Detailed Project Description

Part 1) Executive Summary

The proposed work consists of stream restoration and floodplain creation within a severely eroding and flood prone reach of the Wissahickon Creek. This stream is a highly used, yet significantly impaired waterbody with multiple TMDLs for nutrients and sediment, an approved Act 167 plan, and has been identified as a state-wide restoration priority by PADEP. Many mapped Environmental Justice Communities are passed through by the Wissahickon Creek and sections of the Schuylkill River to which the creek is tributary, further contributing to the project's expected benefits.

Both the causal factors contributing to the erosion and the rate of bank erosion have been carefully studied and quantified by experienced geomorphologists and hydraulic engineers funded through the project applicant, Responsible Preservation Incorporated (RPI). Importantly, this investigation has directly quantified the rate of outer bank erosion through aerial photograph comparisons for a 25-year period. These measured rates corroborate well with predicted rates developed using regional bank erosion curves developed by the U.S. Fish and Wildlife Service and suggest that extreme rates of erosion are atypical for the region. Additionally, the investigators have visually observed bank collapse during recent events this spring and a worsening of bank conditions following these events.

The design approach will comprehensively address the observed erosion by placing the stream into a lower energy state through channel realignment and lowering. Unlike bank stabilization projects, this approach solves the root problem of excess slope and stream power that is the underlying cause of rapid stream migration rates. The channel bed lowering will also provide an opportunity to create and lower floodplain surface, resulting in significant flood mitigation benefits for adjacent Chestnut Hill College, a notable academic institution in northwest Philadelphia, and the creation/restoration of 9 acres of floodplain forest. The College has experienced significant damage to parking lots, ball fields, and other infrastructure during recent years. Additionally, the project will contribute to flood mitigation downstream. Notably the project is just above the Wissahickon Creek Park, which has suffered significant damage to historically significant structures from flooding in the past 10-20 years in additional to multiple slope failures along the Wissahickon Creek that pose significant public safety risks.

The proposed work is supported by and meaningfully contributes to local and regional watershed efforts including the alternative TMDL process being led by the Montgomery County Planning Commission, as well as watershed restoration efforts led by the two prominent non-profits in the watershed, Wissahickon Trails and the Friends of the Wissahickon.

In addition to core flood mitigation and pollutant load reduction benefits, the proposed work will also provide educational benefits, providing an opportunity for students at Chestnut Hill College enrolled in the College's environmental science program a chance to observe and participate in a real-world restoration project. Additionally, the applicant anticipates an opportunity to add a

recreational trail within the project area that could link Forbidden Drive with the Green Ribbon Trail network in Montgomery County.

The project applicant has significantly invested in the development of this project, well exceeding the required 15% match solely in terms of investments to date. This work has included funding a detailed geomorphic and hydraulic study and the development of informed and technically rigorous project concepts, funding related legal and historical research work, and coordinating extensively with local stakeholders, landowners, and residents, including an in-person and zoom presentation of the geomorphic study results prior to this application.

Part 2) Environmental Need

The proposed work addresses a pressing environmental need of reducing sediment and phosphorus loading within the Wissahickon Creek through active restoration of an acute and worsening stream erosion issue. The Wissahickon Creek is listed as impaired for Aquatic Life, Recreational Use per the 2022 Pennsylvania Department of Environmental Protection (PADEP or DEP) Integrated Report. A draft Total Maximum Daily Load (TMDL) for Total Phosphorus was developed by in 2015 (United States Environmental Protection Agency (USEPA), while nutrient and siltation (sediment) TMDLs were established for the Wissahickon Creek in 2003. The 2015 draft TMDL provides extensive evidence linking nutrient enrichment, and specifically phosphorus, to aquatic life impairment in the Wissahickon. These include studies by the Academy of Natural Sciences and Philadelphia Water Department in 2007. In response to the draft TMDL for total phosphorus released in 2015, USEPA Region 3 is now working with a group of watershed stakeholders led by the Montgomery County Planning Department and the Philadelphia Water Department to develop a TMDL alternative for nutrients.

Given the key role of bank erosion in contributing to total phosphorus loading as well as sediment loading (Dewolf et al., 2004, Langendoen, 2012, Simon et al., 1996, Kronvang et al., 2012; Laubel et al., 2003) projects that address bank erosion, particularly in ways that reflect DEP's stream restoration preferences, should receive a high priority for Growing Greener Funding.

Figure 1: Photograph showing extreme bank heights within the project area. These conditions are unusual compared to conditions found elsewhere along the Wissahickon and extreme when compared with regional data, creating an optimal opportunity for a concentrated and immediate water quality benefit. This bank has retreated by an additional several feet during relatively small storm events this spring. Erosion is occurring into an adjacent hillside with no riparian zone, so bank height will further increase as the erosion proceeds.

By reducing usually high rates of streambank erosion that occur within the study reach, the proposed work will result in substantial and sustained reduction of phosphorus and sediment loading within a high priority watershed, the Wissahickon Creek Watershed, a National Natural Landmark. Bank erosion within the restoration reach is notably severe (see photo of outer bend erosion in Figure 1). For instance, bank retreat rates along two outer meander bends within the study reach were measured as part of a geomorphic assessment of the reach completed by Aterra Solutions (Aterra, 2022). Results show rapid outer bank erosion within the study reach of 1.8 feet foot per year on average from the period 1996-2020 (see Figures 2, and Figure 3 for examples). As part of the study, a Bank Hazard Erodibility Index (BEHI) was performed on the bank shown in Figure 1, yielding a rating of 37.51, which is classified as an extreme rating. Near bank shear stress (NBS) conditions are extreme given the relatively high reach slope and high radius of curvature to width ratio. Using the United States Fish and Wildlife Service (USWFS) bank erosion curve, which is included in the Chesapeake Bay Expert Panel Report Guidance for Prevented Sediment and which relates NBS and BEHI rating to linear bank retreat rates, the predicted rates or erosion using the NBS/BEHI ratings align well with the measured rates (Figure 4). Direct observations of rapid bank erosion during moderate storm events that occurred during the grant development process confirm active bank retreat via mass failure and worsening bank conditions.

Figure 2: Aerial photograph analysis showing bank retreat along an outer meander bend within the study reach. The dark lines indicate the location of the stream banks in 1996, while the lightest lines indicate the position of the banks in 2020.

Figure 3: Aerial photograph analysis showing bank retreat along an outer meander bend within the study reach. The dark lines indicate the location of the stream banks in 1996, while the lightest lines indicate the position of the banks in 2020.

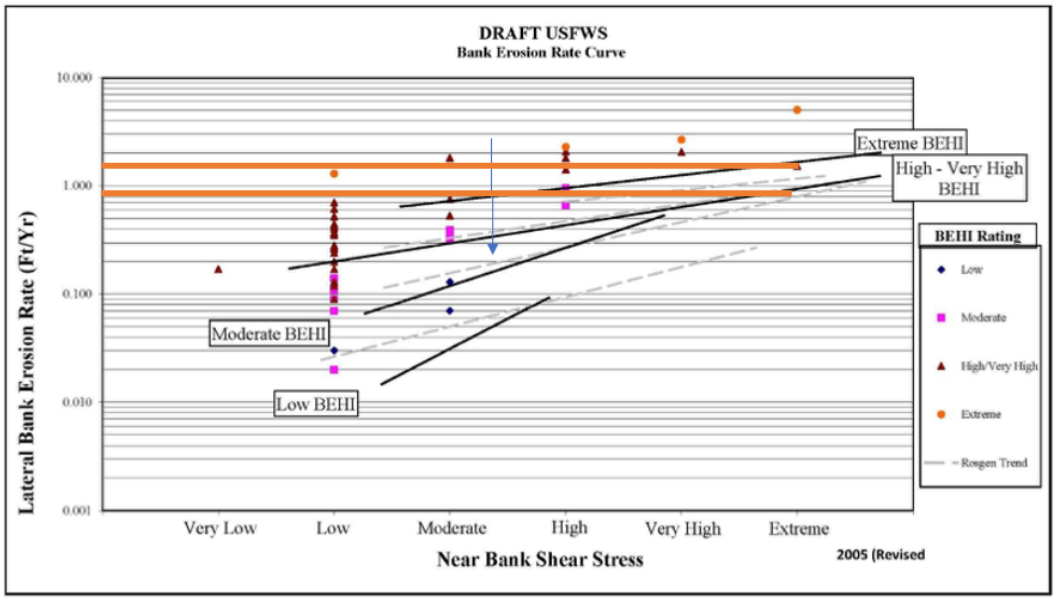


Figure 4: A comparison between measured rates of bank retreat over a 20-year period at two meander bends within the project area (indicated in orange) with measured erosion rates for a range of mid-Atlantic streams. The measured rates are in the very high to extreme rating, even when comparing to a large regional data set.

Given the importance of reducing sediment and phosphorus loading, rates of sediment and phosphorus loading to the Wissahickon Creek due to rapid bank migration in the study area are a compelling argument for funding under the Growing Greener program. The rapid rates of retreat of approximately 1 ft/yr., a field-measured average bank height of 10 ft., and an assumed bulk density of sediment loading of 120 lb./ft3 within the reach is approximately **970,000 lb./yr.** assuming loading from 20% of the total bank length of 3,000 linear feet. This is a conservative (likely low) estimate of sediment loading, given than the remaining 80% of the channel length produce some level of sediment loading, albeit much less than the extreme outer bank migration rates.

The proposed work will conservatively result in stream sediment reduction of at least **700,000 lb./yr.,** assuming an efficiency ratio of 75%. Given the documentation of existing erosion rates using aerial photograph analysis, the efficiency ratio with one year of post project verification is likely to be 90% based on current DEP crediting policy.

Our approach to restoring the stream channel is based on geomorphic investigations performed by experienced practitioners to understand the causes of the observed rapid channel changes and to address the root causes of these changes, namely increases in stream power, through active restoration that reduces the channel slope through the project area. This will produce a durable outcome that not only reduces sediment and phosphorus loading, but creates new floodplain habitat, reduces destructive flooding at Chestnut Hill College and nearby residential properties, reduces flooding downstream within historically significant areas such as Valley Green and the historic Bell Mill Bridge that have been hard hit by flooding in recent years, and provides recreational opportunities through the installation of a new trail segment along the Wissahickon linking Philadelphia and Montgomery county parks.

Our analysis suggests that a series of upstream and localized changes have combined to produce a dramatic and sustained increase in stream power within the study reach. This increase in stream power combined with the naturally steeper slope of the reach (owning to the transition between the flatter, upper reaches of the Wissahickon and the lower elevation Wissahickon Gorge) have produced a high energy system.

These include:

- **Watershed-Scale Changes (see Figure 5)**
  - Increases in runoff due to upstream urbanization
  - Increases in precipitation intensity and duration due to climate change

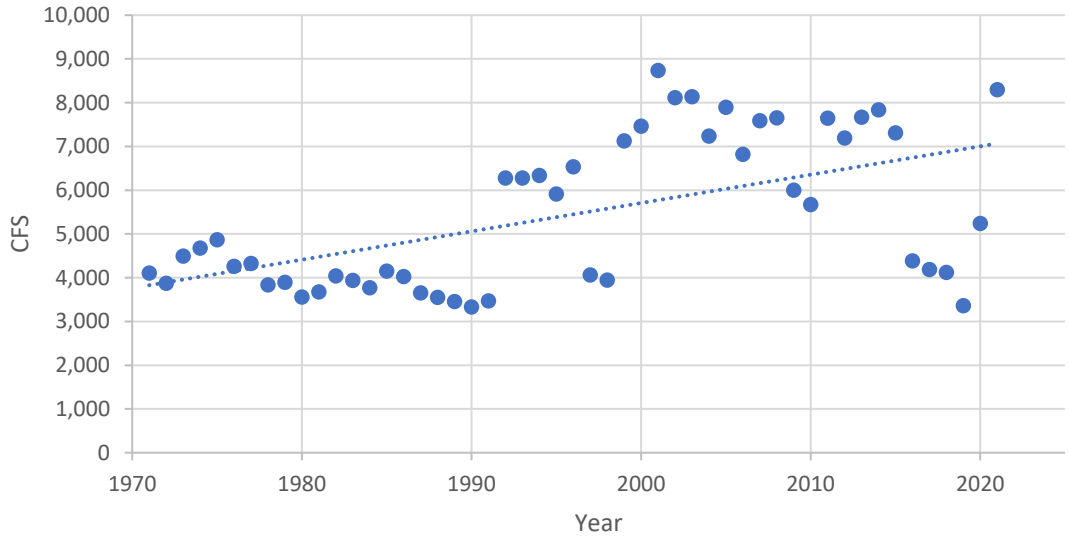
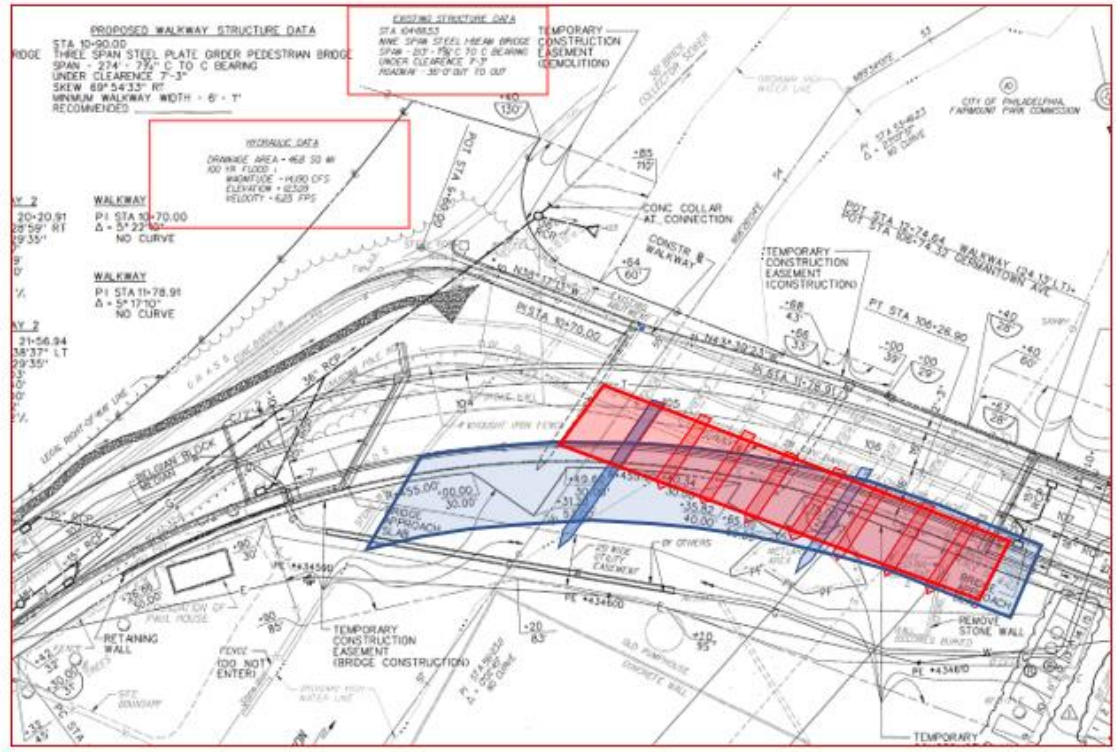


Figure 5: 5-year moving average annual maximum peak flow for the USGS Gage on the Wissahickon Creek at Fort Washington. The clear trend of increasing peak flow over time likely represents the combined influence of urbanization and climate change. The design approach will account for future increases in flow due to climate change by incorporating climate projections for the Philadelphia area.

- **Local Scale Changes**
  - Increase in stream slope due to the removal of a civil-war era impoundment in the mid 1960s (see Figure 6)
  - Replacement of the Germantown Avenue Bridge in 2003 (see Figures 7 and 8)

Figure 6. At left, recent aerial photograph showing the stream's current alignment. Lighter areas indicated by the red arrow show the location of the former impoundment, which is identifiable back to 1863 on a U.S. Coast Guard map (see below)



original bridge had a smaller width and more numerous and wider piers, resulting in a much smaller cross-sectional area. As a result, the original bridge impounded flow to a much larger degree than the current bridge, resulting in less erosive flows.

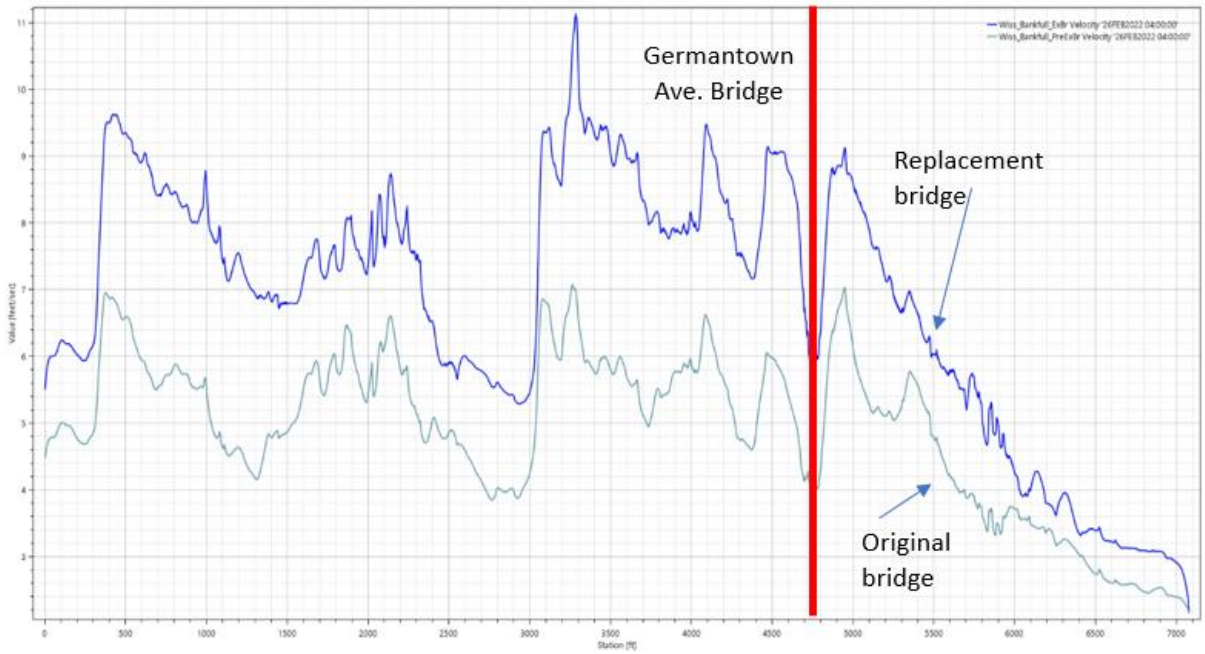


Figure 8: Predicted stream velocity for the study reach at bankfull flow based on HEC-RAS modeling. Results in the darker blue depict the velocity regime using the replacement bridge installed in 2003, while the lighter line indicates results using the original bridge geometry. Results show significant increases in velocity as a result of the bridge replacement, in some cases more than doubling the velocity predicted using the original bridge geometry.

Stream Adjustments:

The geomorphic assessment suggests that the reach is actively adjusting to this increase in stream power via slope reduction. This is occurring in two ways: bed cutting/incision and outer meander extension. Both processes result in elevated rates of bank erosion and work in concert to drive the observed conditions. Specifically, bed erosion results in an increase in bank height, making banks more susceptible to mass failure and increasing overall loads per length of stream.

The geomorphic assessment suggests that the project area is at risk of significant additional bed adjustment, which could significantly increase bank height and result in a further escalation of bank erosion rates through much of the project area. Evidence of head cutting was observed within an over steepened riffle area and steep point bar face. Both indicators are known pre-cursors to headcut formation and are consistent with the previously described increase in stream power. Therefore, active intervention is needed in the short term, not only to reduce rates of current sediment and phosphorus loading, but to prevent further increases in loading due to bed adjustment.

The Price of Inaction:

The geomorphic conditions of the current channel, combined with an understanding of factors discussed above that have led to an increase in stream power, suggest that a do-nothing approach will likely result in a worsening of already extreme conditions. This will occur as the

channel continues to downcut, which will likely result in an increase in bank heights in the upstream areas of the study reach. Field observations of a steepened riffle and associated point bar face (see Figure 9.) suggest that the development of a headcut within the study reach is likely. As the headcut forms and retreats upstream, the lowering of the stream bed elevation will result in a significant increase in bank heights throughout the reach, further escalating bank erosion and increasing sediment and phosphorus loading. The proposed work of this project will dramatically decrease existing loading while preventing the future adjustment processes that will lead to increases in loading. While watershed scale controls will be useful in curbing future increases in flow in the long term, the level of extreme erosion and channel adjustment in this reach warrants near term action.

Figure 9: Observations of steepened riffle and point bar faces are diagnostic of active vertical adjustment, suggesting that the erosion problems within the reach are likely to worsen over time as incision leads to increases in bank height and mass failure. Downcutting will also increase the production of coarse bed load which will increase downstream point bar formation.

Additional Restoration Benefits

Additional restoration benefits anticipated as a result of the project include:

- **Enhanced riparian buffers:** while some tree removal will be required, other areas, which are currently turf grass, will be reforested, while species diversity in areas with tree removal will be markedly enhanced. The addition of plant species of interest that would enhance habitat for migratory songbirds and other conservation species of interest will be incorporated into the design. For instance, riparian fringes may be planted with upland meadow grasses and forbs that provide nesting and foraging habitat for songbirds.

- **In-stream habitat:** the addition of in-stream habitat enhancement features such as boulders, engineered debris jams and other similar features will be incorporated into the final design

Part 3) Justification of Funding

Anticipated Environmental Benefits

As stated above, the proposed work will substantially reduce a major source of sediment and phosphorus loading in a watershed impaired for aquatic life and recreation due to nutrient and sediment pollution, and for which several TMDLs and draft TMDLs have been developed. The proposed approach is in alignment with DEP's preference for integrated stream restoration projects that address root causes and is supported by a detailed geomorphic assessment performed by experienced practitioners. Anticipated sediment load reductions of over 700,000 lb/yr, calculated using conservative assumptions, make this project a clear priority for funding.

In addition to providing high levels of sediment and phosphorus reduction, the project supports several other 2022 Growing Greener Grant priorities, including:

- This project supports the implementation of the Comprehensive Conservation and Management Plan (CCMP) developed by the Delaware Estuary Program, as well as several watershed-based plans for the Wissahickon Creek.
- This project occurs in the City of Philadelphia, a municipality that has a current floodplain ordinance in compliance with PA Code Title 12, Chapter 113 and the Floodplain Management Act.
- This project addresses several Commonwealth Investment Criteria including I(1) mitigation of high hazard locations, II (5b), Creation of Temporary Jobs, II (6a), Sustainable natural resource industry improvement, II (7a) Cleans up and reclaims polluted lands and waters II (7b), Protects environmentally sensitive lands, II (7c) protects wetlands, surface, and groundwater resources, and II (8a), improves parks etc. and or infrastructure, historic, cultural, greenways and/or open space incorporated.
- This project occurs in a Restoration Priority Watershed under PADEP Section 303(d) list, the only such designated watershed in the Philadelphia Metropolitan Area.
- This project implements DEP's preference for projects that restore floodplains and mitigate the risk of flood damage and provides co-benefits identified in the 2021 Climate Action Plan (see flood mitigation benefits, below)
- This project occurs within a County with a DEP-Approved Act 167 Plan. The Wissahickon Creek Act 167 Plan was prepared in 2014 and is available online at https://www.montcopa.org/DocumentCenter/View/9534/Introduction_Revised_Nov2014
- The project exceeds the minimum match requirements of 15%. The project partners have identified over 90% of the requested funds as matching funds. Additional matching funds are anticipated post award as a result of on-going **discussions** with landowners and local watershed groups.

Flood Mitigation Benefits

The proposed project will provide substantial flood mitigation benefits for Chestnut Hill College, an established educational institution in Northwest Philadelphia. The College's lower fields, volleyball courts, access drives, and parking areas have been repeatedly flooded by the Wissahickon Creek, resulting in substantial property damage as well as a significant public health and safety issues, given the use of these parking areas by faculty, staff, and students. Flood mitigation benefits will also extend downstream to recreational areas including Harpers Meadow, in the Wissahickon Valley Park that have been adversely affected by flooding and erosion in recent years. These include the Valley Green Inn, a historically significant property that was the recent subject of a flood mitigation design competition, and the steep slopes that lead from Forbidden Drive, a major recreational resource, to the Wissahickon Creek. The Friends of the Wissahickon has invested significantly in projects to restore failing slopes along Forbidden Drive. The proposed work will lessen the impacts of high flow events on slope stability, helping to reduce the incidence of future slope failures.

The project concept proposes the lowering of the existing stream grade by up to 4 feet through much of the proposed project reach. This lowering has two functions: first, to reduce the stream's slope and stream power, which will lower rates of stream erosion and second, to provide flood storage for large events. Given the volume of the proposed floodplain storage creation, we anticipate that the frequency of damaging floods to Chestnut Hill College will be substantially reduced.

The proposed work will also contribute to downstream flood mitigation and climate adaptation efforts within Philadelphia, including those focused on providing relief to Philadelphia's many underserved environmental justice communities (see Figure 10). This approach supports the implementation of Pennsylvania's Climate Action Plan, which identifies mitigation of increasing flooding on overburdened and vulnerable populations as a key area of focus for future mitigation effort. As a tributary to both the Schuylkill River and Delaware Rivers, the flood mitigation efforts along the Wissahickon Creek, particularly those that build significant flood storage, will contribute to the reduction of peak flows downstream. Given the recent events of Hurricane Ida, which resulted in catastrophic flooding of many of Philadelphia's roadways, businesses, and riverfront areas, efforts to build floodplain storage within tributary areas to Philadelphia's major rivers should be considered a strong priority for funding.

Educational Benefits

The proposed restoration project provides a potential learning opportunity for the 1,548 undergraduate and graduate students at Chestnut Hill College. Chestnut Hill College has a large minority population with minority students making up over 50% of the total undergraduate population and black students making up almost 30% of the population. Chestnut College features an undergraduate major in environmental science and already emphasizes nature field trips and the proximity of the Wissahickon Creek as an area of emphasis for environmental studies.

Recreation Benefits

The proposed work provides a collaboration opportunity to construct a stream-side trail that would effectively link the upstream Wissahickon Valley Park in Montgomery County with the Wissahickon Creek portion of Philadelphia's Fairmount Park. This link would provide a dramatic enhancement of opportunities to visitors of the Wissahickon Valley Park and Fort Washington State Park. The improvements in water quality stemming from sediment and phosphorus loading will benefit the environmental quality of the Wissahickon Valley Park, which is a stream used for trout stocking while also supporting warm watered species and is one of the key public green spaces within Northwest Philadelphia. The project will also, through floodplain creation, moderate stream flows downstream, resulting in lower rates of erosion and flood damage within the Wissahickon Valley Park. Given the gorge-like nature of the park, the potential for damaging erosion and flood events is ever-present. Damage to stream side trails and historic resources has occurred during major storm events, causing millions of dollars in damage.

Infrastructure Protection Benefits

The proposed work provides an additional infrastructure benefit, including protection of Philadelphia Water Department sewer lines, which run along the eastern side of the stream in the immediate reach and are threatened by the outer bank erosion in the vicinity.

Coordination with other Existing Efforts

The proposed work will benefit many of the on-going initiatives working to restore and protect the Wissahickon Creek as well as downstream Schuylkill River. As part of the outreach efforts relating to the proposed project, RPI, the project applicant, coordinated a presentation of the geomorphic study results, which were presented to a group of affected landowners, local non-profits, and partner organizations. Further, the results of the geomorphic study were disseminated to a wider group of partners following the presentation. In addition to this work, RPI has diligently engaged with stakeholders and watershed partners throughout the grant development process. This includes outreach to the Wissahickon Trails, Friends of the Wissahickon, Montgomery County Planning Commission, who is leading the Wissahickon Watershed Alternative TMDL development process, and PADEP Southeast Regional Office.

As stated above, the project will contribute to the implementation of the Wissahickon Nutrient and Sediment TMDL as well as the forth coming Alternative TMDL for Total Phosphorus. Additionally, the proposed work supports long standing watershed and water quality improvement programs led by the Philadelphia Water Department, as well as supporting the protection of vital sewer infrastructure.

Part 4) Environmental Justice Areas

The proposed study area, as shown in Figure 10, will provide water quality and flood mitigation benefit to reaches of the Wissahickon Creek, Schuylkill River, and Delaware River flowing through numerous DEP mapped environmental justice (EJ) communities, as well as key parks and recreational areas accessed by residents of EJ communities.

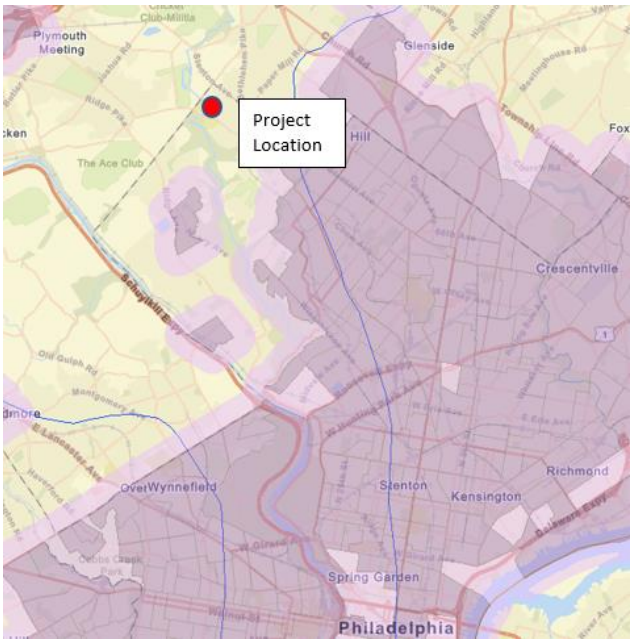


Figure 10: The proposed project will benefit reaches of the Wissahickon Creek, Schuylkill River, and Delaware River that flow near and through many of Philadelphia's EJ communities. Source: PADEP Map Viewer

The study site is located along the campus of Chestnut Hill College, which is situated on lands owned by the Sisters of Saint Joseph, an established educational institution. Chestnut Hill College has a very diverse student body with an almost 35% of students identifying as Black or African American and around 60% of all students identify as persons of color. Additionally, many students at Chestnut Hill College are from the state of Pennsylvania and are local to Philadelphia. The Sisters of Saint Joseph are a committed stakeholder in this project, there is an excellent opportunity for engagement of minority college students in field-based observation and study of an environmental restoration project.

Part 5) Match

Through the efforts of RPI board members, as well as time and discount given by legal and engineering consultants, the project predicts to match over 90% of the desired funds.

Part 6) Proposed Scope of Work

Project Goal/Purpose

The goal of the proposed work is to reduce extreme streambank erosion and associated sediment and phosphorus loading and mitigate the effects of flooding along a 3,000 ft. stretch of the Wissahickon Creek in Philadelphia, PA. As described above, the Wissahickon Creek is listed as impaired for aquatic life and recreation. A nutrient and sediment TMDL was established in 2003 and a draft total phosphorus TMDL was released in 2015. More recently municipalities and wastewater authorities in the watershed have engaged in an Alternative TMDL proposal.

We estimate baseline loadings within the reach to be at least **970,000 lb/yr** based on conservative assumptions and that the implementation of this project can result in short term and dramatic reduction in existing loads. This estimate is based on bank retreat data computed through a time series analysis of aerial photographs from 1996-2020. A bank erodibility hazard index (BEHI) assessment was performed for one of the banks that exhibited rapid migration. The BEHI ratings was used to predict bank erosion rate using the integrated U.S. Fish and Wildlife Service curve published in the "*Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects*" and *Consensus Recommendations for Improving the Application of the Prevented Sediment Protocol for Urban Stream Restoration Projects Built for Pollutant Removal Credit*" (Wood, 2020). The resulting predicted rates, which reflect a near bank shear stress rating of "high", substantiate the measured rates and suggest that long term adjustments may be in excess of 1 ft per year. Additionally, direct observation of bank failure during recent storm events and subsequent worsening of bank conditions from those used to conduct the BEHI ratings suggest that rates of erosion may be accelerating as bank conditions deteriorate. Given the propensity for future channel downcutting, which is likely to further increase rates of erosion due to an increase in bank height and introduction of additional coarse bed load, which will tend to increase point bar formation, loads calculated herein are likely to further increase without intervention.

Expected Environmental Results

The primary expected environmental result is a reduction in annual sediment loading of at least 700,000 lb. per year, with attendant reductions in total phosphorus. Sediment loading and bank erosion reductions will be verified through credit verification procedures developed by the Expert Panel. Phosphorus loading will be computed by taking soil samples and determining the TP concentration. Specifically:

- BEHI and Near-bank Shear Stress ratings will be repeated post restoration and compared with pre-restoration values

- Repeated cross-section surveys will be completed at 1, 2, and 5 years after installation to measure channel migration rates.
- Additional measurements of bank retreat via aerial photograph comparisons

Table 1. Additional Environmental Results and Proposed Measurement Methods

Environmental Result	**Measurement**
Increase in habitat quality of 9 acres of floodplain and riparian zone	Pre- and post-construction riparian species surveys
Reduction in extent, severity, and duration of damage causing flood events	Hydraulic modeling of pre- and post-construction conditions with calibration where possible
Improvement in in-stream habitat quality	Pre- and post-construction benthic macroinvertebrate surveys

Project Deliverables

Project funding is requested to advance the project through the development of construction documents, including the procurement of permits. Project deliverables will consist of the following:

- **Task/Deliverable 1 – Concept Design and Feasibility Package**
  - Existing conditions topographic survey including utility mapping, contours, etc.
  - Geotechnical investigations including bulk density and TP samples of eroding banks and additional floodplain borings,
  - Conceptual design plans to include plan, profile, and section concepts,
  - Existing geomorphic and bank erosion survey (building on already completed work)
  - Preliminary existing and proposed conditions hydraulic modeling using HEC-RAS 2D
  - Wetland delineation per USACE methods.
  - Natural resources inventory (focusing on riparian habitat and species) and macroinvertebrate assessment (family level IBI to be coordinated with watershed-wide methods)
  - PNDI Screening
  - Cultural Resources Screening
  - Pre-application Meeting with PADEP Southeast Regional Office and USACE

- **Task/Deliverable 2 - 30% Preliminary Engineering Package**
  - Updated HEC-RAS Model
  - Existing Conditions Plan
  - Grading Plan
  - Cross-Section Plan
  - Profile Plan
  - Preliminary Construction Details

- Preliminary Cost Estimate

- **Task/Deliverable 3 - 70% Detailed Design Package:**
  - Design Report
  - Existing Conditions Plan
  - Grading Plan
  - Cross-Section Plan
  - Profile Plan
  - Landscaping Plan
  - 70% Construction Details
  - Erosion and Sediment Control Plan
  - Erosion and Sediment Control Notes
  - Erosion and Sediment Control Application to PWD Plan Review
  - National Pollution Discharge Elimination System Permit for Temporary Discharges of Stormwater during Construction Activities
  - Joint Water Obstruction and Encroachment Application to PADEP
  - Conditional Letter of Map Revision submittal to FEMA and/or application to City of Philadelphia for a Floodplain Consistency Determination
  - 70% Cost Estimate

- **Task/Deliverable 4 - 100% Construction Documents Package**
  - Front End Bidding Documents (form of proposal, etc.)
  - Technical Specifications (earthwork, site prep, landscaping, etc.)
  - 100% Construction Plans
    - Survey Control Plan
    - Existing Conditions Plan
    - Grading Plan
    - Cross-Section Plan
    - Profile Plan
    - Landscape Plan
    - 100% Construction Details
    - Erosion and Sediment Control Plan
    - Erosion and Sediment Control Notes
    - Erosion and Sediment Control Plan and Details
  - 100% Cost Estimate
  - National Pollution Discharge Elimination System Permit for Temporary Discharges of Stormwater during Construction Activities
  - PADEP Water and Obstruction Permit and associated 401/404 Water Quality Authorization
  - Erosion and Sediment Control Approval from Philadelphia Water Department
  - 100% Cost Estimate
  - Detailed Operations, Maintenance, Repair and Replacement Plan (OM&R)

Project Description

The proposed project will involve the restoration of a roughly 3,000 ft stretch of the Wissahickon Creek up stream of the Germantown Avenue Bridge. The work will include the following elements:

- Lowering, realigning (to the north), and reconstruction of the stream channel along approximately 1,500 linear feet of stream, and associated floodplain creation. The resultant stream channel is expected to have a significantly lower slope, resulting in lower stream power. This in combination with reduced bank heights and flood storage due to floodplain grading on both banks will vastly reduce the potential for significant erosion in the study reach.
- Regrading and floodplain benching along approximately 900 linear feet of stream.
- Stabilization of existing banks with biostructural stabilization as needed. The use of habitat creating wood structures will be emphasized.
- Floodplain/riparian planting and matting within 9 acres of riparian and floodplain habitat.

A schematic of the proposed project concept is provided as Figure 11.

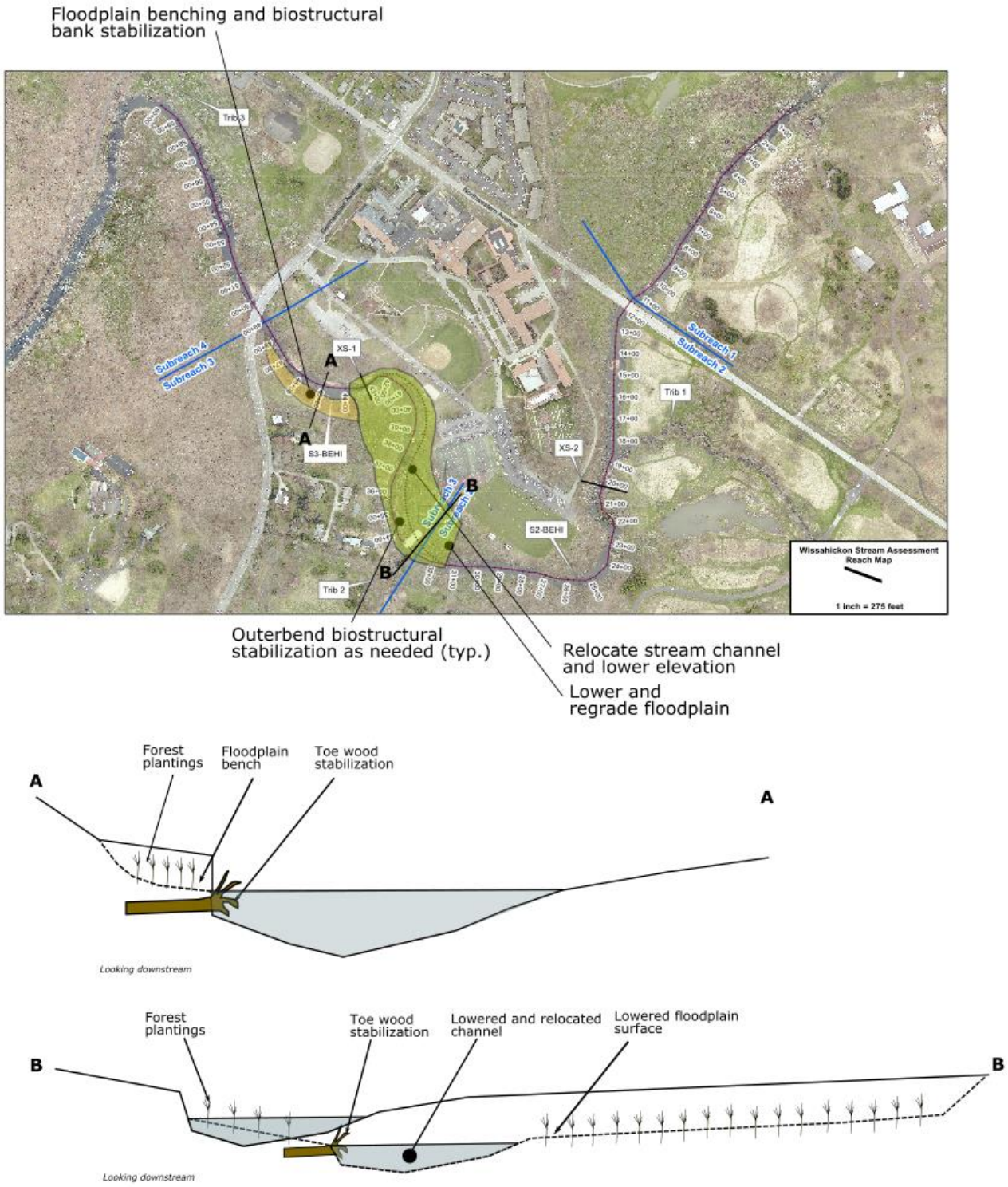


Figure 11. Project design concept. The project design will involve lowering and relocating the channel within the areas shown in green and cross section B-B. In the lower reaches of the project, the design focuses on creation of a floodplain bench, while keeping the existing channel alignment and elevation.

Landowner Interest
The project will occur on lands owned by the Sisters of St. Joseph, a Catholic order which owns Chestnut Hill College and adjoining lands. The Sisters of St. Joseph are highly motivated and engaged partners in the project. The proposed project advances the organizational goals of the Sisters of St. Joseph by promoting environmental stewardship. Additionally, the project will result in tangible benefits for Chestnut Hill College in the form of reduced erosion, flood damage and land loss. A Landowner Commitment Letter from the Sisters of St. Joseph is provided as an attachment to the online application.

The project will also occur adjacent to several residential properties along Marstan Road to the south of the project area. The project boundaries as currently conceived are not proposed to extend into the residential properties. Instead, the project extents reflect a shift of the current channel alignment to the north in this vicinity so that the floodplain grading can be achieved without direct disturbance to the residential properties. Nevertheless, RPI has conducted extensive outreach and coordination with the group of residential landowners and Letter of Commitment have been provided for several of the landowners.

Special Approvals
The Project will require a Water and Obstruction Permit from PADEP. Most likely, PADEP will also issue Federal 401/404 authorization via the State Programmatic General Permit. (SPGP) process. However, given the scale of the project, a permit from USACE may be required. Either a Nationwide 27 permit or USACE Individual Permit could be required. The project may also involve disturbance or work within PWD sewer easements. Coordination and approval from PWD for this work is expected. Additionally, the project will require a NPDES General or Individual Permit (depending on the final disturbance) for Stormwater Discharges Associated with Construction Activities and a Conditional Letter of Map Revision from FEMA or Floodplain Consistency Letter from the City of Philadelphia.

Other permit approvals that could be required include threatened and endangered species clearances through the PNDI process, and Pennsylvania Historical Museum Commission clearance for impacts to historical resources, should these be present. Special approvals for impacts to T&E species or historical resources are not expected based on the current understanding of the project area. The applicant and consultants, however, are experienced and fully prepared to address these issues should they arise during the design process.

Long Term O&M Activities
Long Term O&M activities for the project will include:

- Periodic inspection and replanting, if needed, of plantings to achieve 85% cover. Areas of repeated poor germination will be replanted with alternative species. Inspections will be performed at least once annually and after major storms.
- Periodic inspection and periodic repair of minor erosion and/or damage to structures. Inspections will be performed at least once annually and after major storms.

Long Term O&M will be jointly funded by RPI, the project landowners. and watershed partners through a combination of donated services and direct financial contributions. A detailed operations, maintenance, and repair/replacement plan will be developed as part of the design contract.

Implementation Schedule and Timeline

An implementation timeline is provided in Figure 12. All tasks will be performed by the project design engineer and it's subconsultants with review and oversight by RPI and the project landowners and partners.

Disclosure of Conflicts of Interest

No conflicts of interest have been identified by the applicant.

Project Task/Deliverable	Months after Grantee Approval																				
	1	2	3	4	6	7	8	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Task/Deliverable 1 – Concept Design and Feasibility Package																					
o Existing Conditions Survey																					
o Geotechnical Investigations																					
o Conceptual Design Plans																					
o Existing Geomorphic and Bank Erosion Survey																					
o Preliminary Existing and Proposed Conditions Hydraulic Modeling																					
o Wetland Delineation																					
o Natural Resources Inventory																					
o PNDI Screening																					
o Cultural Resources Screening																					
o Pre-Application Meeting with PADEP and USACE																					
Task/Deliverable 2 - 30% Preliminary Engineering Package																					
o Updated HEC-RAS Model																					
o Existing Conditions Plan																					
o Grading Plan																					
o Cross-section Plan																					
o Profile Plan																					
o Preliminary Construction Details																					
o Preliminary Cost Estimate																					
Task/Deliverable 3 - 70% Detailed Design Package:																					
o Updated HEC-RAS Model																					
o 70% Engineering Plans																					
o Erosion and Sediment Control Application to PWD Plan Review																					
o NPDES Permit Application																					
o Joint Permit Application to PADEP																					
o Conditional Letter of Map Revision/Floodplain Consistency Letter																					
o 70% Cost Estimate																					
Task/Deliverable 4 - 100% Construction Documents Package																					
o Front End Bidding Documents (form of proposal, etc.)												Permit Review And Issuance									
o Technical Specifications (earthwork, site prep, landscaping, etc.)																					
o 100% Construction Plans																					
o National Pollution Discharge Elimination System Permit																					
o PADEP Water and Obstruction Permit/401/404 Water Quality Cert.																					
o Erosion and Sediment Control Approval from PWD																					
o 100% Cost Estimate																					

Figure 12. Proposed Implementation Timeline

Part 7) Contractor Provisions

The project application intends to retain Aterra Solutions for completion of the design portion of the project (i.e., the work proposed under the current application). While RPI understands DEP's preference for competitive bidding, RPI has already been working with Aterra to conduct a geomorphic and hydraulic study of the restoration area and feels strongly that Aterra and its subcontractor's specific level of expertise (including extensive prior experience with the preparation and successful implementation of a major restoration project in Fairmount Park and through the Growing Greener program), are critical to the successful implementation of the work. Aterra intends to subcontract with local minority firms to provide survey and geotechnical services. RPI intends to use competitive bidding to retain a construction contractor for the project and will establish a local minority business goal to encourage participation of minority businesses in the construction phase.

Part 8) Data Collected

Data collected for the project will include existing conditions characterization activities discussed in Deliverable 1. These will include existing survey, geotechnical investigations, macroinvertebrate monitoring, wetland delineation, natural resources inventory, and additional geomorphic and bank erosion data. Of the data collected, the bank erosion and macroinvertebrate data could be potentially useful to DEP in future 303(d) determinations and will be collected per the Existing and Readily Available information protocols to the extent practicable.

Part 9) AMD Remediation Projects
*AMD remediation is not applicable to this application***.**

Part 10) Property and Equipment
No property or equipment acquisition is proposed as a part of this grant.

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