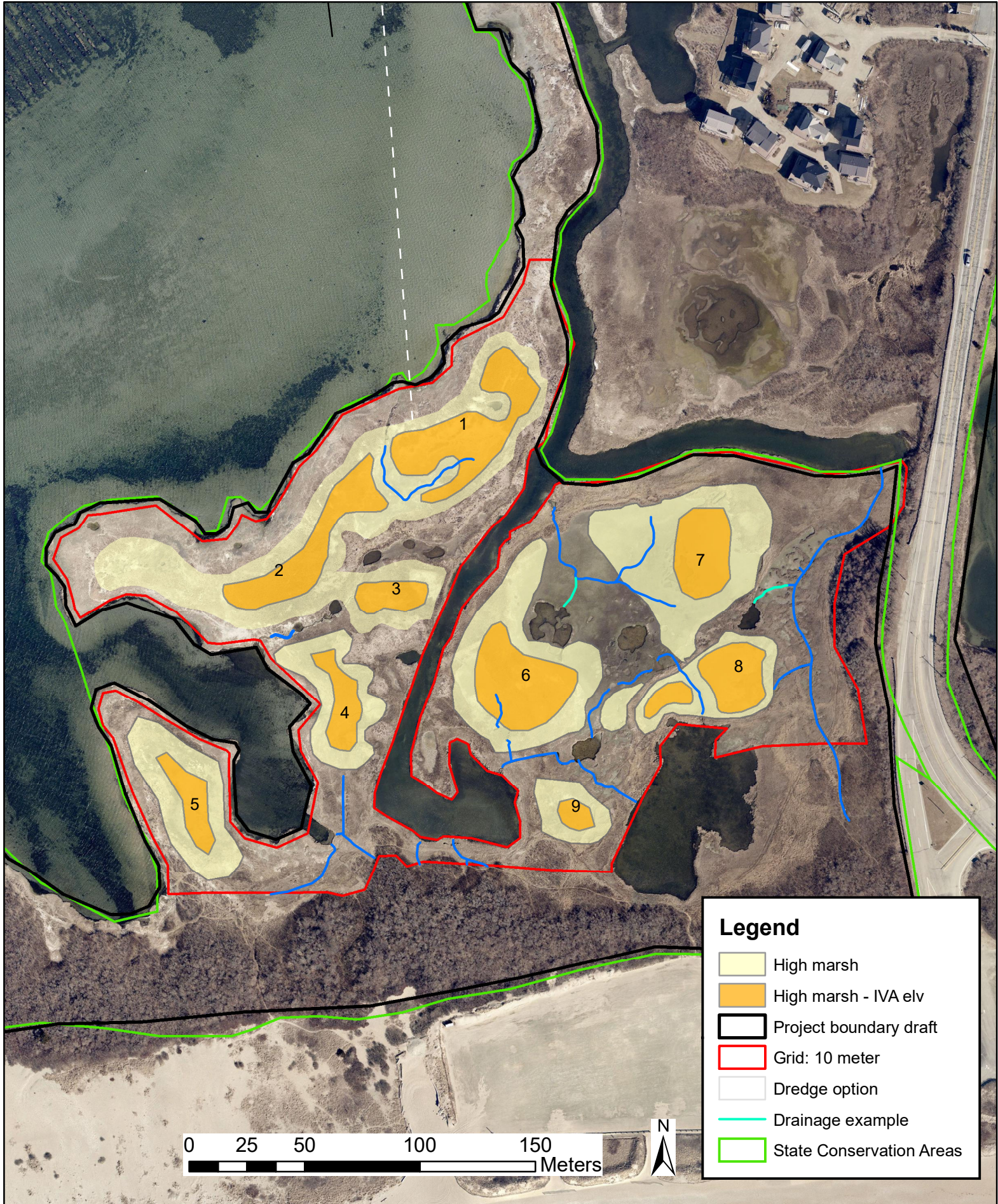
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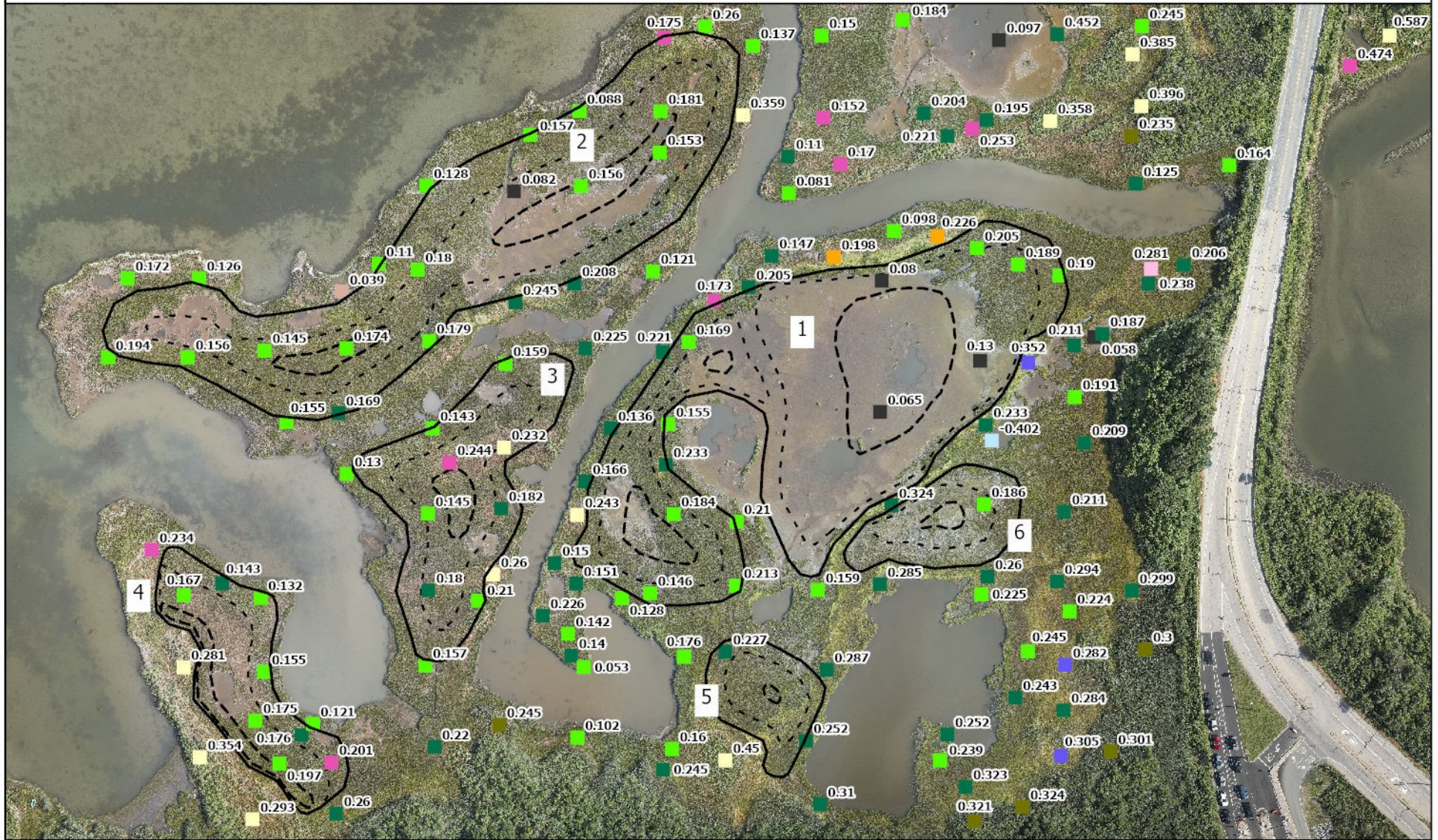
Succotash Marsh Restoration: East Side Potential Sediment Placement Units Draft 2



Succotash Marsh Restoration: Potter's Pond Side Sediment Placement Options Draft 2



Potter Pond Potential Salt Marsh Restoration Sites



Marsh Cover Type and Elevation (NAVD88m)

- Dieback denuded peat
- Dieoff bare depression

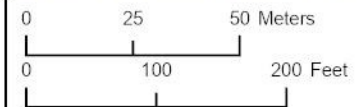
- High Marsh *Distichlis spicata*
- High Marsh *Juncus gerardii*
- High Marsh *S. paten*
- Meadow High Marsh
- Meadow Sa-Mix

- Natural Pool
- Phrag
- Sa High Marsh
- Salt shrub

New Surface Target Elevation (NAVD88m)

- Iva* elevation (0.4)
- S. patens* elevation (0.3)

Extent of Restoration Area (0.2 m)



Data sources: URI-EDC; Save the Bay, NBNEER; RINHS. High resolution imagery collected using Matrice 300 RTK un-manned aerial system with a 45-megapixel RGB camera; Aerial photography acquired July, 2023

Succotash Potential Salt Marsh Restoration Sites



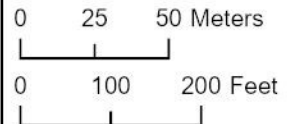
Marsh Cover Type and Elevation (NAVD88m)

- Dieback denuded peat
- Dieoff bare depression

- High Marsh *Distichlis spicata*
- High Marsh *S. paten*
- Low Marsh
- Meadow High Marsh
- Meadow Sa-Mix

- Natural Creek
- Natural Flat
- Natural Pool
- Phrag
- Sa High Marsh
- Salt shrub

- New Surface Target Elevation (NAVD88m)
- Iva elevation (0.9)
- S. patens* elevation (0.7)
- Extent of Restoration Area (0.4m)



Data sources: URI-EDC; Save the Bay, NBNEER; RINHS. High resolution imagery collected using Matrice 300 RTK un-manned aerial system with a 45-megapixel RGB camera. Aerial photography acquired July, 2023

Rhode Island Coastal and Estuary Habitat Restoration Fund Full Proposal Form 2024/2025

****for planning projects please use Full Proposal Form for Planning Projects**

I. PROJECT SUMMARY

- 1. Project Title:** Restoring coastal habitats and improving resilience on Winnapaug Pond
 - 2. Project Location and coordinates (include map):** 328 Atlantic Avenue, Westerly, RI
 - 3. Project type (Design, Construction or Other):** Design and permitting
 - 4. If other, please specify:**
 - 5. Habitat type (River System, Salt Marsh, Seagrass, Shellfish Bed, other):** Salt marsh and coastal buffer
 - 6. If other, please specify:**
 - 7. Restoration technique (e.g. re-vegetation, tidal restoration, etc.):**
 - 8. Total acreage or miles(river systems) of habitat to be restored, or project area planning unit size:**
7.31 acres
 - 9. Project benefits:** Public access, climate resilience, restore coastal wetland and marsh migration pathway habitat
 - 10. Project partners (organizations providing financial or other support to the project):** NOAA, RIDEM, NBNERR, CRMC, Town of Westerly, Save the Bay
 - 11. Is this is an ongoing project that has previously received funds from the CRMC Coastal and Estuarine Habitat Restoration Fund?** No **If yes, year(s) funding was awarded:**
-

II. PROJECT MANAGER CONTACT INFORMATION

- 1. Name:** Caitlin Chaffee
- 2. Organization:** RIDEM, Narragansett Bay National Estuarine Research Reserve
- 3. Address:** 235 Promenade Street
- 4. City:** Providence **5. State:** RI **6. Zip:** 02908
- 7. Phone:** 401-537-4056 **8. Email:** Caitlin.chaffee@dem.ri.gov
- 9. Property Owner(s):** Town of Westerly (RIDEM holds a conservation easement on the property)

Applicant must document ownership of project site or permission to perform all proposed restoration, maintenance and monitoring activities (*include appropriate documentation*).

III. BUDGET SUMMARY

(List individuals or organizations providing financial or in-kind support to the project under Project Partners)

		Request: \$85,000
Matching Funds	Project Partner(s)	Amount of Match
	NOAA BIL Funding	\$2.56M
	TOTAL PROJECT COST	\$2,645,000

IV. PROPOSAL NARRATIVE (five pages maximum)

1. Justification and Purpose

Describe the human impacts and previous restoration activities at the proposed project site. If multiple sites, please describe the impacts and previous restoration activities at each). Briefly describe the proposed project, its restoration goals, long-term and short-term outcomes.

This proposed project seeks to restore a critical coastal property located along an ecologically sensitive coastal barrier in Westerly, Rhode Island. The 7.31-acre parcel, known as the Sorensen property (328 Atlantic Avenue, Plat 166, Lot 19) recently acquired by the Town of Westerly, is located along the north side of Atlantic Avenue, a municipal roadway that runs along a barrier spit known as the Misquamicut Headland and separates Block Island Sound from Winnapaug Pond, a coastal salt pond. The northern half of the Sorensen property abuts Winnapaug Pond and consists of salt marsh habitat that is directly adjacent to a larger, 15-acre contiguous salt marsh complex owned by the RI Department of Environmental Management (RIDEM)'s Division of State Parks. The remaining southern half of the property consists of low-lying upland habitat that abuts Atlantic Avenue. Prior to 2019, the property had been used as a family-owned and operated water park. Since then, water slide structures have been removed, but a large pile of fill, a 285-square-foot mechanical building, and a 9,541-square-foot retail building remain on the property. Restoring the Sorensen property will preserve important current and future coastal wetland habitat, improve opportunities for passive recreation and public access in a region of the state with limited coastal access, and improve the resilience of the site to extreme weather events.

2. Project Activities, Schedule and Work Plan

Describe the planned on-the-ground project activities, and explain how each activity will help to restore ecosystem functions. List specific project activities and when they will occur (month and year). Indicate when annual and final project reports will be submitted.

Initial (Phase 1) restoration activities will include removal and / or redistribution of the fill material that is present on-site, and grading of currently unvegetated areas to create more gradual slopes and facilitate stormwater drainage and future inland migration of coastal habitats. Existing coastal wetland and upland buffer areas will be enhanced with native plantings and management of invasive species. The coastal wetland itself will also be assessed for human legacy impacts and potential for hydrologic restoration through ditch remediation and installation of runnels to reduce permanent ponding on the marsh surface at low tide.

The requested funds would support development of a comprehensive habitat restoration plan for the property, and 60% designs and permit applications for the Phase 1 activities. This work is anticipated to be completed within one year (12 months). If funding allows, site preparation activities will begin in month 12.

Tentative Project Schedule:

Months 1-3: Contracting of design and engineering services

Months 3-6: Conceptual design development and project team feedback

Months 6-9: 60% design development

Months 9-12: Finalization of 60% designs and permit application development

Months 12-18: Permit applications developed and submitted

Months 18-24: Begin site preparation activities (funding dependent)

3. Minimization of Adverse Impacts

What are the potential impacts resulting from project activities (e.g. the disturbance of sensitive species by construction activities), and how will these impacts be minimized (e.g. scheduling construction to avoid disturbance of sensitive species).

Soil testing during the acquisition process identified the presence of several Polynuclear Aromatic Hydrocarbons (PAH) at concentrations above their respective Method 1 Residential and/or Industrial/Commercial Direct Exposure Criteria in the northern and eastern sides of the mound. BETA Group, Inc. will oversee/direct the soil excavation program. The intent is to move soil from the northern and eastern sides of the mound where elevated PAH concentrations were detected, and stockpile them in a separate location on site. Soil will be excavated until a “clean” interface is identified. The Town of Westerly, through its Department of Public Works, will provide a backhoe and an operator to excavate soil within the mound. Results of additional testing will be detailed within a Site Investigation Report (SIR). BETA Group, Inc will prepare a Short-term Response Action Plan (STRAP), which will describe remedial actions that will be undertaken to bring the site into regulatory compliance. An alternatives analysis must be provided for review by RIDEM and the Town prior to selection and implementation of remedial action. The anticipated remedial action will include the removal and proper disposal of the mounded soil. The RIDEM Office of Land Revitalization and Sustainable Materials Management has suggested that contaminated fill could be used below a parking area and capped.

4. Public Support

Demonstrate public support for the project by providing evidence of communication with adjacent landowners, community members and other stakeholders. Describe planned or completed community / stakeholder education and outreach efforts.

The northern half of the Sorensen property abuts Winnapaug Pond, which consists of salt marsh habitat, is directly adjacent to a larger, 15-acre contiguous salt marsh complex owned by the RIDEM’s Division of State Parks. The nearby complex has been the location of decades of restoration work led by Save The Bay to address manmade impacts to the marsh’s tidal hydrology. RIDEM has a long history of partnering with community organizations and towns to preserve open space for ecological protection. CRMC and NBNERR will continue to work closely with Planning and Development staff throughout this process if funded. The Town of Westerly is in full support of this effort and sees this property as an opportunity to partner more formally with the Salt Ponds Coalition, a local non-profit community science and education organization rooted in the stewardship of Rhode Island’s salt ponds.

5. Economic and Educational Benefits

How will the proposed project provide direct economic and/or educational benefits to a community and/or the state?

The Town of Westerly's Recreation Department works with organizations such as New England Science and Sailing, Mystic Aquarium, Southern RI District of Conservation, Indigenous tribes of Southern RI, United Way, and the Westerly Public School System to support experiential learning programs. Mystic Aquarium's [STEM Mentoring RI Initiative](#), which has historically utilized the property, is dedicated to providing afterschool and summer programs that support STEM enrichment activities, focusing on reducing high-risk behaviors, improving academic success, and increasing knowledge of STEM topics and career paths for their youth. STEM Mentoring RI has historically served a diverse population, and a majority of participants have been BIPOC youth from underserved towns throughout the state (e.g., Cranston, Providence, Pawtucket, East Providence, Central Falls). New England Science and Sailing (NESS) often works in school districts with high percentages of students who qualify for free or reduced-price lunch in order to target those who would benefit the most from their STEM-based experiential learning and offers scholarships to ensure their programs are accessible. This project would ensure that these programs have a safe and accessible site in southern RI to engage youth. Additionally, this project would enable Salt Ponds Coalition, a regional conservation organization, to increase their reach and lead more community science and stewardship opportunities on Winnapaug Pond, as access has historically been a barrier.

6. Climate Change and Coastal Resiliency

How have the present and future impacts of climate change been considered during the project planning and design phases? What impact will the project have on resilience of coastal or estuarine habitat to climate change?

The proposed project will support efforts to restore vital coastal habitats on Winnapaug Pond, an area that is heavily developed with limited shoreline public access. Protection of this parcel from future development has increased coastal resilience by avoiding risks to built infrastructure. The planned restoration effort will further increase coastal resilience by enhancing natural areas that will mitigate shoreline erosion, improve water quality, and provide habitat for fish and wildlife. It will also preserve areas to accommodate the inland migration of shoreline habitats with sea level rise.

7. Environmental Justice

Will the proposed project take place within or otherwise benefit environmental justice "priority areas" as defined by the Narragansett Bay Estuary Program's analysis of [Environmental Justice in the Narragansett Bay Region](#)? Does the proposed project incorporate Environmental Justice concerns as defined by the US EPA's Guidance on [Environmental Justice and Equitable Development](#)?

Providing coastal access does not always guarantee equitable coastal access, and this restoration effort presents an intentional effort to address these disparities in access while also increasing the resilience of the local community to withstand climate change impacts. [Analyses of coastal public access](#) and community demographics across Rhode Island have highlighted the role that coastal access plays in environmental justice, revealing that race and ethnicity are strongly correlated to travel distance to the state's public coastal amenities, which translates to higher cost and burdens for populations that have been historically marginalized. This also means that non-white populations are severely underrepresented in coastal recreation spaces in the state. Social inequities also exist at the local scale – due to tourism demands, many people in inland sections of Westerly, particularly those from downtown Westerly ([CEJST # 44009050801](#)) or Bradford (identified as an Environmental Justice Priority Area via the Narragansett Bay Estuary Program's EJ mapping tool) do not have the means to access their local shoreline. The EJ mapping tool, titled [Environmental Justice in the Narragansett Bay Region](#) visualizes the distributions of environmental benefits and burdens relative to underserved communities in the state and highlights inequities even within the Town of Westerly.

8. Planning Consistency and Restoration Priority

Is the proposed project consistent with the goals of a local, state or regional planning initiative? Please specify initiative and explain (see [CRMC website](#) for guidance). Does the proposed project involve a state, regional or federal priority habitat restoration need or special consideration? Please specify and explain (see [CRMC website](#) for guidance).

This parcel exemplifies the type of land that would be considered a priority for protection within the [RI Coastal and Estuarine Land Conservation Plan](#) boundary, as it abuts a coastal salt pond, and would provide recreational enjoyment of the coast, protect water resources, and expand existing natural habitat. At large, the conservation of salt marsh habitat on this parcel will ensure connectivity to a larger wetland system, and in turn contribute to a healthier salt pond for the public to enjoy through activities such as recreational fishing, aquaculture, kayaking, and swimming. Winnapaug Pond has extremely little public access – currently there is no town-owned access to the pond for recreational activities, however this is a primary goal of the Town of Westerly as indicated in their [2021 Comprehensive Plan](#). Protecting the Sorensen property will build more equitable access to coastal resources in the town and provide an easily accessible site for coastal educational opportunities. Additionally, this project is aligned with the priorities outlined in the [Rhode Island Coastal Wetland Restoration Strategy](#) (2018), which recognizes the preservation of habitat migration corridors as a vital management action to offset future wetland losses due to climate change.

9. Species of Concern

Will the project result in benefits to wildlife species listed as federally or state endangered, threatened, or species of concern within Rhode Island? Please specify which species will benefit and how. For a list of species, see the Rhode Island National Heritage Program's listing of animals at: http://www.rinhs.org/wp-content/uploads/ri_rare_animals_2006.pdf or a listing of plants at: http://www.rinhs.org/wp-content/uploads/ri_rare_plants_2007.pdf

Salt marshes located on this property support the health of Winnapaug Pond by improving water quality and providing nursery grounds and foraging habitat for species of fish, shellfish, birds, and mammals, many of which are listed as Species of Greatest Conservation Need through Rhode Island's [2015 Wildlife Action Plan](#). Habitat restoration in this area has a good potential to have long term benefits for the Diamondback Terrapin, a state endangered species, and in the review process for evaluation of a listing petition by USFWS. Winnapaug Pond was identified as having a high probability of serving as suitable nesting habitat for Diamondback Terrapin in [The Northern Diamondback Terrapin in the Northeastern United States: A Regional Conservation Strategy](#) (Egger, S., 2016). In addition, restored salt marsh habitat would serve as beneficial foraging and overwintering habitat for juvenile and adult terrapins. The [Atlantic Coast Joint Venture](#) has ranked the Sorenson property in the top 50% of RI salt marsh patches with potential to provide high quality, resilient habitat to support the Saltmarsh Sparrow population long term. Restoration of salt marsh habitat and creation of marsh migration corridors for the Saltmarsh Sparrow, likely to be listed by USFWS, is critical. Saltmarsh Sparrows have been detected off of Weekapaug Road, bordering Winnapaug Pond.

10. Permitting

List any federal, state or local permits required to complete the project and the permit application status for each.

Anticipated permit requirements include Section 401 Water Quality Certification, and a CRMC coastal assent. The selected consultant will develop permit applications in coordination with the project team.

11. Capacity of Lead Organization (attach additional materials if necessary)

Demonstrate the capacity of the lead and/or partner organizations to successfully complete the proposed project by providing any or all of the following: a) a description of the organization(s) b) resume(s) or summary of qualifications of involved personnel c) evidence of successfully completed habitat restoration or conservation projects.

The project team is well-qualified to implement the proposed activities. NBNERR is a NOAA-funded state federal partnership based within RIDEM that manages over 4,000 acres of state conservation land where it conducts monitoring, stewardship, restoration, and educational programs. NBNERR staff have expertise in coastal and estuarine habitats and ecological restoration, and will assist partners with site assessments, baseline condition reporting, restoration planning and monitoring of implemented actions. The Town of Westerly (the property owner) currently manages a public beach facility in close proximity to the project property and conducts education programs from the proposed project location through its Department of Recreation. Restoration partner Save The Bay's Habitat Restoration team has decades of experience increasing the resilience of coastal habitats throughout RI and has led four [restoration projects on Winnapaug Pond](#) in collaboration with the Weekapaug Foundation, Town of Westerly, Audubon Society of RI, RI DEM, and the Westerly Land Trust.

IV. SUSTAINABILITY (one page maximum)

1. Maintenance

What is the estimated "lifespan" of each planned restoration activity? What are the anticipated short-term and long-term (beyond the funding period) operation and maintenance requirements of the project? Specify who will be responsible for funding and carrying out each O & M activity. Indicate when and with what frequency activities will occur.

The five year plan for the property is to restore coastal wetland and buffer habitat through rehabilitation of the human-altered landscape of the former Water Wizz park while creating public access to Winnapaug Pond. A management plan is currently being developed for the property by NBNERR and the project team to address long-term needs such as habitat and public access maintenance, vulnerable species protection, and invasive species management.

2. External Factors

Identify existing external (off-site) factors that could reduce the chances of achieving the project goals (e.g. stormwater inputs to the site from the surrounding drainage area). Explain how these external factors will be addressed. Describe any additional measures taken to help ensure long-term success of the project (e.g. installation of stormwater management practices or securing of conservation easements). What are the likely future effects of climate change and future sea level rise on the proposed project and how will these be addressed?

This property is located in a Federal Emergency Management Agency (FEMA) Special Flood Hazard Area Zone AE, meaning it is located in a 100-year flood zone. Flood Zone AE presents a 1% chance of flooding on any given year, and around a 26% chance of flooding over a 30-year mortgage. High resolution modeling of sea level rise and coastal storm scenarios via the state's [STORMTOOLS viewer](#) estimates the flood depth for a 100-year event to be over 9 feet at this property. Additionally, a NOAA-funded project titled ["Modeling, Visualizing and Communicating Nor'easter and Hurricane Threats with Sea-level Rise to Support Coastal Management in New England"](#) quantified the impacts of sea-level rise and storm scenarios in the Winnapaug Pond area. Restoring habitat in a high hazard flood area will reduce monetary and physical risks due to direct storm. Given that this parcel is surrounded by properties that are classified as "Beyond Carrying Capacity" according to the Salt Pond Region SAMP, open and natural habitat that reduces flooding and storm surge impacts is a critical need. This project is centered around restoring salt marsh and future

marsh habitat and enhancing its resilience to climate change and sea-level rise. Restoring the upland portions of the property

VI. EVALUATING PROJECT SUCCESS (one page maximum)

- **Performance Measures**

How will the success of the project be measured in relation to the restoration goals set forth in this proposal? List performance measures and how they will be recorded. Include a detailed monitoring plan; if applicable (see below).

To evaluate project success, specific performance metrics to be measured will include 1) the total number of habitat acres restored and 2) the number of underserved youth programs that benefit from access to the property. The number of acres protected by habitat type will be finalized once a survey is completed on the property. The project team will establish target numbers of youth programs based on historical data and existing partnerships. The Recreation Department will keep records of attendance for all programs. Any site-specific monitoring will follow procedures outlined in the data management plan.

- **Monitoring Plan**

Describe any planned or completed pre- and post-project monitoring activities. For each monitoring activity list the frequency and month/year of start and end date and the parameters measured. List the entity or entities responsible for funding and carrying out each monitoring activity, and describe how results will be made available to CRMC and the public. If using an established monitoring protocol, please provide references (see CRMC website for information on established monitoring protocols).

NBNERR will assist the Town in developing a management plan for the property that is focused on maintaining and/or enhancing the conservation values of the property as they exist at the time of the execution of the Conservation Easement. Development of a management plan will allow the project team to work through the details of the vision for the use of the property, responsibilities of the Town and RIDEM related to long-term monitoring and maintenance, the activities permitted, and will ensure that permitted uses are consistent with the intent of the conservation easement. NBNERR is prepared to assist the Town with future site assessments and long-term monitoring of the property. The project team will solicit additional input from the Town of Westerly Recreation Department to discuss potential uses, access and signage needs and develop a shared vision that maximizes experiential learning while minimizing adverse impacts. In addition, NBNERR staff will work with the Town and partners such as Save The Bay to create a baseline monitoring report that details existing conditions of the property and documents ecological value. The baseline monitoring report will utilize as much existing data as possible, including USGS topo, USGS quadrangle, and color ortho maps; aerial photography; and RIDEM Environmental Resource maps. Habitat mapping will ground truth to verify existing flora and fauna species data using a 10m observation grid. The growing range of vegetative species will be calculated from real-time kinematic positioning (RTK) measurements to understand elevations of different vegetation communities. The baseline monitoring report will directly inform a subsequent restoration plan that will identify opportunities, strategies and methodologies for habitat restoration and enhancement.

VII. PROJECT BUDGET

BUDGET CATEGORY	CRMC REQUEST	MATCH	MATCH PENDING OR SECURED? (select one)	SOURCE OF MATCH	TOTAL
Existing conditions plan development and data collection	\$15,000				\$15,000
Restoration Design	\$50,000				\$50,000
Permitting	\$10,000				\$10,000
Mobilization and Site Preparation	\$10,000				\$10,000
Conservation Easement Purchase		\$2.56M	Secured	NOAA BIL	\$2.56M
TOTAL	\$85,000	\$2.56M		TOTAL PROJECT COST	\$2,645,000

VIII. BUDGET NARRATIVE (one page maximum)

Please provide a description and justification for each line item included in the project budget form (e.g. for personnel costs, provide hourly and fringe rates, for travel specify rate and estimated number of miles). Please specify any match requirements for each source of funding. Please include costs associated with required annual and final reports to CRMC. Be sure to detail how CRMC funds will be used.

Total cost of restoration design, permitting, and site preparation is anticipated to be \$85,000. The project team will continue to pursue funding to cover the full cost of construction of the restoration project. This and the requested funds will leverage \$2,560,000 in federal funding that was used to purchase the conservation easement on the property. Additional local funding from the town for material removal is expected to be leveraged.

IX. ADDITIONAL MATERIALS

Please include the following with your application:

 X Site and Locus Maps

 X Ground-level photographs of existing site conditions

 X Aerial photographs, if available

 N/A Preliminary design drawings, maps or engineering plans, if available

 X Pertinent physical, ecological, biological, and cultural / historical survey data

- Former Water Wizz Parking Plan
- Soil Testing Report

 Letters of support

AUTHORIZED SIGNATURE

AUTHORIZED AGENT OF LEAD ORGANIZATION

Signature

Date

Return your completed proposal by 4:00 p.m. on **March 3, 2025** to:

Bruce Lofgren
RI Coastal Resources Management Council
Oliver Stedman Government Center
4808 Tower Hill Road
Wakefield , RI 02879
blofgren@crmc.ri.gov

Applicants are required to submit one (1) signed hard copy of the proposal form and one (1) electronic copy in Adobe PDF format. ****Please submit electronic copy as a SINGLE PDF FILE containing all application materials.****

Contact Bruce Lofgren at by email or **401-782-4196** with any questions.



Sorensen Property, Westerly RI



1/10/2024

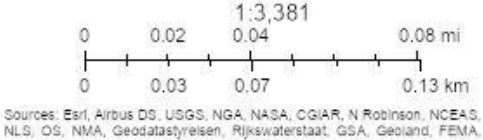




Figure SFHA-1
Special Flood Hazard Areas (SFHAs)

THIS MAP DEPICTS THE SPECIAL FLOOD HAZARD AREAS (SFHAs) WITHIN THE TOWN OF WESTERLY AS DEPICTED ON NFIP PROVIDED DFIRM GIS DATA

Legend

- Special Flood Hazard Area**
SFHA (-5801 acres)
- AE Zone (Floodway) ~ 205 acres
 - AE Zone ~ 1,763 acres
 - VE Zone ~ 567 acres
 - A Zone ~ 1,763 acres
 - Zone X (500-Year Floodplain) ~ 798 acres

Total 100-Year Flood Zone Area (A, AE, VE) ~ 4,282 acres
Total Town Acreage (excluding large ponds) ~ 18,867 acres
23% of Town is within 100-Year Flood Zone Area

FEMA, FIRM. Effective April 3, 2020. National Flood Hazard Layer (NFHL) Version 1.1.1.0 <<https://msc.fema.gov/>> (last accessed: December 22, 2020).



September 2022

Town of Westerly
Rhode Island

This map is for informational purposes and may not have been prepared for, or be suitable for, assessment, legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.



Aerial images of the Sorensen Property and surrounding land use of Atlantic Avenue, courtesy of Zillow.



Aerial images of the Sorensen Property and surrounding land use of Atlantic Avenue, courtesy of Zillow.



#3 View of Mound on Western side of Building Facing Northerly from Roadway



#4 View of Rear of Building facing Westerly



#5 View of area to the Rear of the Building facing Northerly



#6 View of Northern Portion of Subject's Upland Area facing Westerly



#7 View Winnapaug Pond and Rear of Subject facing Northwest



#8 View of Improvement from Mound facing Southeasterly



#9 View facing East along Atlantic Avenue



#10 View facing West along Atlantic Avenue

Date: July 23, 2024
BETA Project No.: 11051

To: Kyle Zalaski, PE
Town Engineer
Town of Westerly, RI
68 White Rock Road, Westerly RI 02891

From: Steven Richtarik, PE
BETA Group, Inc.

Subject: Environmental Assessment Memo – Former Water Wizz Facility

Attachments: Figure 1 – Sample Locations
Table 1 – Summary of Soil Analytical Results
Laboratory Analytical Report

Introduction

BETA Group, Inc. (BETA) has prepared this memorandum to present the results from the soil sampling program that took place on July 1, 2024, at the former Water Wizz facility in Westerly, Rhode Island. Water Wizz, which was situated at 328 Atlantic Avenue (Assessor's Plat 166, Lot 19), operated from approximately 1979 to 2019. To construction of water slides at the facility a large volume of soil (approximately 20,000 cubic yards) of unknown origin was imported to the site to raise grade. This soil was the subject of this sampling program.

Sampling Program

To facilitate sample collection, ten (10) test pits were excavated within the soil pile with a backhoe by personnel from the Town of Westerly's Department of Public Works. Test pit/sampling locations are shown on the aerial photograph provided as Figure 1.

BETA prepared one composite soil sample at each test pit location. Composite samples, labeled Stockpile Sample A through Stockpile Sample J, were prepared from discrete soil samples collected at depth intervals of approximately 0-2 feet, 4-6 feet, and 6-8 feet below ground surface. Each discrete sample was field screened for the presence of total volatile organic compounds (TVOCs) with a Photoionization Detector (PID) equipped with a 10.6 eV lamp calibrated to a 100 parts per million (ppm) isobutylene reference standard. Soil screening activities did not identify concentrations of TVOCs above background levels.

Soil types were generally consistent throughout. The upper layer consisted of brown sandy loam with trace amounts of gravel. Below that soil was predominantly fine sands. It should be noted that bits of asphalt were entrained in the soil excavated at Test Pit Location "H". Due to overgrown roots/trees, possible old water line/piping from the former water park, and steep inclines, some areas of the stockpile were inaccessible.

Findings

Composite soil samples were analyzed by ESS Laboratory in Cranston, Rhode Island for the following:

- Volatile Organic Compounds (VOCs) by EPA Method 8260

- Polynuclear Aromatic Hydrocarbons (PAHs) by EPA Method 8270
- 16 Metals by various methods
- Total Petroleum Hydrocarbons (TPH) by EPA Method 8100M
- Polychlorinated Biphenyls (PCBs) by EPA Method 8082
- Asbestos
- Flashpoint
- pH

Analytical results are presented in Table 1 and summarized as follows:

- PAHs were identified above applicable Rhode Island Department of Environmental Management Method 1 Residential Direct Exposure Criteria (RDEC) in Stockpile Samples H, I and J:
 - Benzo(a)anthracene (Sample H)
 - Benzo(a)pyrene (Samples H, I and J). The concentration in Samples H and J also exceeded the State's Industrial/Commercial DEC
 - Benzo(b)fluoranthene (Sample H)
 - Benzo(g,h,i)perylene (Sample H)
 - Benzo(k)fluoranthene (Sample H)
 - Chrysene (Samples H, I and J)
 - Indeno(1,2,3-cd)Pyrene (Sample H)
- Several metals were detected at concentrations above laboratory reporting limits but below their respective RDEC.
- TPH was detected in Stockpile Samples H, I, and J above laboratory reporting limits but below the RDEC.
- VOCs, PCBs and asbestos were not detected in any of the samples.

The complete laboratory report is also attached to this memorandum.

Conclusions

Several PAHs in the composite samples at Test Pits H, I and J were detected at concentrations exceeding their respective RDEC and/or Industrial/Commercial DEC. . These sampling locations are at the northern and eastern sides of the soil pile. Asphalt fragments were observed in soil at Test Pit H, which could represent the source of the PAHs at this location.

With further sampling, it may be possible to delineate impacted soil in proximity to Test Pits H, I and J from other soil in the pile. The impacted soil must be appropriately managed. If it is to remain on-site, it must be covered with an appropriate engineered barrier. If it is to be excavated and removed from the site, it must be disposed at an appropriately licensed facility.



LEGEND

A Test Pit/Sampling Location



Figure 1 - Sampling Plan

328 Atlantic Ave
Westerly, RI

**Rhode Island Coastal and Estuary Habitat Restoration Fund
Full Proposal Form for Planning Projects 2024/2025**

****for design or construction projects please use Full Proposal Form**

I. PROJECT SUMMARY

1. **Project Title:** Salt marsh habitat improvement and Phragmites suppression in a protected marsh
 2. **Project Location and coordinates** (*include map*): Racquet Road Wildlife Refuge
 3. **Habitat type** (*River System, Salt Marsh, Seagrass, Shellfish Bed, other*): Salt marsh primary, plus forested swamp, shrubland (in Narragansett Bay SAMP)
 4. **If other, please specify:**
 5. **Targeted restoration technique** (*e.g. re-vegetation, tidal restoration, etc.*): Marsh flow improvement, control of invasives, revegetation of native plants
 6. **Potential future benefits resulting from proposed planning project:** Suppression of invasive plants leading to enhanced marsh function and resiliency with sea level rise
 7. **Project partners** (*organizations providing financial or other support to the project*): Save The Bay
 8. **Is this is an ongoing project that has previously received funds from the CRMC Coastal and Estuarine Habitat Restoration Fund?** **No** **If yes, year(s) funding was awarded: N/A**
-

II. PROJECT MANAGER CONTACT INFORMATION

1. **Name:** Scott Ruhren
2. **Organization:** Audubon Society of Rhode Island
3. **Address:** 12 Sanderson Road
4. **City:** Smithfield **5. State:** RI **6. Zip:** 02917
7. **Phone:** 401-949-5454 (x3004) **8. Email:** sruhren@asri.org
9. **Property Owner(s):** Audubon Society of Rhode Island

III. BUDGET SUMMARY

(List individuals or organizations providing financial or in-kind support to the project under Project Partners)

Amount Requested from Trust Fund		\$21,076
Matching Funds	Project Partner(s)	Amount of Match
	Save the Bay	\$930
	Private support to Audubon	\$2,900
	TOTAL PROJECT COST	\$24,906

IV. PROPOSAL NARRATIVE

1. Justification and Purpose

Briefly describe the proposed planning project. What questions does it propose to answer? What are the restoration goals and anticipated long-term and short-term outcomes. Describe the human impacts and previous restoration activities within the proposed study area. If the project area includes multiple impacted sites, please describe the impacts and previous restoration activities at each.

The proposed project area has a long history of human impacts including a road restricting tidal flow, historical agricultural work, wall construction and ground and surface water flow from house sites. In conjunction with Save the Bay (STB), we propose steps to improve salt marsh function through enhanced inflow of salt water and drainage of fresh water. Approximately 10 years ago, as part of a USDA-NRCS WHIP project and collaboration with Jamestown, the town installed two culverts connected to the bay, under the existing road and beyond the sandy beach, replacing one smaller existing culvert, allowing better inflow and outflow. The goal was to maintain salt marsh community structure and slow the spread of Phragmites. Phragmites have not been cut or treated directly by Audubon and it has spread along the creek since culvert improvements.

Using established techniques such as frequent cutting, without herbicides, and improved marsh creek flow, we propose that Phragmites can be reduced in vigor and spread allowing for native vegetation to recover in affected areas. This would require a 10-year management assent for repeated vegetation cutting. Hydrologic improvements should enhance these efforts.

The marsh is in a drainage basin with houses, roads and roadside ditches historically designed to drain into the refuge and eventually the marsh. Because one of the increasing problems on this marsh is too much fresh water, the creek and culverts will be cleared of any blockages and maintained as needed.

A separate smaller component of this project is proposed to reduce invasive plants and add native pollinator plants in two roadside patches that are already treeless. This will require brush-hogging then seeding cleared areas and planting plugs of native plants.

2. Project Activities, Schedule and Work Plan

Describe the planned project activities, and explain how each activity will help to plan for restoration of ecosystem functions. List specific project activities and when they will occur (month and year). Indicate when annual and final project reports will be submitted.

April-July 2025 – Breeding bird assessment and vegetation documentation as baseline

December 2025-February 2026 – Cutting Phragmites; Culvert cleaning, ditch clearing, creek improvement; Annual report submitted

October 2025 – January 2026 – Site prep and planting for pollinators in two roadside patches

December 2026 – February 2027 – Follow-up Phragmites cutting and creek and culvert maintenance as needed; Annual report submitted

3. Coordination and Public Support

How will the project lead organization coordinate with other stakeholder groups, and which groups will be included? Describe planned or completed community / stakeholder education and outreach efforts.

Audubon will collaborate with Save The Bay on creek excavation and permitting with State and Federal agencies. Many neighbors, other Jamestown residents and visitors to the nearby boatyard have been following the expansion of the Phragmites population at Racquet Road. They have also noticed the increase of invasive plants in the upland habitat and roadsides.

Frequent outreach by Audubon to the neighborhood and Audubon supporters will occur. This population will be invited to help with bird and pollinator monitoring.

4. Planning Consistency and Restoration Priority

Is the proposed project consistent with the goals of a local, state or regional planning initiative? Please specify initiative and explain (see [CRMC website](#) for guidance). Does the proposed project involve a state, regional or federal priority habitat restoration need or special consideration? Please specify and explain (see [CRMC website](#) for guidance).

The proposed project supports CRMC's mission to preserve, protect and restore, when needed, the coastal resources of Rhode Island.

5. Species of Concern

Does the planning project address threats to wildlife species listed as federally or state endangered, threatened, or species of concern within Rhode Island? Please specify which species will benefit and how. For a list of species, see the Rhode Island National Heritage Program's listing of animals at: http://ww.rinhs.org/wp-content/uploads/ri_rare_animals_2006.pdf or a listing of plants at: http://www.rinhs.org/wp-content/uploads/ri_rare_plants_2007.pdf

The planning project would enhance bird survival. Heron, egrets and Glossy Ibis, many RI species of Concern, use the marsh during the summer and as a migratory stopover point. It is likely that Rails do as well. Common Yellowthroat and Red-winged Black Birds, priority birds for Audubon, also inhabit the marsh during the breeding season.

Monarch butterflies and bumble bees would benefit from pollinator enhancements.

6. Climate Change and Coastal Resiliency

How will present and future impacts of climate change be considered during the project planning and design phases? What impact will the final project have on resilience of coastal or estuarine habitat to climate change?

This project proposes to maintain and improve existing coastal habitat degraded by ponding of water on the marsh. This condition supports an invasive Phragmites stand and threatens the native salt marsh community. Enhanced tidal flow is necessary to deal with more frequent flooding higher tides and storms.

7. Environmental Justice

Will the proposed project take place within or otherwise benefit environmental justice “priority areas” as defined by the Narragansett Bay Estuary Program’s analysis of [Environmental Justice in the Narragansett Bay Region](#)? Does the proposed project incorporate Environmental Justice concerns as defined by the US EPA’s Guidance on [Environmental Justice and Equitable Development](#)?

This project does not take place within an environmental justice priority area,

8. Permitting

List any federal, state or local permits required to complete the project and the permit application status for each.

Three agencies will be contacted for permitting of proposed activities. These are CRMC, RIDEM wetlands and ACOE for creek and sediment work. This process has not started.

9. Capacity of Lead Organization (attach additional materials if necessary)

Demonstrate the capacity of the lead and/or partner organizations to successfully complete the proposed project by providing any or all of the following: a) a description of the organization(s) b) resume(s) or summary of qualifications of involved personnel c) evidence of successfully completed habitat restoration or conservation planning projects.

The Audubon Society of Rhode Island has a long record of successful habitat management including projects within coastal zones. As project lead, I have nearly 30 years of conservation and restoration projects from NJ to RI (resume attached).

I have guided twenty years of habitat restoration projects partially funded through USDA-NRCS. These include the following:

- 2024-present – Coastal grassland and pollinator restoration at the Touisset Marsh Wildlife, Warren, RI
- 2024-present – Coastal grassland and pollinator restoration at the Haffenreffer Wildlife Refuge, Little Compton, RI
- 2021-present – Bird and pollinator habitat improvement and restoration at the Kingston Wildlife Research Station
- 2012-2015 – New England cottontail habitat restoration and management, Exeter, RI
- 2012-2015 – New England cottontail habitat restoration and management, Westerly, RI
- 2010-2012 – Control of *Phragmites australis* in salt marsh of Lathrop Wildlife Refuge, Westerly, RI
- 2009 – Control of *Phragmites australis* in salt marsh of Emilie Ruecker Refuge, Tiverton, RI
- 2008 – Biological control of *Lytbrum salicaria* along the Hunt River in Davis Memorial Wildlife Refuge, North Kingstown, RI
- 2006-2011 – Wildlife habitat improvement and restoration at the Kingston Wildlife Research Station, RI
- 2005-2011 – Warm season grassland restoration and invasive species management at Newman Farm, Gloucester & Smithfield, RI

10. External Factors and Climate Change

Identify existing external (off-site) factors that may be affecting habitat within the study area. How will external factors be considered? What are the likely effects of climate change and sea level rise within the study area and how will these be considered?

The excess standing fresh water may be supporting the Phragmites as much as the decline in salt water flushing. As a basin, the refuge receives drainage from upland sources, mainly the houses and the public road with several culverts flowing into the subject parcel. The current road creates some flow restrictions in the low elevation, east side bordering the beach and bay. The road is not likely to be closed or removed because of neighborhood use, access and safety considerations etc. The topic has been discussed with conservation partners, but not broached with the community. Still, the road has been occasionally flooded during king tides and storms.

V. EVALUATING PROJECT SUCCESS (one page maximum)

1. Performance Measures and Deliverables

How will the success of the project be measured in relation to the restoration goals set forth in this proposal? List all deliverables (e.g. reports, updates, websites, etc.) associated with the project.

Success will be measured first broadly by Phragmites population vigor, plant height etc. and the recovery of associated native marsh vegetation after cutting and marsh flow improvements. Focus monitoring will also be on marsh biota including birds and invertebrates, water flow, salinity and marsh platform drainage.

Deliverables will include:

- Marsh monitoring reports focused on marsh community dynamics before, during and after creek restoration and Phragmites control. Bird breeding surveys will be recorded as well.
- Pollinator monitoring will occur in the proposed pollinator restoration patches.
- Outreach will occur on Audubon website and social media, focused on project rationale, progress and successes. This will include marsh restoration and pollinator patches.

2. Monitoring Plan

Describe any monitoring activities that are part of the planning project. For each monitoring activity list the frequency and month/year of start and end date and the parameters measured. List the entity or entities responsible for funding and carrying out each monitoring activity, and describe how results will be made available to CRMC and the public. If using an established monitoring protocol, please provide references (see CRMC website for information on established monitoring protocols).

Breeding bird surveys (May-August 2025-2027) by Audubon staff and volunteer swill be conducted one day per week at approximately the same time each day on clear weather days. Results will be compiled in a report on biota for CRMC. Results will also be linked on Audubon's website and science pages.

Plant community composition will be determined through fixed point quadrats in a transect from the marsh edge along the road into and beyond the Phragmites population. This data will be compiled before and after restoration from May 2025 until December 2027

VI. PROJECT BUDGET TEMPLATE

BUDGET CATEGORY	CRMC REQUEST	MATCH	MATCH PENDING OR SECURED? (select one)	SOURCE OF MATCH	TOTAL
Phragmites cutting	\$3,720	\$700	Secured	Audubon staff and private	\$4,420
Marsh creek improvement - equipment (STB)	\$3,658	\$630	Pending	Save the Bay	\$4,288
Marsh creek improvement – labor, 3 years	\$5,580	\$900	Secured	Audubon staff and private	\$6,480
Permitting & Agency Outreach (STB)	\$1,860	\$300	Pending	Save the Bay	\$2,160
Pollinator habitat restoration	\$3,240	\$600	Secured	Audubon staff and private	\$3,840
Monitoring pre and post, marsh and pollinators	\$744	\$500	Secured	Audubon staff and private	\$1,244
Reporting	\$372	\$200	Secured	Audubon staff and private	\$572
Overhead (10%)	\$1,902				\$1,902
TOTAL	\$21,076	\$3,830		TOTAL PROJECT COST	\$24,906

9. BUDGET NARRATIVE (one page maximum)

Please provide a description and justification for each line item included in the project budget form (e.g. for personnel costs, provide hourly and fringe rates, for travel specify rate and estimated number of miles). Please specify any match requirements for each source of funding. Please include costs associated with required annual and final reports to CRMC. Be sure to detail how CRMC funds will be used.

CRMC Restoration Trust Fund Application – Budget Narrative – Audubon Society of RI 2025

Phragmites cutting and control:

Audubon staff labor 100 hours x \$30/hr. = \$3,000 + \$720 (24% fringe) =	\$3,720
Match = Audubon volunteers	\$700
Total:	\$4,420

Marsh creek improvement, equipment, travel: Save the Bay

STB excavator rental and operation	\$2,000
Travel 60 miles round trip	\$950
Total \$2,950 + \$708 (24% fringe) =	\$3,658

Marsh creek maintenance: Three years

Audubon staff labor: 100 hours x \$30/hr. = \$3,000 + \$720 (24% fringe) =	\$3,720
Audubon staff labor: 50 hours x \$30/hr. = \$1,500 + \$360 (24% fringe) =	\$1,860
Match = Audubon volunteers	\$900
Total:	\$6,480

Permitting and agency outreach:

Save The Bay staff: 50 hours x \$30/hr. = \$1,500 + \$360 (24% fringe) =	\$1,860
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Pollinator habitat restoration:

Audubon staff labor: 50 hours x \$30/hr. = \$1,500 + \$360 (24% fringe) =	\$1,860
Materials (seeds, plants)	\$1,380
Match = Audubon volunteers	\$600
Total	\$3,840

Monitoring pre and post, marsh and pollinators:

Audubon staff labor: 20 hours x \$30/hr. = \$600 + \$144 (24% fringe) =	\$744
Match = Audubon volunteers	\$500
Total	\$1,244

Reporting

Audubon staff labor: 10 hours x \$30/hr. = \$300 + \$72 (24% fringe) =	\$572
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IX. ADDITIONAL MATERIALS

Figure 1. Project site, green outline, Racquet Road Wildlife Refuge. Jamestown, Rhode Island with surrounding road, house lots and Narragansett Bay shown..

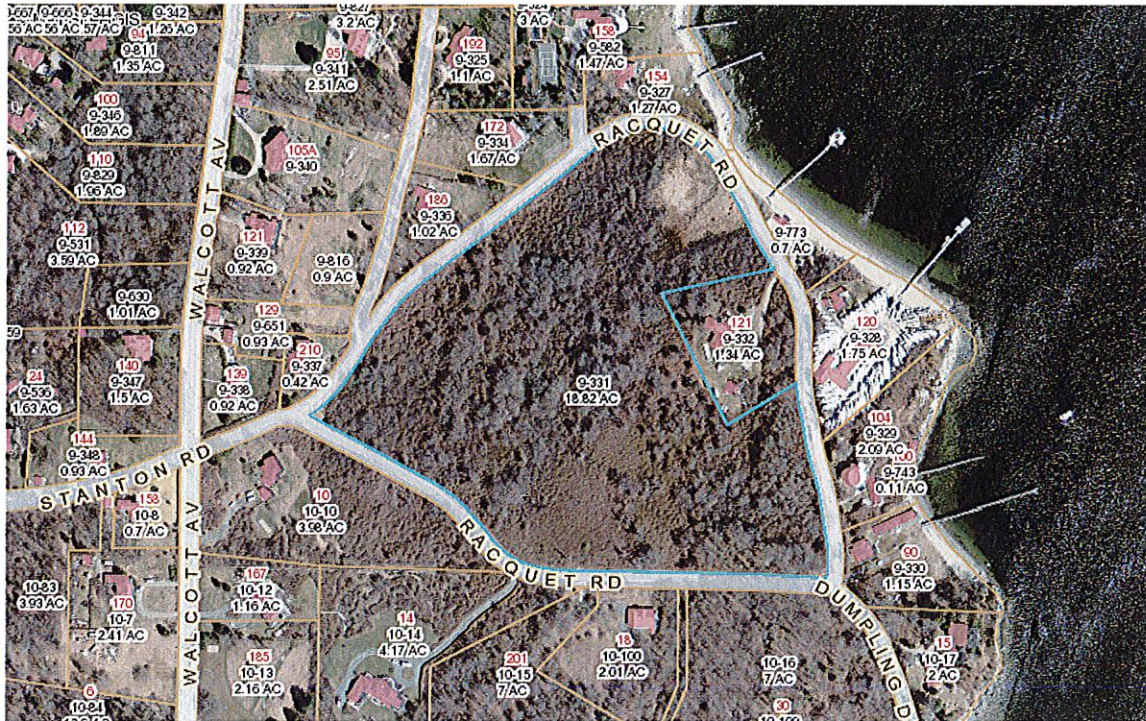


Figure 2. Zoomed-in view of salt marsh showing creek outflow to Narragansett Bay and approximate location of dirt road, Racquet Road Wildlife Refuge. Jamestown, Rhode Island.



Figure 3. Racquet Road Wildlife Refuge. Jamestown, Rhode Island, showing extent of wetlands. (Some shape shifting on map.)



Figure 4. Marsh looking east with Phragmites in rear, Racquet Road Wildlife Refuge. Jamestown, Rhode Island, 13 July 2024. (Photograph by Scott Ruhren)



Figure 5. Marsh-road edge looking north, Racquet Road Wildlife Refuge. Jamestown, Rhode Island, 13 July 2024. (Photograph by Scott Ruhren)



Figure 6. Standing water in Phragmites, Racquet Road Wildlife Refuge. Jamestown, Rhode Island, 10 January 2025. (Photograph by Scott Ruhren)



Figure 7. Culverts connecting to Narragansett Bay, Racquet Road Wildlife Refuge. Jamestown, Rhode Island, 10 January 2025. (Photograph by Scott Ruhren)



Figure 8. Isolated pools on marsh recommended for ditch restoration, Racquet Road Wildlife Refuge. Jamestown, Rhode Island, 10 January 2025. (Photograph by Scott Ruhren)

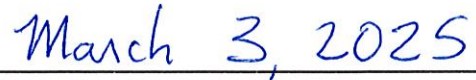


AUTHORIZED SIGNATURE

AUTHORIZED AGENT OF LEAD ORGANIZATION



Signature



Date

Return your completed proposal by 4:00 p.m. on **March 3, 2025** to:

Bruce Lofgren
RI Coastal Resources Management Council
Oliver Stedman Government Center
4808 Tower Hill Road
Wakefield , RI 02879
blofgren@crmc.ri.gov

Applicants are required to submit one (1) signed hard copy of the proposal form and one (1) electronic copy in Adobe PDF format. ****Please submit electronic copy as a SINGLE PDF FILE containing all application materials.****

Contact Bruce Lofgren at by email or **401-782-4196** with any questions.



SCOTT RUHREN, PH.D.
SENIOR DIRECTOR CONSERVATION

Audubon Society of Rhode Island
12 Sanderson Road
Smithfield, Rhode Island 02917
401-949-5454 sruhren@asri.org

SUMMARY OF QUALIFICATIONS

Conservationist with broad experience in field investigations, habitat assessments, baseline documentation and restoration of natural communities. Proficient in identification of plants and animals. Experienced nonprofit manager with fundraising, board, budgetary and supervisory experience. Workshop and field trip leader, successful report and grant writer, university instructor and public speaker.

PROFESSIONAL EXPERIENCE

Management

- Managed and balanced departmental budget (\$200,000) with fiscal responsibility
- Guided staff, board members, volunteers and interns in statewide conservation efforts
- Oversaw conservation projects and long-term restoration sites
- Contributed to organizational strategic planning
- Complied with grant requirements from USDA and Fish and Wildlife
- Assumed complete responsibility for long-term research projects with partners
- Trained interns, land trusts and garden club volunteers in biological survey techniques
- Supervised and mentored teaching and research assistants and advised students and interns

Communication and Outreach

- Published research findings in peer-reviewed science journals
- Presented research results at international meetings; moderated sessions at scientific meetings
- Cultivated donors while serving as Audubon ambassador
- Prepared reports and ecological recommendations for state, private and commercial clients
- Researched and designed guides to plants of a national park and university arboretum
- Led interpretive walks for Audubon, The Nature Conservancy and National Park Service
- Reviewed and edited scientific journal manuscripts and books
- Judged elementary, middle and high school science fairs

Conservation

- Conducted grant-funded independent and collaborative research in ecology, conservation and restoration of rare plants and animals including salt marsh and estuarine habitats
- Assessed forest health and suitability for northeastern birds
- Evaluated the effect of native and invasive shrubs on forest ecology
- Determined the impact of deer and small mammals on conservation and restoration of habitats
- Restored native wildflowers and natural communities in degraded terrestrial and wetland habitats
- Monitored rare and endangered plants and animals
- Assessed the biological condition of terrestrial and aquatic hazardous waste sites

Teaching

- Coordinated experiential learning projects in field and laboratory classes

- Taught university-level science courses in: Biology and Society, General Biology, General Ecology, Applied Ecology, Plant Ecology, Environmental Biology, Botany, Marine Botany, Biology of Algae
- Served as a curriculum advisor in graduate ecology program

EMPLOYMENT HISTORY

Senior Director of Conservation

The Audubon Society of Rhode Island, Smithfield, RI, June 2005-present

Science Projects Coordinator, Part Time

The Watch Hill Conservancy, Westerly, RI, March 2013-December 2014

Adjunct Professor

College of Continuing Education, University of Rhode Island, Kingston, RI, August 2004-present

School of Continuing Education, Providence College, Providence, RI, August 2004-December 2007

Instructor, Researcher and Advisor

Department of Biology, University of Rhode Island, Kingston, RI, August 2001-August 2004

Project Manager and Postdoctoral Research Associate

Center for Urban Restoration Ecology, Rutgers University, New Brunswick, NJ June 1998-August 2001

Research and Teaching Assistant

Department of Ecology and Evolution, Rutgers University, New Brunswick, NJ September 1994-May 1998

PROFESSIONAL SERVICE:

Committee Member –

Forest Conservation Commission – current

Rhode Island Woodland partnership - current

Climate Change Vulnerability Assessment Tool for Coastal Habitats – 2016

Technical Habitat Conservation Advisory Committee – RI Department of Environmental Management

Steering Committee – Rhode Island Freshwater Wetland Restoration Strategy Team, 2010-present

Steering Committee and Reviewer – Forest Resources Assessment and Strategies, 2010. RI Department of Environmental Management, Division of Forest Management.

Steering Committee – Rhode Island Forest Health Works Project

Contributor – “Conservation Easement Guidance Manual,” RI department of Environmental Management

Workshop Leader and Proctor – Rhode Island Envirothon, annual competition, 2008-2015

Science Training Advisor – Narragansett Bay Watershed Coastal Training Program, January 2006-2008

Manuscript Reviewer – *American Journal of Botany*, *International Journal of Plant Sciences*, *Torrey Botanical Society*

Book Reviewer – *Plant Science Bulletin*, 2000-present; Sinauer Associates, Inc., Spring 2004-present.

EDUCATION

Ph.D. 1998 Ecology and Evolution. Rutgers, The State University of New Jersey

M.S. 1994 Botany. University of Maryland, College Park

B.S. 1987 Plant Science. Rutgers, The State University of New Jersey

AWARDS AND HONORS

State Open Space Grant, 2012, 2017, 2024 – To purchase habitat for conservation. RI Department of Environmental Management.

Professional Conservationist of the Year, 2014 – Southern Rhode Island Conservation District

Governor’s Science Advisory Committee – Rhode Island Bays, Rivers and Watersheds Coordination Team, 2010-2011

CONSERVATION GRANTS

United States Department of Agriculture - Natural Resources Conservation Service –

- 2024-present – *Coastal grassland and pollinator restoration at the Touisset Marsh Wildlife, Warren, RI*
- 2024-present – *Coastal grassland and pollinator restoration at the Haffenreffer Wildlife Refuge, Little Compton, RI*
- 2021-present – *Bird and pollinator habitat improvement and restoration at the Kingston Wildlife Research Station*
- 2012-2015 – *New England cottontail habitat restoration and management, Exeter, Rhode Island*
- 2012-2015 – *New England cottontail habitat restoration and management, Westerly, Rhode Island*
- 2010-2012 – *Control of Phragmites australis in salt marsh of Lathrop Wildlife Refuge, Westerly, Rhode Island*
- 2009 – *Control of Phragmites australis in salt marsh of Emilie Ruecker Refuge, Tiverton, Rhode Island*
- 2008 – *Biological control of Lythrum salicaria along the Hunt River in Davis Memorial Wildlife Refuge, North Kingstown*
- 2006-2011 – *Wildlife habitat improvement and restoration at the Kingston Wildlife Research Station*
- 2005-2011 – *Warm season grassland restoration and invasive species management at Newman Farm, Gloucester, Smithfield.*

March 3, 2025

Bruce Lofgren
RI Coastal Resources Management Council
Oliver Stedman Government Center
4808 Tower Hill Road
Wakefield, RI 02879

Dear Bruce,

I am writing on behalf of Save The Bay in support of the Audubon Society of Rhode Island's proposal "Salt marsh habitat improvement and *Phragmites* suppression in a protected marsh" to the Rhode Island Coastal and Estuarine Habitat Restoration Fund. Save The Bay has collaborated with the Audubon Society of Rhode Island (ASRI) on multiple salt marsh restoration projects at other Audubon owned refuges over the past 10 years. For the Racquet Road salt marsh, we have conducted a site visit to the marsh and assisted the Senior Director of Conservation with developing a salt marsh restoration plan for the site.

This proposal will address the invasive plant, *Phragmites australis*, which has clogged a small freshwater tributary to Narragansett Bay causing the *Phragmites* to expand onto the salt marsh platform in recent years. The existing high marsh is good condition and is threatened by further expansion of *Phragmites* due to freshwater becoming impounded on the marsh platform, creating conditions to allow *Phragmites* to thrive and outcompete native high marsh vegetation.

Save The Bay will be an active participant in this project providing in-kind services of staff time on the finalizing the restoration plan and during the permitting and implementation stage. Save The Bay is also written into the budget to assist ASRI on developing the state and federal permit applications for the creek excavation and *Phragmites* management and for operating the state's low ground pressure excavator.

We look forward to continuing our partnership with ASRI on this and other salt marsh restoration projects.

Sincerely,



Wenley Ferguson
Director of Restoration