Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding



A Delaware Canal for the 21st Century

A New Paradigm for a Sustainable Future

This report is designed for on-line viewing and is formatted for 11X17 printing only if absolutely needed. The pages have a navigation bar on the side to access each section from any page in the report.

Begin

DELAWARE CANAL 21
LANDMARK *FUTURE*

ESI ECONSULT SOLUTIONS INC.
economics | strategy | insight

eDESIGN DYNAMICS

SIMONE COLLINS
LANDSCAPE ARCHITECTURE

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding



Introduction

Delaware Canal Waterway Authority Feasibility Study

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

A Vision for a 21st Century Canal

Key Findings and Recommendations

- The Delaware Canal supports millions of dollars of economic value and activity for the residents and businesses of the communities adjacent to and near it, as well as Bucks and Northampton Counties, and the Commonwealth of Pennsylvania.
- The Delaware Canal was not designed and has not been managed as a stormwater structure, flood control project, or as a primary source of water for fire protection. However, as demonstrated in the DC21 Stormwater Analysis, the Canal has provided environmental benefits of stormwater management as streams and runoff enter the canal. It also has provided limited public safety benefits through DCNR's management of canal levels to help reduce property damage due to flooding and being a source of water for fire protection through dry hydrant placement for use of local fire departments.
- The economic, environmental, and public safety benefits are threatened by the challenges of maintaining adequate water throughout the entirety of the 60-mile Canal. State budget limitations, aging canal infrastructure, damage from storms and impacts of development have resulted in inconsistent water levels and compounded long-term damage, reducing the overall community benefits of the Delaware Canal.
- An engineering analysis conducted for this assessment identifies a strategy for repairing the Delaware Canal to support a consistently watered and functional canal.
- Rethinking, restructuring, and expanding the current funding model to include community partners can position managers of the Delaware Canal to raise capital and utilize financial resources more effectively.
- Creation of a Delaware Canal Improvement District (to serve as a funding, planning and management partner for maintenance of the Canal) could supplement PA DCNR funding and ensure the long-term sustainability of a fully watered canal, enabling the array of environmental, economic, and public benefits to the community.
- A Delaware Canal Improvement District can raise funds in a variety of ways, such as pursuing government grants, creating a dedicated canal benefit fee, or engaging philanthropic and private funding partners.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

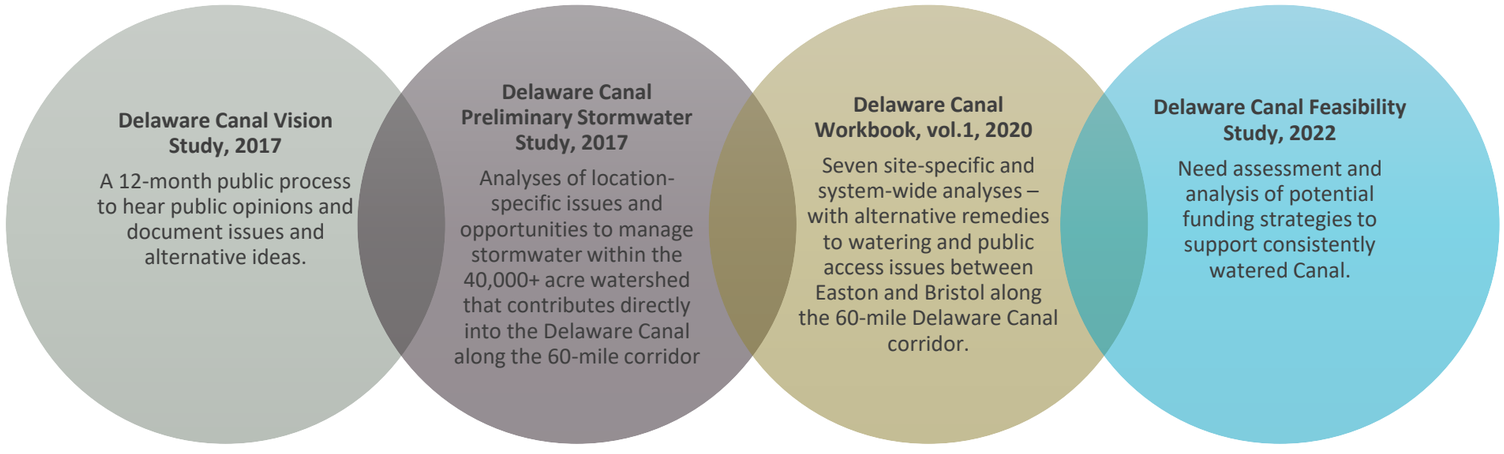
Building the Case for a 21st Century Canal

Research and Analytical Foundations

Following three consecutive years of devastating Delaware River flooding in the early 2000s, DCNR's Bureau of State Parks pursued a partial watering policy for the Delaware Canal—based on the assumption that the public would accept such a solution as the unfortunate reality of the limits to State Parks budgets. However, public meetings and surveys showed a strong commitment to maintaining a fully watered Canal.

In response, three citizen-based planning projects were conducted by regional non-profit partners, all in partnership with DCNR. The studies solicited public opinions; collected data; and assessed potential structural and operational alternatives to the status quo State Parks-only management model for the Delaware Canal management.

Delaware Canal 21, with financial and in-kind support from the Pennsylvania Department of Conservation and Natural Resources, PA DCED, Bucks County, Northampton County, commissioned a feasibility assessment for a new collaborative funding model that could help to achieve the consensus goal of a fully watered canal. Delaware Canal 21 engaged Econsult Solutions, Inc. to manage this project, with support from the planning firm Simone Collins and engineering firm eDesign Dynamics. This feasibility analysis is the fourth effort and builds on the previous three studies.



Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

A Consensus for a Fully-watered Canal

Building on Previous Studies to Create a New Paradigm

The recommendations of this study are based upon the findings of previous analyses and new research in order to meet the new challenges and opportunities that have surfaced due to evolving environmental, economic and health related factors.

DCNR 2015 Master Plan

DC21 Sponsored Reports

Delaware Canal Vision Study (2017)

Delaware Canal Stormwater Study (2017)

Delaware Canal Workbook Volume 1 (2020)

Friends of the Delaware Canal

Two primary goals:

1. Canal fully watered from Easton to Bristol
2. Towpath trail is usable along entire length

Excerpts from DCNR 2015 Mater Plan: Goals and Objectives

- To create a first-class recreation facility taking advantage of the unique resources of the Canal and Delaware River.
- To develop sections of the Canal that historically demonstrated a reasonable degree of water carrying sustainability into optimum examples of historic watered canal environment, maintaining as the ultimate goals as a fully watered canal.
- To implement plans for the maintenance of any sections of the Canal that are projected to remain dry for an extended period, including vegetation control and preventive maintenance for the Canal prism and Canal structures to prevent deterioration and facilitate future watering.
- To explore with Canal support groups innovative ideas looking toward supplemental or non-traditional sources of funding to support the Canal and the Park.
- To explore ways to minimize and mitigate the frequency and/or impact of future flooding, storm water, and other sever weather events on the Canal and the Park.
- To conduct long range planning and visioning for the Canal and the Park with Canal support groups.
- To provide personnel and financial resources necessary to develop, operate and maintain the entire 60-mile length of the park complex.
- To initiate projects designed specifically to increase the total length of “Optimum Historic Watered Canal Environments,” thereby increasing the possibility of realizing a fully watered, historically appropriate Canal for the entire 60-miles.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Collaborative Feasibility Assessment

Identifying a New Model

Delaware Canal 21, with financial and in-kind support from the Pennsylvania Department of Conservation and Natural Resources, Bucks County and Northampton County, commissioned a feasibility assessment for a new model that could help to achieve the consensus goal of a fully watered Canal.

Delaware Canal 21 engaged the Philadelphia based consulting firm Econsult Solutions, Inc. to manage this project, with support from the planning firm Simone Collins and engineering firm eDesign Dynamics.

Over the past year, the Econsult team:

- reviewed previous reports
- researched best practices and case studies of alternative governance and funding models
- conducted an in-depth engineering analysis of what it would take to achieve a watered Canal
- estimated the economic benefits of the Canal
- developed a new model to support DCNR and the Canal, and
- identified potential funding sources

Delaware Canal 21

DCNR Bureau of State Parks

Bucks County

Northampton County

Econsult Solutions, Inc.

Simone Collins

eDesign Dynamics

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Approach to the Feasibility Study

Developing a Sustainable Way Forward

The Econsult Solution's team approach utilized a combination of quantitative analysis, literature review, and case study briefs to assess the viability of an authority structure that will be responsible for providing all needed water for the purposes of consistency and continuity of optimal volume in the Canal. The study was conducted in three phases:

- **Phase 1: Engineering Baseline Research and Best Practices Research (Winter 2021)**
- **Phase 2: Feasibility Analyses (Spring 2022)**
- **Phase 3: Summary Roadmap with recommended funding sources and an implementation strategy (Summer 2022)**

2022 Feasibility Assessment Goals

The study examines five primary goals for watering the Delaware Canal

Canal Threats and Challenges	Fully Watering the Canal	Economic and Environmental	Maintenance of the Canal	Moving to a New Model
Identify challenges and threats for preserving the value of the Canal	Independent engineering and planning analysis for fully watered Canal from the Easton inlet lock to the Bristol outlet lock	Document the real estate, economic, health, and environmental role of the Canal for local communities and residents	Identify and assess potential new structures and innovative funding models to augment DCNR spending for both major capital and ongoing maintenance needs	Identify decision points and roadmap to new funding model(s)

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

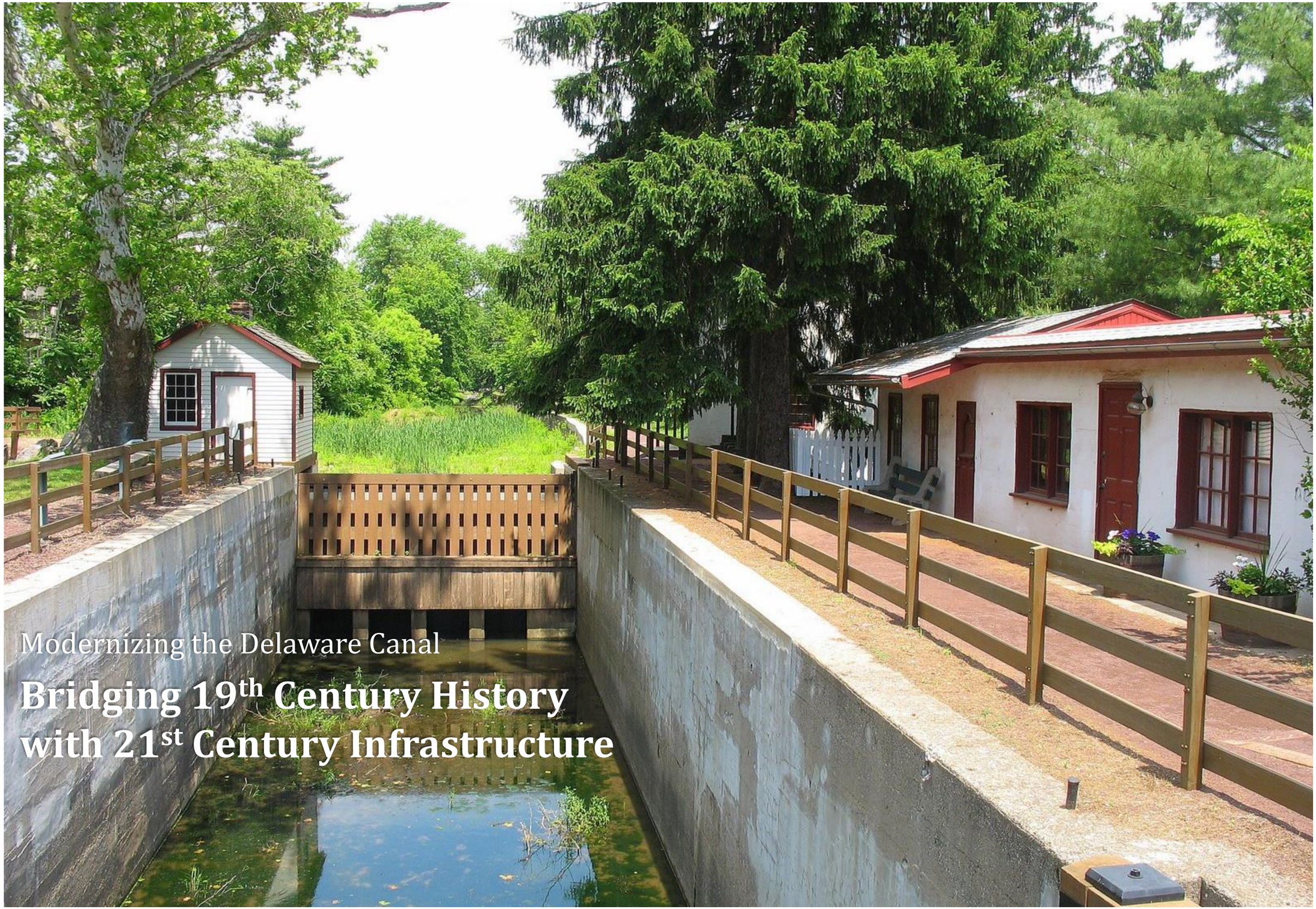
The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding



Modernizing the Delaware Canal

Bridging 19th Century History with 21st Century Infrastructure

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

The Delaware Canal has a Long and Storied History

Changes in Ownership and Purpose have Varied Throughout its Time

In 2022, the Delaware Canal is a national historic landmark; a national trail; a state park; the first greenway in the Commonwealth of Pennsylvania; a key element of the federal Lower Delaware Wild and Scenic River system; and a revered cultural asset that shaped all the places that grew up around it across two eastern Pennsylvania counties and 18 municipalities.

The Delaware Canal was built in 1832 as a transportation enterprise to enable the passage of boats during the industrial revolution and functioned like a regional plumbing system over a remarkable 99 years of commercial operations. The public right-of-way remains, and 59 of the 60 original miles of channel are capable of being fully watered. The entire towpath trail is open for public recreation and transportation, except for Mile 1 in Bristol Borough.

At 190 years old, this early system and cultural landmark faces an existential crisis within a perfect storm of perennially insufficient state budgets; a backlog of deferred maintenance; an outdated model; and surging physical impacts from climate changes.

These challenges all conspire to present the latest obstacles to operating a consistently watered Delaware Canal. The tempest of watering challenges is accelerated by an exponential growth in recreation user demands on the Delaware Canal State Park since the COVID-19 pandemic forced national social distancing protocols.

This analysis focuses on the need for a new model that can support the shared goal of a fully-watered, sustainably funded Delaware Canal. In the following sections, we document the Canal's value to the community, a strategy for restoring water to the full Canal, a new model, and ways to fund repairs and ongoing maintenance.

This ***Delaware Canal Authority Feasibility Analysis*** *acknowledges* the tough issues; documents costs; articulates multiple benefits; and analyzes partnership alternatives that may assist the Department of Conservation and Natural Resource's Bureau of State Parks to maintain a fully watered Delaware Canal.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

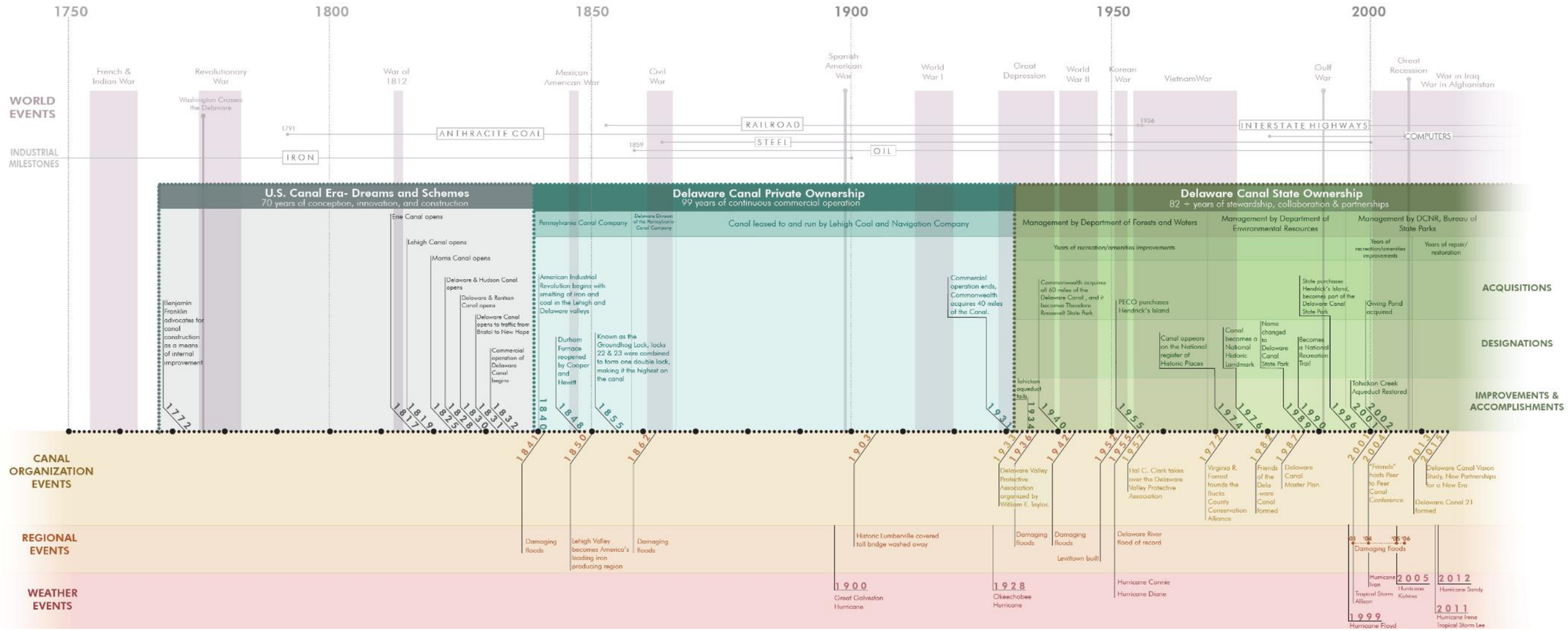
21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

The Delaware Canal Story (1831 – 2015)

Conceived Before the **American Revolution** … Built Before the **Industrial Revolution** … Owned Publicly Since the **Digital Revolution**



Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Framing the History to Plan for the Future

A Canal of Evolving Importance

Commercial Operations (1832-1931)	State Acquisition (1932 thru Post WWII)	Reactions to Industrial Impacts (Post WWII through mid-1980s)	Adaptive Reuse Strategies (1980s-2012)	Ecology Based Resiliency (2012-Present)	Cultural Resiliency for the Future (2021 and Beyond)
The right of way for construction and commercial operations was secured for the Delaware Canal as a Division of the Pennsylvania Canal. Revenue from the waterway commerce paid to maintain a watered Canal. Commercial operations ceased after a remarkable 99 years, when the third version of the Tohickon Aqueduct failed.	Through state acquisition, the Canal became the first Pennsylvania greenway, certainly the first PA blueway. The picturesque values and the irreplaceable ROW drove the purchase. The original assumption was that the watering of the Canal would be a perpetual given. This was a pivotal decision that led to housing and recreational activities locating near and around the Canal.	Public reaction to demolition, encroachments, and new structures began a 60's preservation movement. However, the goal of preservation rarely was accomplished. The costs of deferred maintenance since the 1950's was coming and by the mid 80's the Canal begins to remain dry—in long sections for longer and longer periods of time. Some of the post-WW2 concrete structures were nearing 40-years old and original materials and methods for repair no longer were available or affordable.	Several adaptive reuse strategies were undertaken during this period. In late 1980s, Friends of the Delaware Canal helped to excavate the prism and the Army Corps of Engineers classifies the prism as a wetland, south of New Hope. In 2001, DCNR completes the Tohickon Aqueduct. In the early 2000s, the Historic Delaware Canal Improvement Association was created. Between 2004-06, major Delaware River flooding devastated the Delaware Canal State Park and private properties which took approximately 10 years to repair.	In 2012, Delaware Canal 21 was founded primarily to advocate for and maintain water in the Canal. Soon after, the Delaware Canal Resource survey was administered by PennDOT. Delaware Canal 21 also initiated three major studies, Delaware Canal Vision Study 2017 Delaware Canal Stormwater Study, 2017 Delaware Canal Workbook vol 1, 2020.	In 2021, a feasibility study to examine the environmental financial and Governance Strategy to water and maintain the Canal is started. Post-COVID impacts and climate change have caused leaders to look at the multi-faceted benefits of the Canal through a new lens to chart a path of resiliency and vibrancy for the future of the Delaware Canal.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

A Sustainable 21st Century Delaware Canal

Strategic Investments in the Canal will Produce Long-term Savings

Conserving 19th Century Historic Fabric in the 21st Century

Previous studies of the Delaware Canal have identified priority character-defining features as those characteristics that are essential to be conserved —including: the water itself, alignment, scale, and materials where possible and practical. This approach is central to the pursuit of a sustainably watered Delaware Canal—and must be the basis for all the engineering and cultural resource treatment decisions that will need be made for the future of the Canal.

Every structure will eventually deteriorate, and many of the original Delaware Canal structures have already been replaced multiple times. Nothing can be, nor has ever been rebuilt exactly as the original. This acknowledgement retires the antiquated notion of historic preservation, which is replaced by the practice of conservation. Many examples of modern interventions have helped conserve historic resources—such as modern HVAC systems in historic buildings. The treatment strategy developed for each resource is the key to its conservation.

The Problem as the Solution—Valuing the Benefits of a Watered Canal

By keeping the long sections of the prism dry, as a short-term austerity measure, there is long-term harm to the Canal and a negative cost benefit. Unfortunately, the practice ensures that the clay liner dries out, leaks, and multiple problems result to the waterway clay, wood, and stone structures. The capital cost savings from not maintaining a watered prism for miles above and below a construction project site are externalized from State Parks capital budgets to State Parks operations budgets to pay for preventable repairs.

The significance and integrity of the Delaware Canal can be conserved by making smart and appropriate rehabilitation investments that respect historic resources and help modernize the Canal and increase its value as an economic and environmental asset.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

The Delaware Canal is a 190-Year-Old, Complicated Plumbing System …

And a Community Asset in Need of Repair

The Delaware Canal is an aging system of infrastructure that has parts and structures that need to be replaced or updated to keep the "plumbing" in working order—and to provide community benefits over the 60-mile path of the Canal. What needs to be fixed?

Faucets: The Canal has 2 "faucets" or ***intakes*** that provide water to the Canal at the Lehigh Dam in Easton and the Delaware River Dam in New Hope.

Pipes: It has "pipes" *(the ***canal prism*** or channel) that carry the water the length of the Canal. The prism is supported by walls, aqueducts, and overflow spillways, that need to be maintained, repaired, and dredged to hold the Canal's water and support the towpath trail.

Valves: The flow and level of water in the canal prism is controlled by "valves" in the form of the hydraulic system of ***locks and waste gates*** all along the Canal.

Obstructions: Over time, new development on and around the Canal have created ***obstructions*** or restrictions that limit the water that flows through the canal.

Drain: Ultimately, the water is released back into the Delaware River through an ***outlet*** pipe at the end of the Canal.

This system has been impacted, altered, and damaged over time by erosion, storms, and development. Restoring the Canal today requires repairs and/or replacement of hydraulic structures and the canal prism structure, removal of obstructions and ongoing maintenance.

COMMUNITY	*Intake*	*Canal Prism*	*Locks & Waste Gates*	*Obstructions*	*Outlets*
EASTON	✓	✓			
NORTH CENTRAL REACH COMMUNITIES		✓	✓		
NEW HOPE	✓	✓	✓		
YARDLEY		✓	✓	✓	
MORRISVILLE		✓	✓	✓	✓
BRISTOL		✓	✓	✓	✓



Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Engineering and Planning Research Approach

Baseline Estimates Established to Plan the Best Way Forward

Independent Engineering Assessment

The study team utilized the expertise of environmental engineers eDesign Dynamics (eDD) and the landscape architects of Simone Collins to observe and assess existing conditions related specifically to managing a watered prism along the 60-mile Delaware Canal. The resulting independent engineering analyses are a significant contribution to a limited body of available data developed by the Commonwealth over its eight decades of Delaware Canal State Park management. The difference in the new data is the study team focus—specifically centered on repairing the water related infrastructure (elements) of the historic Delaware Canal State Park

Identifying Water Elements

Delaware Canal State Park is unique from other state parks in that it contains a historic canal. The engineering team compiled a list of the water elements within Delaware Canal State Park, including: the prism (channel), locks, bypass sluice gates, culverts, aqueducts, and wastegates.

Some park elements serve multiple functions—and this method of categorizing services may help future budgets to be prorated between major purposes.

On-site Engineering Observations

The team of engineers began work with a tour of the 60-mile Delaware Canal to observe representative conditions of all water elements, within the context of landscape topographic and hydraulic changes that affect the waterway management across the three distinct geo-physical provinces through which it was built. This process was conducted independently from State Parks—with findings shared.

Engineering Data Collected

Basic geometric data of the prism pool lengths, elevation changes; estimated pool volumes; quantities of each type of watering element; and a general inventory of facilities' conditions were collected and compiled by the engineering team.

Conditions Assessed; Costs Estimated

The team of engineers incorporated climate change projections (sea level rise, average annual precipitation, etc.) in their conceptual-level hydraulic and hydrologic (H&H) calculations for the rehabilitation/replacement of hydraulic structures along the Canal. Associated costs were compiled for the entire Canal length. These cost estimates were compiled independently of State Parks historic cost records.

The cost estimates in this report were compiled in the spring of 2022 and do not reflect recent inflationary cost increases.

Items not addressed

DCNR notes that the bridge structures crossing the canal are located within the canal prism, and that structural deficiencies associated with the bridges can prevent the flow of water through the canal. The consulting team did not address those structures within this analysis as part of the water elements for the Canal.

The analysis also does not consider storm damage maintenance and repairs as part of the capital and maintenance cost estimates. The focus of this analysis were structural improvements that would enhance water flow.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Engineering and Planning Research Approach

eDesign Dynamics identified areas along the Delaware Canal (DC) that require repairs, based on the Delaware Canal Workbook (DCW). The goal was to create a resilient and sustainable, fully-watered canal within five (5) years.

The engineering team performed conceptual-level Hydrologic & Hydraulic (H&H) analyses to obtain capital and O&M cost estimates for repairs, recording all assumptions.

They grouped repairs into seven (7) sections:

1. Replacement of Hydraulic Structures
2. Dredging, Restoring Clay Liner, & Stabilizing Banks
3. Repairs to Rivers Walls in North-Central Communities
4. Obstructions
5. Canal Terminus in Bristol Borough
6. Morrisville
7. Other Items for Future Consideration



Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Repairing the Water Elements of the Delaware Canal

Full Cost of $96M Will Allow the Canal to Maximize its Potential

eDesign Dynamics, the engineering firm for the feasibility analysis, developed an estimated cost in the spring of 2022 to achieve a corridor-long, rehabilitation for all water elements that serves as a baseline budgeting metric.

The costs are associated with identified areas along the Delaware Canal that require repairs, based on the Delaware Canal Workbook.

$5.1M in maintenance cost will help maintain the quality of the Canal during the first five years after initial capital outlay.

SECTION	CAPITAL COST ESTIMATE	FIVE YEAR O&M COST ESTIMATE
Along Entire Canal - replacement of hydraulic structures	$ 3,900,000	$ 863,000
Along Entire Canal - dredging, restoring clay liner, & stabilizing banks	$ 58,400,000	$ 4,224,000
North-Central Communities – install new retaining walls	$ 10,100,000	$ 36,000
Obstruction removal – create a daylighted prism at Levittown Shopping Center, replace undersized culverts and install full capacity culverts that remove obstructions	$ 20,100,000	$ --
Canal Terminus in Bristol Borough – install 5-foot diameter pipe and retaining wall to prevent flooding	$ 3,170,000	$ --
Morrisville – remove downstream obstructions and install new outlet structure	$ 120,000	$ 20,000
Total	**$ 95,790,000**	**$ 5,143,000**

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Replacement of Hydraulic Structures

Issues

a) Hydraulic control structures (e.g.: wastegates and bypass sluice gates) are controlled manually by DCNR staff, which is an escalating challenge for staff as weather events become more intense and dangerous.

b) Hydraulic locks are inoperable.

c) Culverts that carry streams under the Canal to the Delaware River (DR) are deteriorating.

Proposed Solutions

a) Replace locks and wastegates with new hydraulic structures that contain automated controls, enabling remote operation of water levels within each pool.

b) Seal existing bypass sluice gates.

c) Conduct a structural engineering inspection of culverts that carry streams under the Canal to the river.

Additional Considerations

a) Replacing the current hydraulic structures with automated structures would require approval by the PA Historic and Museum Commission considering the Canal's National Historic Landmark status. The consulting team understands this and believes the project can be designed to both meet historic interpretation standards and modern operational challenges.

b) If approved, there would need to be an assessment of staffing requirements for operations of the new structures. Any addition would need to be added to the operations costs.

Total Capital Cost: $3.9M



Existing bypass sluice gate, looking southeast
(photo taken during field visit on 11/4/21)

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Dredging, Restoring Clay Liner, and Stabilizing Banks

Issues

a) Sediment transport/sedimentation in the Canal due to failures/erosion of mountainside areas adjacent to the Canal in the North-Central communities.

b) Perpetual saturation of mountainside areas leads to water movements below the Canal which eventually erode the clay liner and underlying unconsolidated materials.

c) Canal is not fully watered due to breaches and sinkholes in the clay liner.

d) Multiple local streams flow directly into the Canal with high velocities and volumes that transport and deposit sediment and cause erosion to the prism walls.

Proposed Solutions

a) Remove sediment accumulated in Canal.

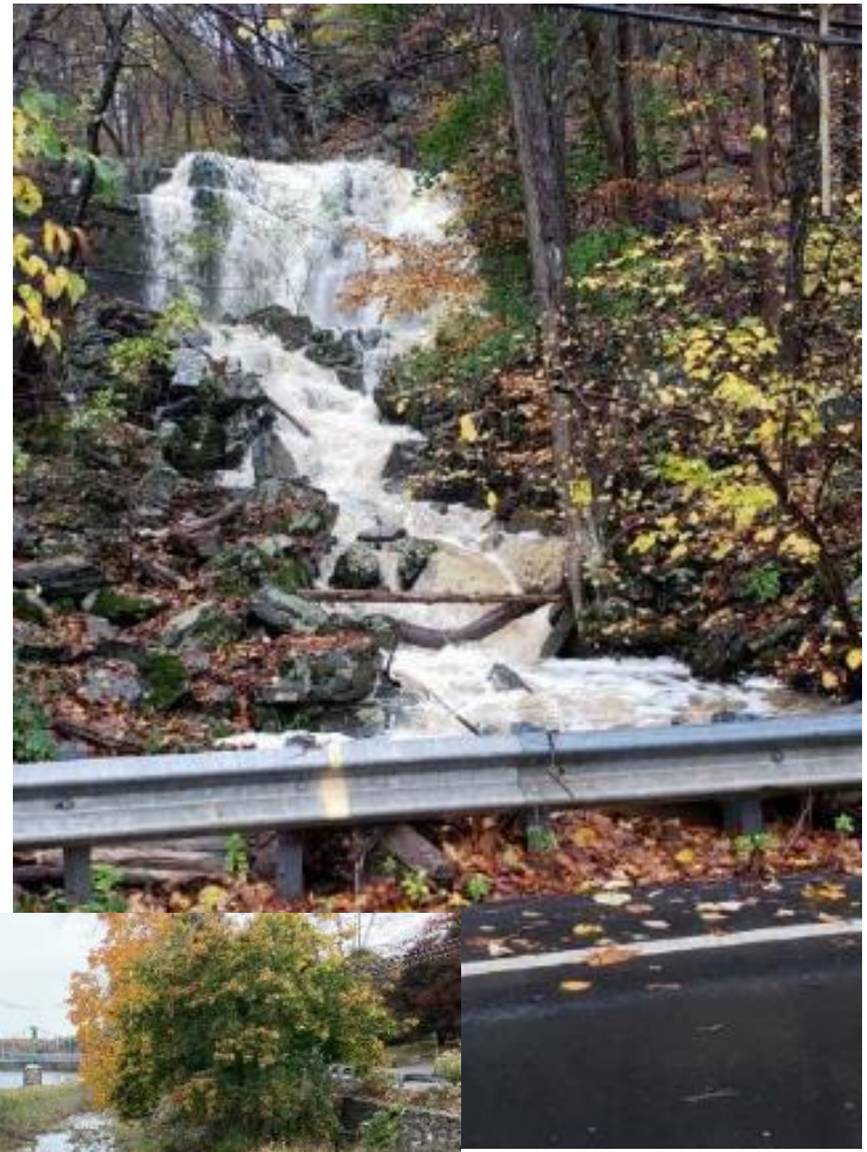
b) Maintain minimum flow rate and velocity needed in the Canal to satisfy water quality goals without eroding the clay liner.

c) Mitigate erosion of the Canal liner through repairs to clay liner.

d) Stabilize unstable subgrade adjacent to river walls via compaction and flowable backfill.

e) Install forebays and slope stabilization measures for the stream confluence points in the North-Central communities.

Total Capital Cost: $58.4M





Top: Small streams flow down the mountainside directly into the Canal prism (photo taken from DC 21 Workbook Vol. 1, 2020)

Left: Vegetation growth in the DC, looking southeast (photo taken during field visit on 11/4/21)

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Repair of River Walls in North-Central Communities

Issues

a) Porous (stone) river walls in the North-Central communities have failed in the past and will continue to fail from combinations of age, scouring, and the forces of periodic river surges.

b) Canal is not fully watered due to backflow through porous (stone) river walls in the North-Central communities.

Proposed Solutions

a) Replace 5% of porous river walls with new retaining walls.

Additional Considerations

a) Walls supporting state roadways are the responsibility of PennDOT, and funding and managing any repairs to walls such as these will need to be negotiated between the funding entity, DCNR and PennDOT.

Total Capital Cost: $10.1M



Structural failure of a retaining wall (photo taken from DC 21 Workbook Vol. 1, 2020)

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Obstructions

Issues

a) Undersized culverts were built across the Canal in Falls Township through railroad and highway ramp embankments and at the Levittown Shopping Center.

b) Existing aqueducts constrict flow southward (and many are deteriorating and/or damaged and need replacement regardless).

c) Multiple other hydraulic obstructions and constrictions are present along the Canal (i.e. roadway culverts and small bridges).

Proposed Solutions

a) Create a full-capacity daylighted prism that spans the entire Canal cross section at the Levittown Shopping Center.

b) Replace the undersized culverts at the railroad and highway ramp embankments with 12-ft diameter culverts.

c) Create full-capacity culverts for other obstruction/constriction locations in North-central communities.

Total Capital Cost: $20.1M



Top: Railroad obstruction, looking south (photo taken during field visit on 11/4/21)
Bottom: Tyburn Road obstruction, looking south (photo taken during field visit on 11/4/21)



Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Canal Terminus in Bristol Borough

Issues

a) Mile 0-1 was backfilled, and multiple roadways were built across the backfilled prism.

b) The mean water elevation in the Delaware River is expected to rise based on climate change projections.

c) Flooding along Adams Hollow Creek, upstream of the Canal, can pose a danger to the Canal.

Proposed Solutions

a) Install a 5-foot diameter pipe between the Canal/Adams Hollow Creek and the river to serve as the terminus outlet to the Delaware River.

b) To prevent a risk of breach of the Canal due to flooding along Adams Hollow Creek, install a retaining wall along the outer edges of the Canal berm bank and towpath where Adams Hollow Creek traverses the Canal.

Total Capital Cost: $3.2M



Earthen dam separating the DC from the Bristol Lagoon (photo taken from DC 21 Workbook Vol. 1, 2020)

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Morrisville Flooding

Issues

The area between the Canal and the Delaware River levee in Morrisville floods when river levels are high, forcing the levee's outlet backflow preventer to close. Flooding is caused by flows overspilling the Canal at the East Maple Street wastegate from river surges, stormwater runoff, and the downstream obstructions constricting in Falls Township.

Proposed Solutions

a) Remove the downstream obstructions in Falls Township (railroad and highway ramp embankments).

b) Install a new outlet structure north of the DR levee on Delmorr Avenue near the Calhoun Street Bridge as a back-up method of discharging Pool 4 to the river during river surge events.

Additional Considerations

a) These estimates are preliminary and would require a more detailed feasibility study. DCNR believes these costs would be much higher than the preliminary estimate.

Total Capital Cost: $119K



Flooding during 2005 between the DR levee and East Maple Street wastegate in Morrisville (photo taken from DC 21 Workbook Vol. 1, 2020)

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Other Items for Future Consideration



Wing dam near the gravity-fed inlet from the DR to the DC in New Hope (photo taken from DC 21 Workbook Vol. 1, 2020)

a) Install a pump station near the gravity-fed inlet from the Delaware River to the Canal in New Hope to supply water to New Hope-south during low river flows.
b) Replace culverts that carry streams under the Canal to the river with new culverts, based on structural engineering assessment.
c) Formalize local stream confluence points in New Hope-south communities.
d) Repair remaining clay liner in New Hope-south communities.
e) Repair remaining River Street porous walls, pending structural assessment.
f) Create full-capacity culverts for other obstruction/constriction locations in New Hope-south communities.
g) Replace aqueducts.
h) Daylight Mile 0-1 in Bristol Borough.
i) Stormwater wetlands in Bristol Borough.
j) Stormwater collection bioswales in Bristol Borough and Morrisville.
k) The dam at Easton is a vital water source for the Canal, so any repairs or replacements to the dam will require consideration of the Canal.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Repairing the Water Elements of the Delaware Canal

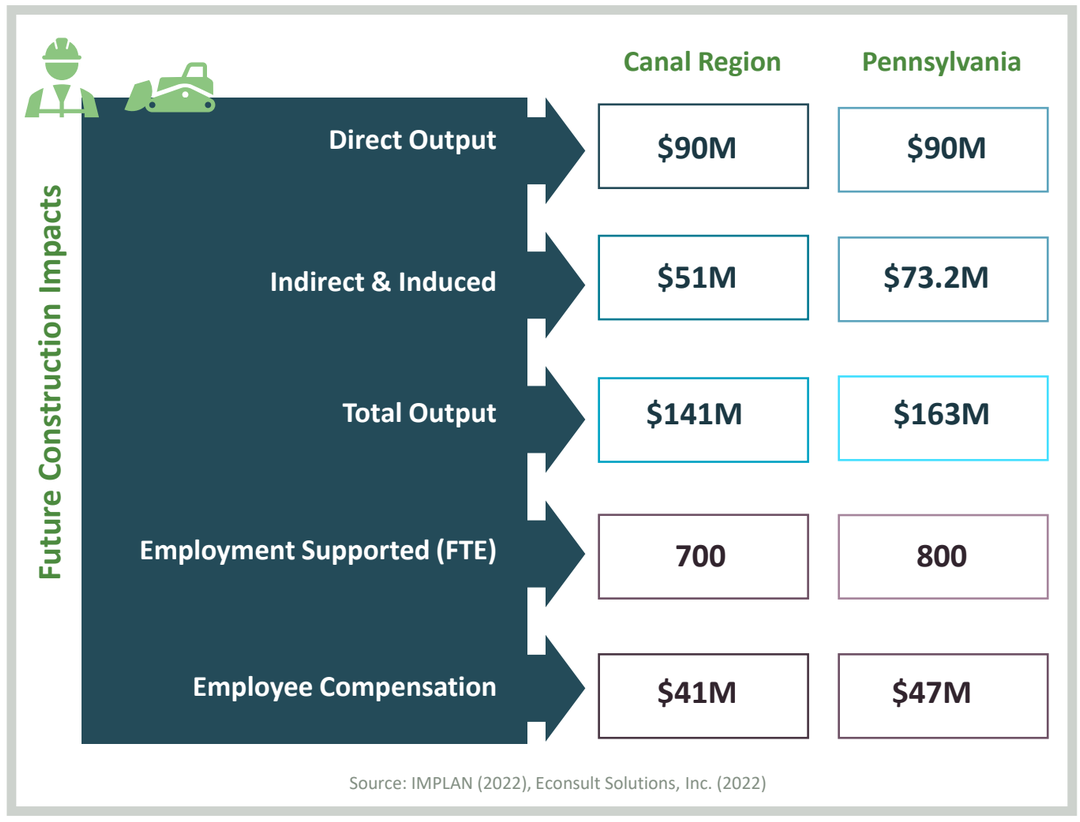
New Investments Stimulate Economic Activity and Create Jobs

$90M in construction investments would yield $141 M in economic activity and would support approximately 700 jobs in Bucks and Northampton Counties.

In addition to restoring a fully watered canal, investment in rehabilitation of the Delaware Canal will also provide economic benefits and jobs as a result of the construction project. The Delaware Canal region, inclusive of Bucks County and portions of Northampton County, and the Commonwealth will all realize economic benefits from strategic investments in the Delaware Canal. Investment from construction related activities will help to stimulate the economy through direct, indirect and induced spending.

Direct economic activity will occur when firms working on the Canal purchase construction materials and pay workers. *Indirect economic activities* will happen when local firms buy goods and services from other local firms. *Induced economic activity* will be generated from the purchasing impact of workers employed in canal related projects.

The potential future investment in the Canal stands to provide a significant benefit to the local economy. Not only will the project create hundreds of jobs and significant tax revenue from the project, but it will also result in an improved Canal that has the potential to draw in more visitors, improve surrounding property values, and increase environmental benefits.



Source: IMPLAN (2022), Econsult Solutions, Inc. (2022)

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding



The Delaware Canal as a Community Asset

Economic and Environmental Value

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Viewing the Canal as a Modern, Multipurpose Asset

A Fully Watered Canal Provides Value to DCNR, Local Communities, Residents, and Businesses

It is critical to understand the role of the Canal as a community asset, not just a historical amenity. So many aspects of the eastern Pennsylvania civic fabric are woven through the heritage of the Delaware Canal, including recreation, community/economic revitalization, ecology, public health, transportation and cultural history. Therefore, investment, modernization and enhancements of this asset is critical to the continued growth and prosperity of the region. But how can the Canal be maintained in a sustainable manner?

A fully watered Canal could be viewed as green infrastructure that can deliver multiple services to the community. The Delaware Canal is a sustainable resource that is deeply integrated within the ecological and cultural communities that host it. A simple example is how watering the Canal could not have been achieved without manipulating the natural hydraulic systems surrounding it.

This human-made waterway, originally built in 1832, could serve as a key component of a modern stormwater management system; a naturalized aquatic habitat; a flood prevention/mitigation resource; a local firefighting reservoir; and major aquatic recreation infrastructure – all services that deliver imperative and quantifiable 21st Century economic values, but require a fully watered canal.

A fully watered Canal can generate revenue to support park budgets—both for capital improvements and operations/maintenance costs that are essential to remedy the legacy of deferred Delaware Canal investments.

New investments must yield clear benefits. Several potential models offer relevant strategies for providing the state park with ongoing revenues with elements of public canal operations that may be appropriate for the Delaware Canal.

- Existing and future utility easements are potentially compatible with recreation and cultural resource demands on the Delaware Canal State Park and offer opportunities for annual revenues from lease fees.
- Hydroelectric generation on the Delaware Canal is currently under separate study with opportunities for annual revenue generation that requires a reliably watered prism for power supply.
- A fully watered canal could serve as a public water transmission system, similar to its sister canal, the D&R, in New Jersey. Either through the Canal directly, or through pipes aligned beneath the Canal prism, the Canal could become the foundation for future partnerships with water suppliers, that would help manage challenges regarding the rise in sea level that affects freshwater supplies in the greater Philadelphia region.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Economic and Environmental Value of the Delaware Canal

Much More than a Beloved Recreational Trail Amenity

The Delaware Canal is an important part of greenspace infrastructure that not only contributes to the quality of life of residents and visitors but also strongly impacts economic and environmental cost, which has tangible effects on a range of categories from health savings to increasing housing value.

RECREATION
Continue to be a destination for activities that contributes to health and well being.

HISTORICAL/CULTURAL
Help preserve the historical and cultural destinations along the Canal.

ENVIRONMENTAL
Improve storm water management infrastructure and contribute to the ecological system.

SAFETY & MITIGATION
Mitigate flooding, ensure structures are safe for use and reduce cost to governments and insurance agencies for related damages.



QUALITY OF LIFE
Improve property values and promote activity in communities in proximity to the Canal.

ECONOMIC DEVELOPMENT
Provide opportunities for economic development activities along the Canal.

SUSTAINABILITY
Implement a stewardship model that enables the Canal to generate supplemental revenue for high quality planning and maintenance.

TOURISM
Attract visitors and enhance tourism in the areas along the Canal route.

Recreation Benefits

Canal neighbors experience an annual cost savings ($150 per household) as a result of recreation activities in and around the Canal

$6M annually as a result of recreation

Health Benefits

Recreation and activity by Canal neighbors helps local businesses and health care providers with annual cost savings

$63M saved annually

Tourism Impact

Canal visitors support increased economic activity in Bucks County.

$11M in increased economic activity

Housing Value

Single family homes within ¾ of a mile of the Canal enjoy a property value premium compared to similar homes outside of that range.

6 – 18% property value premium

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

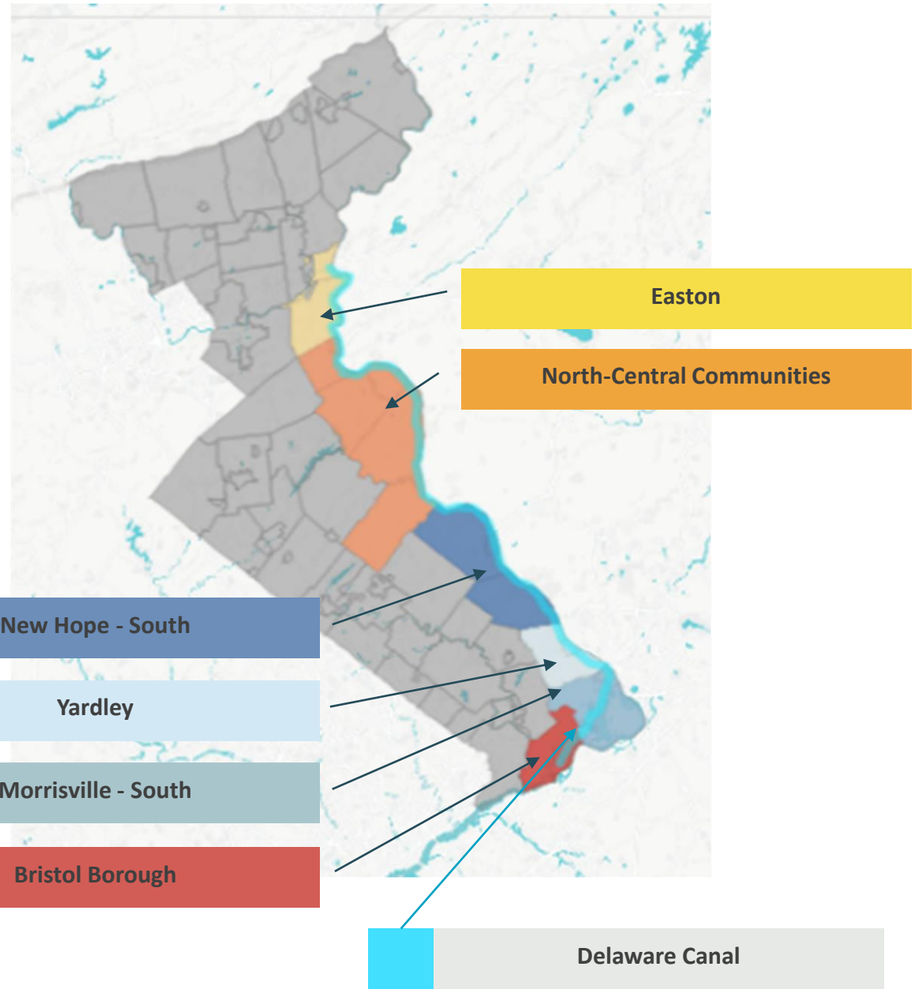
The Delaware Canal Improves Property Value

Residential Properties Near the Canal Gain an Average 6% - 18% Market Premium

The Canal as an amenity positively impacts value to homeowners and local government alike.

Living close to the Canal provides residents with not only tangible access to recreational activities, but also scenic landscapes and wildlife. These are desirable and limited amenities that enhance value to housing characteristics. Because of this added value, residents living near the Canal benefit from a higher single-family property market value while governments gain more tax revenue from property sale transfer and potentially higher property assessment value. ESI estimated the property premiums for proximity to the Canal using Hedonic regression analysis of property transactions within ¾ of a mile of the Canal.

Distance from the Delaware Canal	Average Property Premium
<0.25 mile to Canal	15%-18%
0.25-0.5 mile to Canal	11%-13%
0.5-0.75 mile to Canal	6%-7%



Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

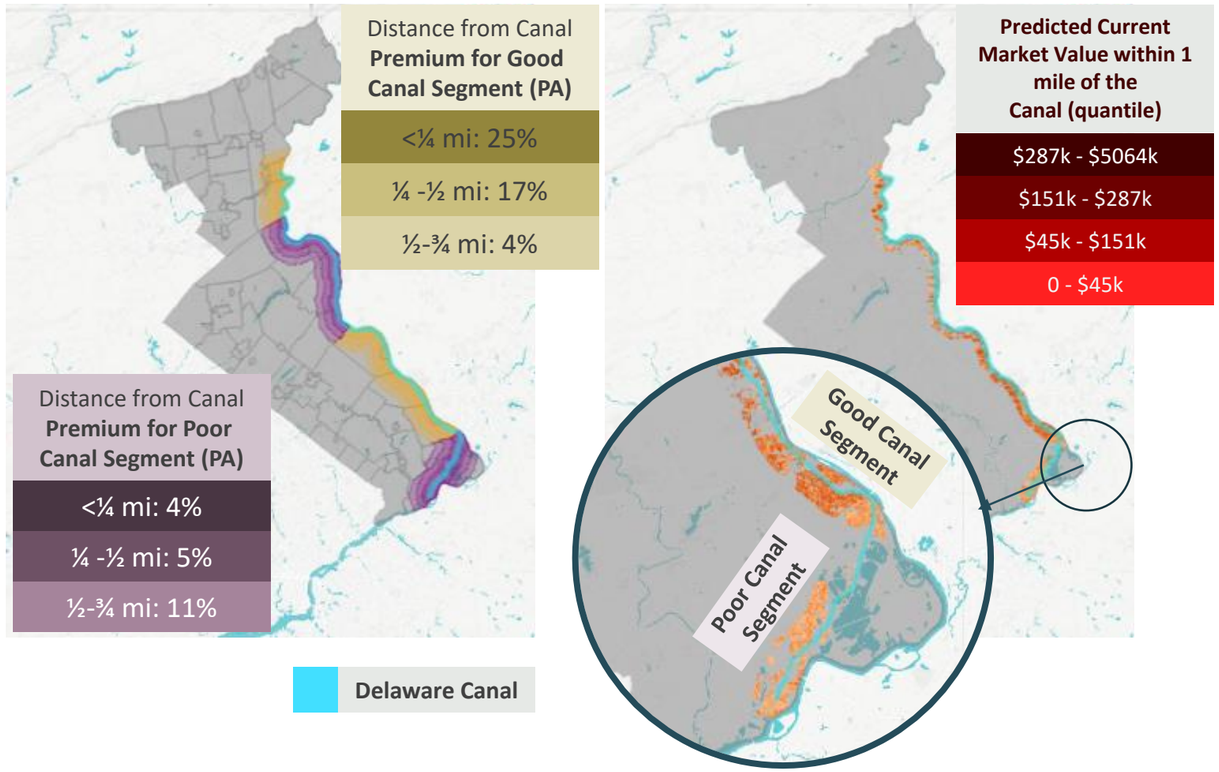
Project Funding

Canal Quality Matters

A Fully Watered, Well-Maintained Canal Adds Even More to Property Value

Properties near a good quality canal segment capture an additional value premium. Houses close to canal segments where water fully flows, the prism structure is intact (including the towpath), and recreational entrances are fully accessible, are estimated to generate a market price premium of 17-25% for single family properties within ½ mile of the Canal. In comparison, homes near Canal segments where these existing conditions are less ideal, comparatively, have a lower range of value.

Improving poor quality Canal segments can help enhance market values for residential properties, eventually bringing additional wealth to residents. As the property assessments rise, county and local governments could capture a portion of the property value growth through increased transaction transfer taxes from sales of properties and increases in assessed value.



Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

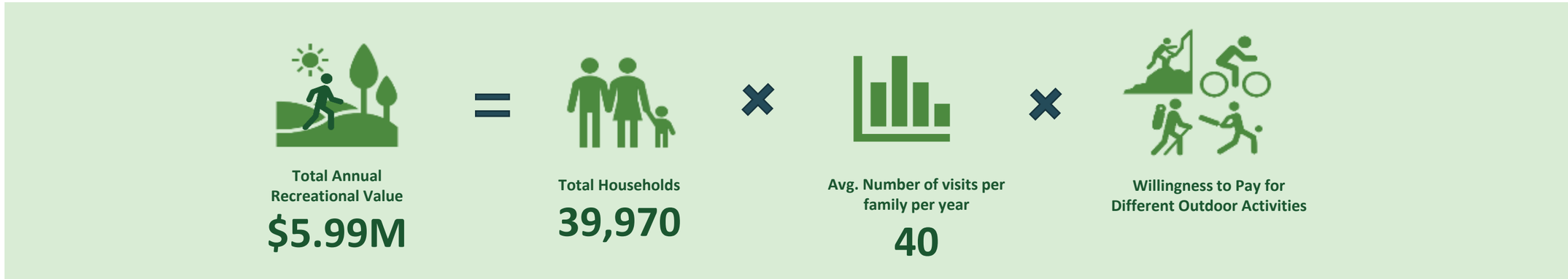
Recreational Benefits Attributable to the Delaware Canal

The Canal Provides $6M in Recreational Cost Savings to Local Households

The Delaware Canal provides a multitude of free and low-cost recreational activities. Estimates of the value residents place on Canal recreation can be derived from using park visitation and valuation estimates. Within the area immediately surrounding the Canal, defined as a one-mile buffer along the Canal, approximately $6M in benefits accrue annually to residents who participate in recreational activities along the Delaware Canal. This value represents the additional amount of money that residents would be willing to spend to participate in the recreational activities they currently enjoy for no personal cost.

The $6M annual value of recreational activity along the Canal is equivalent to $150 per household, per year. The demonstrated willingness to pay for an amenity like the Canal can be leveraged to create additional funding streams such as concessions of fees for usage, or demonstration of value for various grant applications.

While the Canal currently provides recreational benefits to residents biking, running and walking on the intact portions of the Canal towpath, a fully watered canal could add to this value. A fully intact towpath (as part of a repaired canal prism) and a fully watered canal would add more opportunities for biking, running and walking and add in the potential of increased recreational use of the watered Canal for boating and fishing.



Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

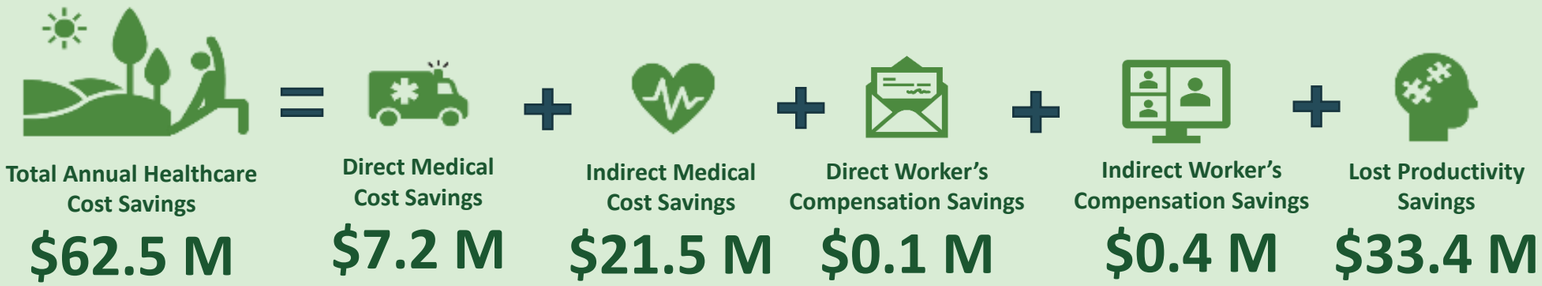
Project Funding

Canal Recreation Supports Health Savings

$62M in Decreased Employer and Health Care Costs

Many of the recreational activities that occur on the towpath along the Canal consist of strenuous to moderate exercise, which contribute to physical well-being and defray health-care costs. In addition to the benefits individuals derive from exercise that takes place along the Canal, the employers of these individuals have lower health-care costs, see fewer workers' compensation claims, and have lower rates of absenteeism and presenteeism. Health care cost savings can be calculated by determining the number of working age adults that conduct physically strenuous exercise along the Canal. According to survey data from PA DCNR, approximately 35 percent of Pennsylvanians participate in exercise outdoors two more times a week and approximately 41 percent of moderate to strenuous outdoor exercise takes place on protected open space such as parks and trails.

According to 2020 estimates from the U.S. Census Bureau's American Community Survey, there are over 61,000 working age (20 to 64 years old) residents within one mile of Delaware Canal. These statistics are used as the basis for estimating the number of residents who meet physical activity guidelines on open space and the associated medical costs, workers' compensation costs, and lost productivity costs that are avoided as a result. In aggregate, it is estimated that employers save $62.5 million from the health benefits their employees derive from the Delaware Canal.



Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

The Delaware Canal Helps Support Tourism Activity

The Canal Attracts Visitors and Encourages Spending in the Region

The Canal is an important historic and recreational amenity that attracts walkers, bikers, runners, and site seers alike. The Delaware Canal Towpath offers visitors the opportunity to experience both the serenity of the preserved natural environment along the Canal and the charming small towns along the Delaware River. Importantly, a significant portion of the tourists drawn to the Canal will spend money in communities they visit. In aggregate, the economic impact of money spent on food, souvenirs, transportation, and more will have a significant direct economic impact, while also generating indirect impacts in local economies in the form of secondary purchases and wages.

Using 2019 Visit Bucks County estimates and additional data, it is estimated that the Canal draws in 82,900 visitors annually. These visitors are estimated to spend $4.1 million within Bucks County. This direct spending at various businesses and institutions results in additional benefits through the service and supply purchases demanded by businesses as well as the purchasing power of individuals employed at these institutions. It is estimated that Canal tourism results in an annual economic impact of $10.8 million.

A fully watered and maintained Canal, as well as further marketing of an enhanced amenity, stand to result in increased visitation. As the number of visitors increases, total dollars spent within surrounding communities has the potential to increase.





Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding



21st Century Delaware Canal

A New Paradigm for the Canal

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

The Need for a New Collaborative Approach

Innovation is Necessary to Address Existing Obstacles to Watering the Canal

Revenue dedicated to maintenance is needed

Despite considerable efforts, state-only maintenance strategies have not been sustainable since commercial operations ceased in 1931. Once transportation revenue no longer paid for maintaining a watered canal prism, the costs of upkeep shifted to the public sector – within an aura of initial optimism that tax revenue through the state parks budgets would be sufficient to sustain the entire system. It was not sufficient, despite significant capital investments by the Commonwealth of Pennsylvania after World War II.

Maintaining water in the Canal is a challenge for Delaware Canal State Park

After decades of trying to stretch limited budgets to fix the problems of an industrial artifact that is deteriorated from age and weather, management decisions are made to maximize the amount and miles of water in the canal while considering all other regulatory and operational (construction projects) needs. Where fiscally feasible, water bypasses are established through construction sites. Unfortunately, for most projects, the ability to keep water flowing is cost prohibitive.

Limits of current public model

By the 1980s, State Parks budgets alone were clearly not able to maintain a watered Delaware Canal. Many heavy canal structures, including those rebuilt by the State in the 1940's-50's, could no longer hold water – resulting in long segments of the Canal prism laying dry for years at a time.

Despite all solutions attempted by State Parks within its budgets, a backlog of structural deterioration continued to grow while periodic river flooding damaged multiple waterway structures. The most immediate negative impacts from the regularly de-watered prism were aesthetic degradation and loss of aquatic habitat in the Delaware Canal – both negatively affecting visitor satisfaction and the ability to successfully market the Delaware Canal within the pool of regional recreation and tourism assets in eastern Pennsylvania. Other impacts were less obvious, but equally significant, including deterioration of the essential clay liner by leaving it to dry, crack, erode and foster structural invasion by unwanted flora and fauna, with the resulting leaks demanding additional repairs before re-watering.

A new model that conserves the Canal infrastructure system by valuing water is in alignment with the sentiments of park users as well as engineering and economic analysis from this and previous studies.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Developing Innovative Solutions to Complex Challenges

Delaware Canal Provides Many Options Outside the State Part Jurisdiction

Safety and public access will always be priorities for Delaware Canal managers, who must respond to every historic structural fatigue and each weather event that nature delivers. The best laid plans for deploying State Park budgets toward strategic system improvements are regularly preempted by urgent responses that are required to meet each new crisis.

Maintaining a fully watered Delaware Canal is a frequent casualty of limited State Parks budgets. Ecological water management opportunities have yet to be considered by State Parks as a potentially new operating principle to support the Canal as an economic and environmental asset, and even potentially provide funding for maintaining the Delaware Canal system.

A full range of quantifiable green infrastructure services that can be delivered by Delaware Canal improvements, such as those required for stormwater management Best Management Practices and flooding resilience, may have the potential to position the Delaware Canal to be eligible for broader funding partnerships.

This analysis presents a range of potentially game-changing, revenue generating partnership opportunities that may enable the Delaware Canal State Park to operate at its full potential as modern, multi-use green public infrastructure.

United Goal …

a watered 60-mile prism is the public consensus (DC Vision Study 2017)

Needs …

are diverse across the corridor

Opportunities …

new partnerships can deliver multiple civic benefits – including health, safety, ecology, economic, community, recreation, infrastructure resilience, transportation

Definitions …

Defining Costs and Investments

- *Costs*
  - *Annual operations & maintenance / periodic minor repairs/replacements.*
  - *Constraints include: DCNR budgets and state park legal ROW*
- *Investments*
  - *Strategic capital improvements for efficiency, resilience, sustainability.*
  - *Transcend only state budgets, park boundary, and beyond in-kind fixes*

Budgets must be clearly delineated to identify water elements

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

The Need for a New Collaborative Approach

Innovation is Necessary to Address Existing Obstacles to Watering the Canal

The current Canal model places most of the burdens on DCNR and the Bureau of State Parks, putting the Canal into budget competition with parks across the state, as well as other Commonwealth agencies.

Rethinking and expanding the Canal model to include community partners can position the Canal to more effectively raise and utilize financial resources. Such a new model is required to meet the complex needs of the Canal.

Canal Ownership
DCNR

Park Management
DCNR

Canal Funding
DCNR

Canal Maintenance and Management
DCNR

Park Programming
(Environmental, Recreation, Historic Interpretation, Tourism Development)
DCNR
D&L Heritage
Friends of The DC
Visit Bucks County

Long Term Planning
DCNR
DC21
Friends of The DC
County Planning Agencies

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Potential Governance Models

Examples of Potential Governance Models Examined for Delaware Canal

Special Services District	Stormwater or Environmental Management District/Authority	Water or Other Public Use Authority	Non-Profit Public Private Partnership/Operating Foundation
Business Improvement District (BID) Neighborhood Improvement District (NID) Tourism Improvement District (TID)			
Local Examples Center City District University City District	**Local Example** Passaic Valley Water Commission	**Local Example** New Jersey Water Supply Authority (includes D&R Canal)	**Local Example** Free Library Foundation
Key Considerations • Can be funded through dedicated assessment fee revenues and/or contributions • Able to apply for foundation and government grants • Requires plans for use of funds • Limits on uses of funds • Flexible structure	**Key Considerations** • Serve as an aggregator for stormwater fees or contributions to build/maintain infrastructure • Need to closely monitor MS4 spending	**Key Considerations** • Provides public service (water, stormwater management, etc.) for fees • Has bonding authority tied to fee generation • Canal has been a long-time source of municipal water • Canal maintenance supported by larger authority rate base	**Key Considerations** • Work closely with government partners • Private fundraising potential • Can manage construction projects and add-on programming • Could serve as home for special services districts or be a part of special service district

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Creating the Delaware Canal Improvement District

A New Paradigm for the Delaware Canal

Special Services Districts are a special purpose government entity that exist independently of the city and county governments. These districts are typically formed around a single purpose or function, varying from development districts to conservation authorities and sanitary service districts or parking authorities.

Within the Commonwealth of Pennsylvania there are over 1,800 special district governments. Notable Pennsylvania special services districts include the Delaware River Joint Toll Bridge Commission, the Philadelphia Regional Port Authority, and the Center City District. These districts have the ability raise revenue to fund specific projects or programs, without diverting funding from municipal or other government budgets.

Municipalities can establish a Special Districts by passing an ordinance or resolution of intent to create such authority. A 30-day public input process, followed by a public hearing must occur for the resolution or ordinance to be compliant with the Municipal Authorities Act. These districts or authorities must then be incorporated and approved by the Pennsylvania's Bureau of Corporations and Charitable Organizations. Districts can be formed by a single municipality or jointly formed by one or more municipalities, including counties. Municipalities have the power to join or leave an authority after its creation.

The Delaware Canal Improvement District

The ESI Team is recommending the establishment of the Delaware Canal Improvement District (DCID) as a county sponsored special services district, with the mission of collaborating with and supporting DCNR, Bucks and Northampton Counties, and local municipalities in repairing and maintaining a fully-watered Delaware Canal.

The DCID would be established as a 501 c3 non-profit overseeing the special services district as established by Bucks County (and potentially Northampton County). The DCID would be responsible for:

- Convening community stakeholders and governmental partners around shared Canal agenda.
- Strategic plan development for Delaware Canal watering projects and maintenance.
- Identifying dedicated funding sources to supplement DCNR funds for completion of projects and operations and maintenance of the watered canal prism.
- Applying for and managing government and philanthropic grants for Canal capital projects and organizational operations

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

A Model for Governance of the Delaware Canal: Case Study

Center City District can be the Prototype Governance Model

Case Study Example: Center City District

The Center City District (CCD) is a special services district in Philadelphia that has helped bring life and vitality to downtown Philadelphia through a variety of safety and maintenance measures, public programing, and park improvements. The CCD was established in March 1990 under the Commonwealth of Pennsylvania's Municipality Authorities Act as a private-sector-directed municipal authority. With the approval from property owners within its boundaries and from the City, the CCD was authorized in November 1990.

Center City District is four organizations, with separate boards, but share common staff and offices:

- **Center City District (CCD)**
- **Central Philadelphia Development Corporation (CPDC)**
- **Central Philadelphia Transportation Management Association (CPTMA)**
- **Center City District Foundation**

How the Center City District model can work for the Delaware Canal Improvement District

Dedicated Funding

CCD: Property assessment district, partners with City to float bonds for Center City improvements and manages projects. Builds and operates concessions and parks.

DCID: Canal Benefit Fee, project management, concession operations

Partnerships and strategic planning

CPDC, CPTMA: Membership organizations, with contributions. Also, can apply for and receive government grants. Provides strategic research and planning services.

DCID: Work with DCNR and government partners on planning, grant applications, private sector partnerships. Convene leadership around Canal issues and collaboration opportunities.

CCD Foundation raises charitable contributions from private foundations to support matching funds, special projects

DCID: Apply for and manage philanthropic contributions and private sponsorships to support projects and operations.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Delaware Canal Sequencing District Sequencing

A new paradigm requires strong leadership, collaboration with multiple partners, and start-up organizational capital. But it can begin relatively quickly, with the support of Bucks and Northampton Counties. There is broad consensus for the need for a fully watered Canal, there is an increased awareness of the value of the Canal, there are new aligned funding opportunities available from the federal and state governments. The timing is right for protecting and enhancing the value of the Delaware Canal by creating a new Delaware Canal Improvement District.

Year 1

START-UP

- Establish Delaware Canal Improvement District
- Obtain $0.5M start-up funding from business, philanthropic, government grants
- Coordinate plan with DCNR, work together to Build support for government grants, focused on Infrastructure bill, ARPA funding

Year 2-3

EARLY STAGE
(as watering improvements begin)

- Canal repair under way
- Government grants evaluated and sought (climate change, stormwater)
- Dedicated Canal Benefit Fee in place
- Voluntary Tourism Funding

Year 3+

LONGER TERM
(after improvements are complete)

- New Canal maintenance funding model established
- Stormwater fees for MS4 communities evaluated
- Water sale/water authority
- Low head hydro power
- Concessions considered
- Voluntary hotel contribution program established

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Creation of a Delaware Canal Improvement District

A New Governance Model to Move the Canal into the 21st Century

Organization	Operations	Roles
Structure/Function		
Form new Business or Neighborhood Improvement District, under PA Municipal Authority Act	Form nonprofit board with leadership staff and board of directors	The new organization will conduct fundraising, convene stakeholders, provide project assistance, and support DCNR management of canal and prism
Key Considerations		
Finding a municipal home in the County (Bucks/Northampton); or Municipality (One or several of 18 municipalities)	Examine relationship with existing organizations, how they would be impacted, and decide what forms of future collaboration will take place (Visit Bucks, Friends, D&L, DC21, County agencies)	Determine collaboration parameters with DCNR, counties, and other agencies to ensure funding stays local and decide project management controls
Benefits		
Can work with local government partners to create dedicated funding sources Able to apply for government grants, leverage public funding Flexible structure that enables different funding models	Ability to receive tax deductible donations and secure foundation funding Work closely with government partners, including potential for project management role on water-based projects	Can play roles of neutral convener that brings all stakeholders together for better collaboration—allowing DCNR to focus on park management Fundraising for Canal improvements can supplement typical park budget limitations

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding



21st Century Delaware Canal

Funding a More Sustainable Future

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Smart Investments to Address Complex Conditions

Innovative Funding Solutions are Required to Tackle Varied Challenges

Funding sources that can supplement state park budgets—both for capital improvements and operations/maintenance costs – are essential to remedy the legacy of deferred Delaware Canal investments.

New investments must yield clear benefits. Several successful models offer relevant strategies for alternative water-based management systems – with elements of public canal operations that may be appropriate for the Delaware Canal.

Potential partners in Delaware Canal maintenance may include state, federal and county government agencies, as well foundation and private sector stakeholders. Changes to the model of solo maintenance by State Parks will require a high level of collaboration to attract supplemental funding partnership commitments.

It is imperative to link the potential benefits of a sustainably-watered Delaware Canal with opportunities for creative funding solutions and partner collaborations. The status quo alternative of management with only State Parks' budgets will most likely result in continued decline of the Canal.

DELAWARE CANAL CHALLENGES

HISTORICALLY UNDERFUNDED PARK	60 MILE 190 YEAR OLD CANAL	EXTREME WEATHER & CLIMATE CHANGE
DIVERSE GEOGRAPHY WITH RURAL AND URBAN LANDSCAPES	MULTIPLE JURISDICTIONS	MULTIPLE GOVERNMENTAL STAKEHOLDERS

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

New Model Requires Significant Funding

Additional Investments in Operations, Capital, and Maintenance are Needed

Annual Delaware Canal Improvement District Support Needed

Up to $1 million operating budget for organization within 3 years, supporting:

- Executive leadership
- Planning and strategy
- Fundraising/development
- Meeting costs
- Support staff
- Overhead
- Office space

Capital and Maintenance Support

Capital funding support for improvement to watered Canal ($95M estimate plus inflationary increases.)

- Provide matching support of 10-20%, totaling $2-4M per year for 5 years
- If taking larger share of responsibility for full project, $50M financed over 20 years would require about $4M per year to retire debt.

Based on current Delaware Canal State Park operating budget of $2 million, supplement DCNR Canal maintenance budget by $500k to $1 million, dedicated to prism maintenance and maintaining water supply.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Funding Source Assessment

Identifying Additional Revenue Sources to Leverage the Canal's Impact

The ESI team evaluated and estimated potential revenue yields for both dedicated and non-dedicated sources of revenues.

Two **dedicated sources** of funds were evaluated and estimated:

- Canal Benefits Fee, based on property assessed values
- Stormwater fees, based on impervious surface square footage

The team conducted research on potential **government grant, business sponsorships and philanthropic opportunities**, which have potential to provide capital funds quickly for the capital investment needed for the proposed Canal repair program. The opportunities of new federal infrastructure and climate change programs are particularly relevant.

Finally, the team explored longer-term **entrepreneurial opportunities**, most of which require demonstration of long-term Canal improvements demonstrating the ability to maintain a fully watered Canal and establishment of partnerships with energy, water or hospitality companies.

Canal Benefit Fee provides dedicated source for long term sustained funding, most linked to benefits received, but most difficult politically.	**Stormwater fees very appropriate for project,** also closely linked to benefits received. Focus will need to be on MS4 communities. Challenge is authority to levy.	**Grants are largest opportunity today,** and by supplementing DCNR could increase flow of funds to Canal quickly.	**Water authority is potential long-term play,** after demonstrating ability to maintain water flow and identify potential customers. Requires willing partner.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Canal Benefit Fee for Properties Near the Canal

Presents Unique Opportunity to Help Close the Funding Gap

Annual amount to raise	$1 Million	$3 Million	$5 Million
Residential Properties			
within 0.25 mile	5 mills	15 mills	26 mills
within 0.5 mile	3 mills	8 mills	13 mills
Commercial Industrial			
within 0.25 mile	17 mills	51 mills	86 mills
within 0.5 mile	12 mills	37 mills	61 mills
Residential + Commercial Industrial			
within 0.25 mile	4 mills	12 mills	20 mills
within 0.5 mile	2 mills	6 mills	10 mills

- A canal benefit fee would be an additional dedicated property assessment for properties within distance bands, as primary beneficiaries of Canal improvements.
- Estimates to the left are based on assessed values of residential, commercial and industrial properties within ¼ and ½ mile of Canal.
- One benefit would be the predictability of the revenues, allowing for the potential of supporting bond repayment for capital projects
- Typically, similar fees are established with fixed durations and linked to specific budgets, requiring periodic reauthorizations.
- Initial establishment will require a campaign effort to explain the use and benefits of the new fee.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Stormwater Management Benefits

While Not Intended, the Canal Has Served as Stormwater Management Infrastructure for Nearby Municipalities

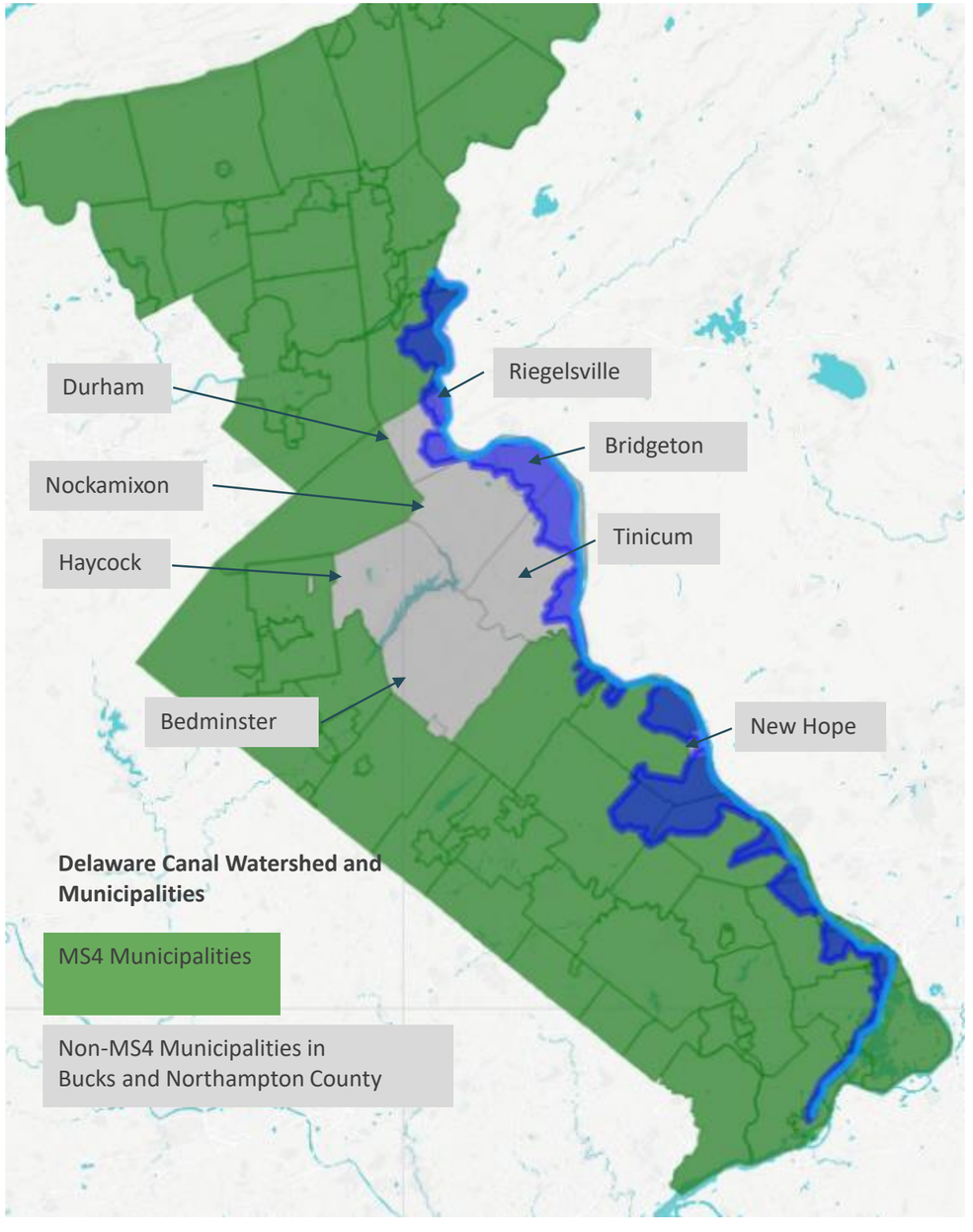
The Delaware Canal Watershed intersects with 20 municipalities in total, 14 of which are MS4 Program operators. These jurisdictions are required by Department of Environmental Protection to implement a stormwater management program for minimizing impact from runoff.

From its origins, the Delaware Canal has received stormwater runoff through stream access directly into the Canal. As climate change has impacted the Watershed, the Canal has seen greater stormwater impact from both the direct stream access and additional runoff sources.

Stormwater Fees have become an increasingly popular mechanism to fund the management and maintenance of required stormwater systems. As of 2019, 27 municipalities in Pennsylvania have adopted stormwater fees. This increase in prevalence can largely be attributed to the ease of implementation and the specificity of use for the revenue generated through these programs.

Unlike general funds, which can be reallocated year to year, revenue from stormwater fees cannot be redirected towards alternative projects, ensuring continuous funding for stormwater infrastructure and maintenance.

While stormwater fees are typically created at the township or city level, as an integral piece of stormwater infrastructure, the Canal, and local communities, could benefit from the revenue generated from a potential stormwater fee. Two potential funding models based on impervious surface fees are presented on the following page.



Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Potential Model Stormwater Fee Options (Bucks County)

Tiered Funding Structure

	Impervious Area sqft	Fee by Tier	Frequency
Tier 1	<1000	$40.2	Annual
Tier 2	1000-1500	$100.6	Annual
Tier 3	1500-2000	$140.8	Annual
Tier 4	2000-2500	$181.0	Annual
Tier 5	2500-3000	$221.2	Annual
Tier 6	3000+	$6.7 per 1000 sf	Monthly

Area of Interest	Total Revenue	Proportion Allocated to the Canal	Canal Revenue
Delaware Canal Watershed	$8,183,811	8%	$654,705
MS4 Municipalities	$7,195,599	8%	$575,648
Bucks County	$7,217,911	8%	$577,433

Flat Fee Structure

	Stormwater Mgmt/ Property	Billings and Collection/ property	Gross Area ($/500 sf)	Impervious Area ($/500 sf)
Residential	$15.04	$1.82		
Non-residential		$2.36	$0.72	$5.12

Total Revenue All Areas	$2,333,207
Total Revenue MS4	$1,717,298
Total Bucks	$2,021,440

Assumed Proportion of Stormwater Fee Allocated to Canal	8%

Revenue to DCID - All Areas	$186,657
Revenue to DCID - MS4	$137,384

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

Non-Dedicated Funding Sources

Source Immediate Opportunities	Type (use and magnitude)	Source Longer term opportunities	Type (use and magnitude)
Federal Government	Infrastructure bill (Capital, Large) Storm water/resiliency (Capital, Large) Climate change (Capital, Large)	**Quasi Government Partnership**	Bridge toll authority (small, difficult) Water/sewer authority contributions (Stormwater fees, water supply agreement, potentially large and flexible)
State Government	PennVest (Capital, loan) DCED grants (Org, Small) DCNR Environmental programs (Capital, Small)	**Entrepreneurial Private Partnership**	Low head hydro power (Maintenance, small, long term) Clean water supply (Capital/maintenance, potentially large, long term) Environmental bonds (Operating, speculative)
County Government	ARPA funds (Capital, short term, large) Bond authority, redevelopment authority (Capital, large) Gaming revenues (Org, Small)	**Concessions and Development Opportunities**	Limited opportunities, but once established could provide some operating support. • Recreation supplies/rentals • Cafés • Festivals
Sponsorship/Membership	Membership (Org, small/cumulative medium)	**Voluntary Tourism Contributions**	Modeled after similar Pocono's fee, potential $10 voluntary contribution would raise $500k with conservative estimate. Could consider restaurant contribution as well.
Philanthropic	Grants (Capital/org/environmental, Large/small)	**Foundations**	Environmental, programmatic, or conservation grants. Most are small with matching requirements.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

The Time is Right for a 21st Century Delaware Canal

A New Paradigm for Funding and Appreciation for this Essential Community Resource

The current environment on the federal and state levels presents an unprecedented opportunity for funding capital improvements for the Canal.

Federal: Largest opportunities could come from the federal infrastructure bill, which prioritizes storm water and climate resilience, and from additional climate resilience funding.

State: Opportunities could arise from new state parks and clean water funding in the 2022-2023 budget.

County and Municipal: Funding opportunities include American Rescue Plan Act funds from county and municipal governments, MS4 funds for stormwater management.

Private: National, regional and local foundation grants focused on watersheds and trails; private support from civic and environmentally minded partners.

The pandemic has increased public awareness of the value of open space, trails and canal as crucial to quality of life and economic vitality of the area. In addition, after Ida and other recent storm events, local residents and officials have an increased recognition of the impact of extreme weather on the canal, and the need for mitigation efforts to ensure canal integrity and increase the canal's ability to help protect local communities and properties.

Post-pandemic efforts promoting the benefits of a fully watered canal must continue to show the importance of the canal to quality of life, economic value, and public safety. This can result in long term support for canal repairs and maintenances, as well as to better position a new stewardship effort to secure funding.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

About the Consulting Team

Project Funding

About the Consulting Team

ESI is a Philadelphia-based economic consulting firm that provides businesses and public policy makers with economic consulting services in urban economics, real estate, transportation, public infrastructure, development, public policy and finance, community development and planning.

eDesign Dynamics is an environmental engineering and planning firm specializing in Water Resources Modeling, Planning, and Design; Ecosystem Design and Analysis; Green Stormwater Infrastructure; International Development; and Resilience Planning and Design.

Simone Collins Landscape Architecture (SC) has a portfolio of visionary and award-winning projects in the areas of parks, trails / greenways, streetscapes, heritage, bridge design, land use and zoning, transportation, institutional / schools, commercial landscapes, and estate garden design.

In conjunction with: **Tony Hanna** has been engaged in commercial development, both in the public and private sectors. He has special expertise in public policy, feasibility analysis, funding partnerships, project management and facilities maintenance.

Introduction
Delaware Canal Waterway Authority Feasibility Study

Modernizing the Delaware Canal
Bridging 19th Century History with 21st Century Infrastructure

The Delaware Canal as a Community Asset
Economic and Environmental Value

21st Century Delaware Canal
A New Paradigm for the Canal

21st Century Delaware Canal
Funding a More Sustainable Future

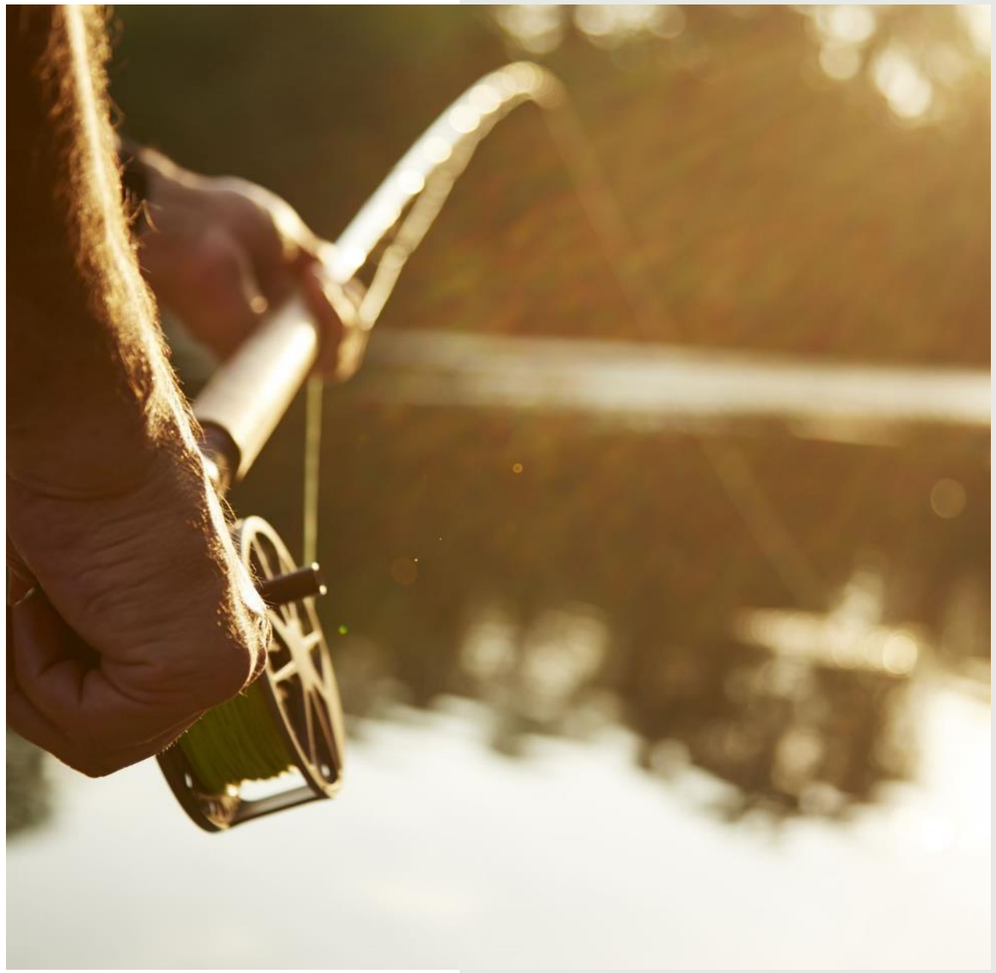
About the Consulting Team

Project Funding

Project Funding

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SIMONE COLLINS LANDSCAPE ARCHITECTURE

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