

Mill-Queen Anne-Black Ditch Creeks Trail Feasibility Study

December 2014

Prepared for:

Bucks County Commissioners
55 East Court Street
Doylestown, PA 18901



Prepared by:

Bucks County Planning Commission
Neshaminy Manor Center
1260 Almshouse Road
Doylestown, PA 18901
Email: bcpc@co.bucks.pa.us

Engineering Consultant:

Pennoni Associates
1501 Main Street, Suite 220
Warrington, PA 18976

Pennsylvania Coastal Zone Management Program

Feasibility Study for the Mill-Queen Anne-Black Ditch Creeks Trail

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Andrew G. Heimark	GIS Technician
Donna W. Byers	Office Supervisor

PENNONI ASSOCIATES

Joel Totten, RLA, LLA	Landscape Architect
-----------------------	---------------------

STUDY STEERING COMMITTEE

Sherri Champey	Bristol Township Recreation Coordinator
Dale Frazier	Greenbelt Overhaul Alliance Levittown (GOAL) / Bristol Township Environmental Advisory Council
Andy Hamilton	Bucks County Bicycle Advisory Task Force / East Coast Greenway
Debby Lamanna	Middletown Township - Parks & Recreation Director / President -Bucks County Recreation Council
Bob Mercer	Silver Lake Nature Center
Phil Smythe	Lower Bucks County Joint Municipal Authority
Chet Szczucki	Landmark Towns Bicycle Strategy Committee / Bristol Borough resident

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EXECUTIVE SUMMARY

The County of Bucks is in the early phases of planning for the development of a recreational trail system primarily along various stream corridors in the County. The stream corridors evaluated by this study, Mill, Queen Anne and Black Ditch Creeks, also collectively known as the Otter Creek watershed, are located in the southern portion of the County in an area bordered by the Delaware River to the south, Trenton Road to the north, Veterans Highway (State Route 413) to the west, and Levittown Parkway to the east.

Map 1 – Mill-Queen Anne-Black Ditch Creeks Trail Project Area



The project area is part of the Atlantic Coastal Plain which is a physiographic province band 5 - 8 miles wide between the Delaware River and the Fall Line, the boundary between the Atlantic Coastal Plain and Piedmont Uplands physiographic provinces. The area includes floodplain and riparian areas and is characterized by wetlands, forested areas, and significant natural resource areas including some of the best remaining examples of coastal plain forest in Pennsylvania including Black Ditch County Park, Delhaas Woods, Silver Lake County Park, Frosty Hollow Park and Queen Anne Park which provide habitat for small populations of rare plants and animals, and Bristol Marsh, a high quality freshwater tidal marsh which contains rare plant species and is used by a diversity of birds for habitat.

Land use in the project area is varied and has evolved over time. Early settlers valued the alluvial lands along the river as productive farmland. The completion of the Delaware Canal in 1832 made the shipment of produce to the city easier and also brought coal from upstate to fuel local development. Extractive land uses in the form of sand and gravel mining began in the 1930's and was followed by large industrial operations such as the United States Steel's Fairless Works in the 1950's which stimulated the

development of large-scale residential housing, commercial and institutional land uses in the form of Levittown. Although the Fairless Steels Work is no longer in existence, the area was taken over by other industrial land uses. In terms of land ownership, the majority of the lands along the stream corridors within the project area are owned by the local municipalities and PECO. Today the area is characterized by intensive suburban development and historic boroughs. The area is well-served by public transportation with the SEPTA Trenton train line having two train stations on this line, Bristol and Levittown-Tullytown, and SEPTA Bus Routes 127, 128, 129 and 304 traverse many of the major roadways in the area. CONRAIL and AMTRAK rail lines also serve the area.

The idea for a linear park in this area goes back to 1955 when the Bucks County Parks Board recommended the creation of a linear park system along various stream valleys in the County. Both the 1974 *Bucks County Park Plan* and the 1986 *Bucks County Park and Recreation Plan* encouraged the establishment of a link park along Mill Creek and Queen Anne Creek. Additionally, the Mill-Queen Anne Creek greenway was identified as a proposed greenway in the Delaware Valley Regional Planning Commission's Long Range Plan, *Destination 2030* and in the *Bucks County Open Space and Greenways Plan* (2011). Additionally, State Route 2053 (Woodbourne Road, Oxford Valley Road, Levittown Parkway) was identified as a priority on-road connection spine as part of countywide bicycle network in the *Bucks County Bicycle Plan* (2012).

The *Mill-Queen Anne-Black Ditch Creeks Trail Feasibility Study* was initiated to further evaluate the feasibility of the trail recommended by these previous planning studies. The project was financed in part by a Federal Coastal Zone Management Grant, administered by the Pennsylvania Department of Environmental Protection (DEP) with funding provided by the National Oceanic and Atmospheric Administration (NOAA), United States Department of Commerce.

As part of the planning process, the Mill-Queen Anne-Black Ditch Creeks Feasibility Steering Committee was established to help direct the production of the project and will be an important resource for moving the trail forward. The Steering Committee consisted of stakeholders and representatives representing the municipalities along the proposed trail route, as well as representatives from various recreational user groups. In addition to the insight provided by the steering committee, input was derived through a public involvement process that included meetings with stakeholders, two public workshops, presentations to various citizen committees, and posting of the draft study for public comment on the Bucks County website.

The *Mill-Queen Anne-Black Ditch Creeks Trail Feasibility Study* evaluates existing conditions, connections to nearby destinations, available public lands, existing trail sections, conservation easements, and other opportunities and constraints. The study considers a series of alternatives and possible trail alignments and presents an opinion of probable construction costs for different alignment scenarios.

Construction of a regional trail along the Mill-Queen Anne-Black Ditch Creek corridors is feasible, although there are several challenges for implementing the project that will need to be addressed. The opportunities and constraints identified and discussed in this study are as follows:

- Opportunities
 - Many residents along the proposed project corridor support the development of a multi-use trail to serve as a community transportation and recreation resource.
 - The trail will increase access for residents of Bucks County to the natural areas along the creek corridors.

- The location of the trail is within close proximity to several schools and will provide outdoor educational opportunities.
 - The trail will provide connection to public transportation.
 - The trail will connect to existing trail systems including the East Coast Greenway and the Delaware & Lehigh Canal Towpath Trail.
 - There are extensive opportunities, via connector trails, to provide connectivity to adjacent residential developments.
- Constraints
 - There are protected natural resources and wildlife habitat within the corridor that will need to be protected as part of the development process.
 - In several areas of the corridor, construction of boardwalks will be required to minimize impacts to wetlands. These costs will need to be considered.
 - Due to significant wetlands in several areas, and other constraints, some segments of the trail will need to be on-road and/or along trails placed in the right-of-way along roads.
 - Funding for both the development and ongoing maintenance of the trail will be needed.
 - Although the majority of properties along the trail corridor are owned either by the County or local municipalities, there are several properties where the acquisition of trail easements on private property will be required.

The Mill-Queen Anne-Black Ditch Creeks Trail is envisioned as a non-motorized, multi-use trail serving as a key component of the County's developing trails network. The trail will be approximately 15.0 miles in length. Anticipated trail use activities include walking, hiking, running, birding, and bicycling. The trail can also serve as a water trail, with improved canoe, kayak, tubing and fishing access along the lower portion of Mill Creek and on Magnolia Lake.

The Mill-Queen Anne-Black Ditch Creeks Trail will generally have a smooth surface designed to accommodate pedestrians, bicyclists, wheelchair users, and strollers. Where possible, the trail will be accessible for maintenance, police, and fire and emergency vehicles. The paved surface of the multi-use trail will generally be a minimum of 10 feet wide and constructed to meet ADA guidelines for accessibility. Due to natural resource or other limitations, certain sections of the trail will be on-road.

The study evaluates and assesses the trail by nine segments, with the range of estimated total costs for each segment being as follows:

Table 1 – Mill-Queen Anne-Black Ditch Creeks Trail Primary Trail Segments

Segment	Segment Boundaries	Miles	Total Estimated Costs
1	Mill Creek - Veterans Memorial Park to Frosty Hollow Road	1.5	\$ 1,300,210
2	Mill Creek - Frosty Hollow Road to New Falls Road & Bristol Oxford Valley Road Intersection	1.2	\$ 1,420,390
3	Queen Anne Creek - Oxford Valley Park to Woodbourne Road	1.4	\$ 1,179,230
4	Queen Anne Creek - Woodbourne Road to New Falls Road & Bristol Oxford Valley Road Intersection	1.4	\$ 1,439,341
5	New Falls Road & Bristol Oxford Valley Road Intersection to Mill Creek Road and Edgely Road Intersection	4.6	\$ 3,383,600
6	Mill Creek Road and Edgely Road Intersection to Levittown Parkway and Bristol Pike Intersection	2.1	\$ 2,509,969
7	Bristol Oxford Valley Road and Mill Creek Road Intersection to Silver Lake Nature Center	1.2	\$ 1,427,903
8	Silver Lake Nature Center to Bristol Pike	0.9	\$ 775,136
9	Bristol Pike to Bristol Marsh	0.8	\$ 156,263
Total		15.1	\$13,592,042

Note: Costs cited are exclusive of alternative routes and connector trails and reflect only those costs associated with the primary trail.

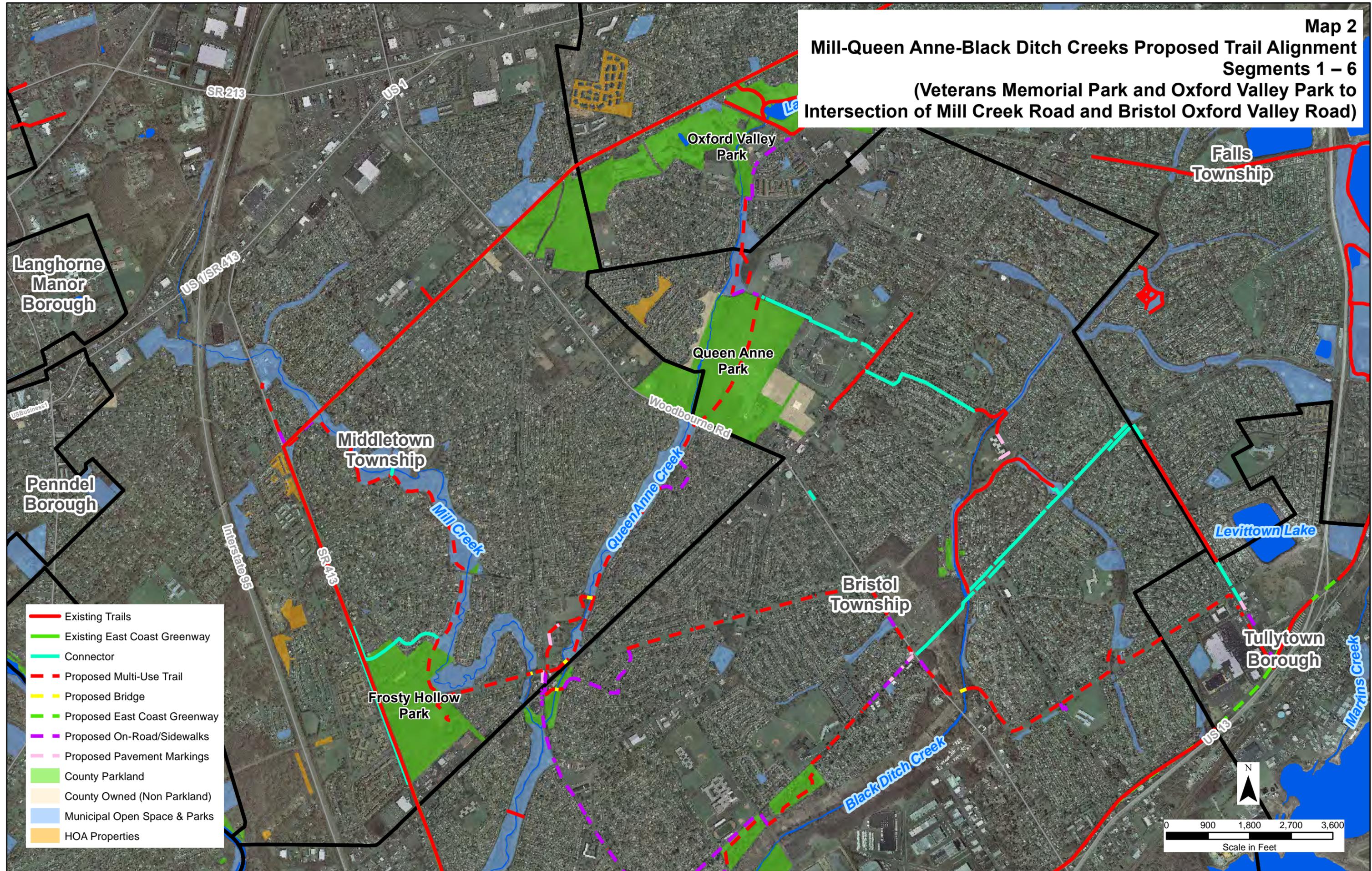
The study establishes specific implementation strategies relative to the recommended phasing of construction of the various segments; outlines alternative organizational structures to oversee the development, operation and maintenance of the trail; identifies specific maintenance tasks associated with the trail; discusses the need to ensure the safety of the trail from both the user and trail operator perspectives; outlines potential funding sources for financing the construction and ongoing maintenance of the trail; and provides recommendations for future actions including:

- **Coordination with municipalities:** Because the proposed trail alignment spans two boroughs and five townships, creating the Mill-Queen Anne-Black Ditch Creeks trail will require a sustained and coordinated effort involving key stakeholders, municipal representatives, and other interested parties to advance the project and assist in accomplishing many of the recommendations and next steps outlined in this study.
- **Fundraising and grant writing:** To advance the project to the next stages, funding will be required. There are a variety of funding sources available for projects of this nature, and all available opportunities should be pursued.
- **Establishment of a maintenance endowment:** Successful trails require ongoing maintenance. Establishing a fund at the beginning of a trail project will help sustain the effort in the future.
- **Securing the Right-of-way:** A process of sharing information with municipal officials relative to those parcels for which easements are needed should be established so that as development plans are presented, any required easements can be secured as part of the development process.

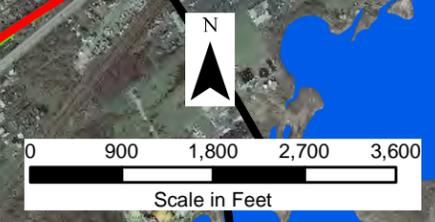
Given the complexity of the project and its associated costs, it is likely that the trail will be built over time in small pieces, where opportunity arises, not all at once. Municipalities can use the study as a way of getting pieces built when there is new development or redevelopment occurring, or road improvements are being undertaken by PennDOT.

The maps on the following pages highlight the proposed route of the Mill-Queen Anne-Black Ditch Creeks Trail and its connections to the growing trail network.

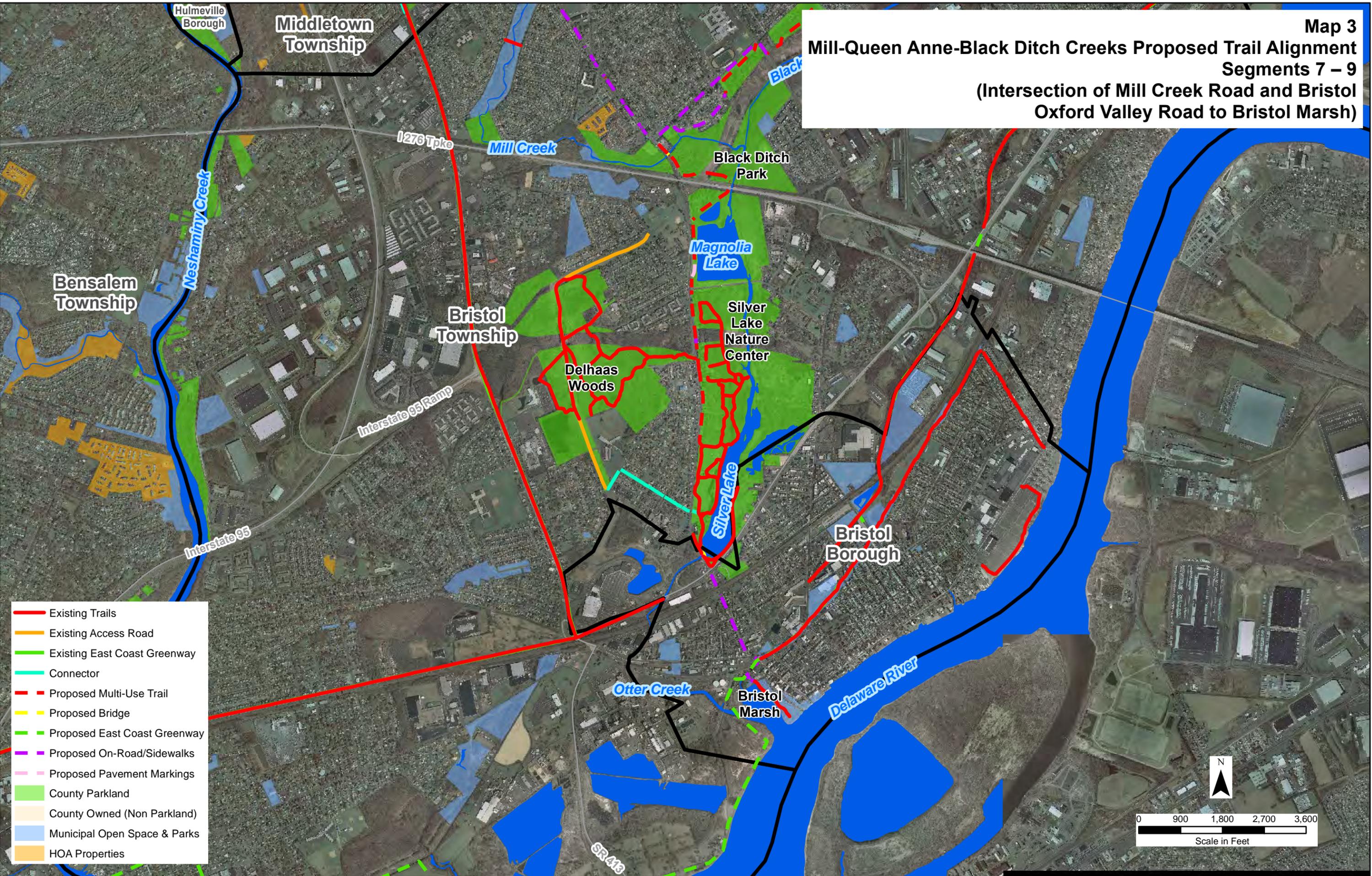
Map 2
Mill-Queen Anne-Black Ditch Creeks Proposed Trail Alignment
Segments 1 – 6
(Veterans Memorial Park and Oxford Valley Park to
Intersection of Mill Creek Road and Bristol Oxford Valley Road)



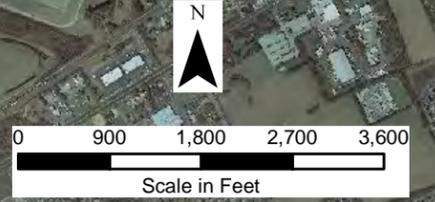
- Existing Trails
- Existing East Coast Greenway
- Connector
- Proposed Multi-Use Trail
- Proposed Bridge
- Proposed East Coast Greenway
- Proposed On-Road/Sidewalks
- Proposed Pavement Markings
- County Parkland
- County Owned (Non Parkland)
- Municipal Open Space & Parks
- HOA Properties



Map 3
Mill-Queen Anne-Black Ditch Creeks Proposed Trail Alignment
Segments 7 – 9
(Intersection of Mill Creek Road and Bristol
Oxford Valley Road to Bristol Marsh)



- Existing Trails
- Existing Access Road
- Existing East Coast Greenway
- Connector
- Proposed Multi-Use Trail
- Proposed Bridge
- Proposed East Coast Greenway
- Proposed On-Road/Sidewalks
- Proposed Pavement Markings
- County Parkland
- County Owned (Non Parkland)
- Municipal Open Space & Parks
- HOA Properties



INTRODUCTION

PROJECT SCOPE

The Mill-Queen Anne-Black Ditch Creeks Trail project is designed to assess the feasibility of a multi-use trail facility along three stream corridors that comprise the Otter Creek watershed. Mill Creek and Queen Anne Creek are the two primary streams in the Otter Creek watershed. These two streams join together in Bristol Township near the intersection of New Falls Road and Oxford Valley Road, flow through Bristol Township as Mill Creek, and then through Bristol Borough as Otter Creek to the Delaware River. Black Ditch is the other primary stream in the Otter Creek watershed and flows into Mill Creek just north of where Mill Creek passes under the Pennsylvania Turnpike.

The length of the primary proposed trail is approximately 15.0 miles. An additional 8.0 miles of connector trails would provide connections to neighborhoods and public transportation facilities. The project area boundaries include Trenton Road to the north; South Oxford Valley Road / Levittown Parkway to the east; the Delaware River to the south; and Route 413 / Veterans Highway to the west. The trail will encourage non-motorized means of travel and provide opportunities for both education and recreation. For these reasons, the Mill-Queen Anne-Black Ditch Creeks Trail is a high priority for the County, meeting goals and needs stated in previous planning documents.

PREVIOUS PLANNING

The Mill-Queen Anne-Black Ditch Creeks have been the subject of numerous planning studies. Planning documents incorporated into this study are summarized below:

- *Delaware Valley Regional Planning Commission - Connections 2040 Plan (2013)* - Identified 104 greenspace corridors across the Delaware Valley region, sixteen of which, including the Mill-Queen Anne Creek Greenway, are located in Bucks County.
- *Bucks County Bicycle Master Plan (2012)* - Identified State Route 2053 (Woodbourne Road, Oxford Valley Road, Levittown Parkway) as a priority spine and on on-road connection of the countywide bicycle network.
- *Bucks County Open Space and Greenways Plan (2011)* and *Bucks County Comprehensive Plan (2011)* - Identified the Mill-Queen Anne-Black Ditch Creek greenway as a multi-use greenway.
- *Bristol Delaware Riverfront Greenway Feasibility Analysis (2009)* - Assessed the feasibility of constructing a portion of the East Coast Greenway, a 3,000 mile-long shared-use trail between Calais, Maine and Key West, Florida, through Bristol Township and Bristol Borough.
- *Middletown Millennium Plan - Recreation, Parks and Open Space Plan Update (2005)* - Identified proposed trails along the Mill Creek and Queen Anne Creek greenways.
- *GreenSpace Alliance - Regional Open Space Priorities Report (2004)* - Identified Silver Lake Park as a Focal Area for Recreation.
- *Black Ditch Creek Greenway Study (2003)* - Assessed the potential of developing passive recreation linkages along the Black Ditch Creek corridor.
- *Bristol Township Municipal Open Space Plan (2000)* - Identified the development of the Black Ditch Creek Trail as one of the highest priority projects.
- *Lower Delaware River Conservation Plan (2009)* - Identified the presence of existing trails and advocated for the development of additional trails.

- *Bucks County Park & Recreation Plan* (1986) - Reaffirms commitment to linear park system.
- *Bucks County Park Plan* (1974) - Reaffirms commitment to linear park system.
- Bucks County Parks Board (1955) - Recommended creation of a linear park system along various stream valleys in the County including the Mill and Black Ditch creeks.

These previous planning efforts serve as the basis of support for the establishment of a trail system along the Mill-Queen Anne-Black Ditch creeks corridors. This study is designed to further the recommendations contained in these previous planning efforts.

This *Mill-Queen Anne Black Ditch Creeks Trail Feasibility Study* investigates the opportunities and constraints affecting the proposed trail alignment and provides recommendations for proceeding with the subsequent phases of implementation. Additionally, the study recommends appropriate management and maintenance entities, as well as funding sources for construction and maintenance. The construction phase is sequenced and cost estimates have been developed for each segment of the trail.

Map 4 – Mill Queen Anne-Black Ditch Creeks Trail Project Area



PROJECT PARTNERS

The Mill-Queen Anne-Black Ditch Creeks Trail project has benefitted from the talent and skills of the project’s many partners. These partners have generously provided their time and technical expertise to the project through participation on the Trail Feasibility Study Steering Committee. Steering Committee members included:

- Sherri Champey Bristol Township Recreation Coordinator
- Dale Frazier Greenbelt Overhaul Alliance Levittown (GOAL) /
Bristol Township Environmental Advisory Council
- Andy Hamilton Bucks County Bicycle Advisory Task Force /
East Coast Greenway
- Debby Lamanna Middletown Township Parks and Recreation Director /
President - Bucks County Recreation Council
- Bob Mercer Director-Naturalist Silver Lake Nature Center
- Phil Smythe Lower Bucks County Joint Municipal Authority
- Chet Szczucki Landmark Towns Bicycle Strategy Committee

In addition to the members of the Trail Steering Committee other partners providing time and expertise include Robert Thomas - Campbell Thomas & Co, Jeffrey Marshall - President, Heritage Conservancy, David Clifford - Montgomery County Planning Commission, and Jeff Knowles - Regional Adviser, Pennsylvania Department of Conservation and Natural Resources.

The feedback and input received from property owners, residents, and other interested citizens who attended the public workshops, reviewed the draft document, and provided useful information and helpful observations were also invaluable in the creation of this study.

The project was financed in part by a Federal Coastal Zone Management Grant, administered by the Pennsylvania Department of Environmental Protection (DEP) with funding provided by the National Oceanic and Atmospheric Administration (NOAA), United States Department of Commerce.

REGIONAL CONTEXT

The project area is located in the southern portion of Bucks County, approximately midway between Philadelphia and Trenton, NJ. The area is bisected north to south by the Pennsylvania Turnpike, with Interstate 95 lying just west of the project area. Historic Bristol Borough and Bristol Marsh, one of the few remaining freshwater tidal marshes along the Delaware, receiving water from the Delaware River and the Atlantic Ocean, anchor the southern end of the project area.

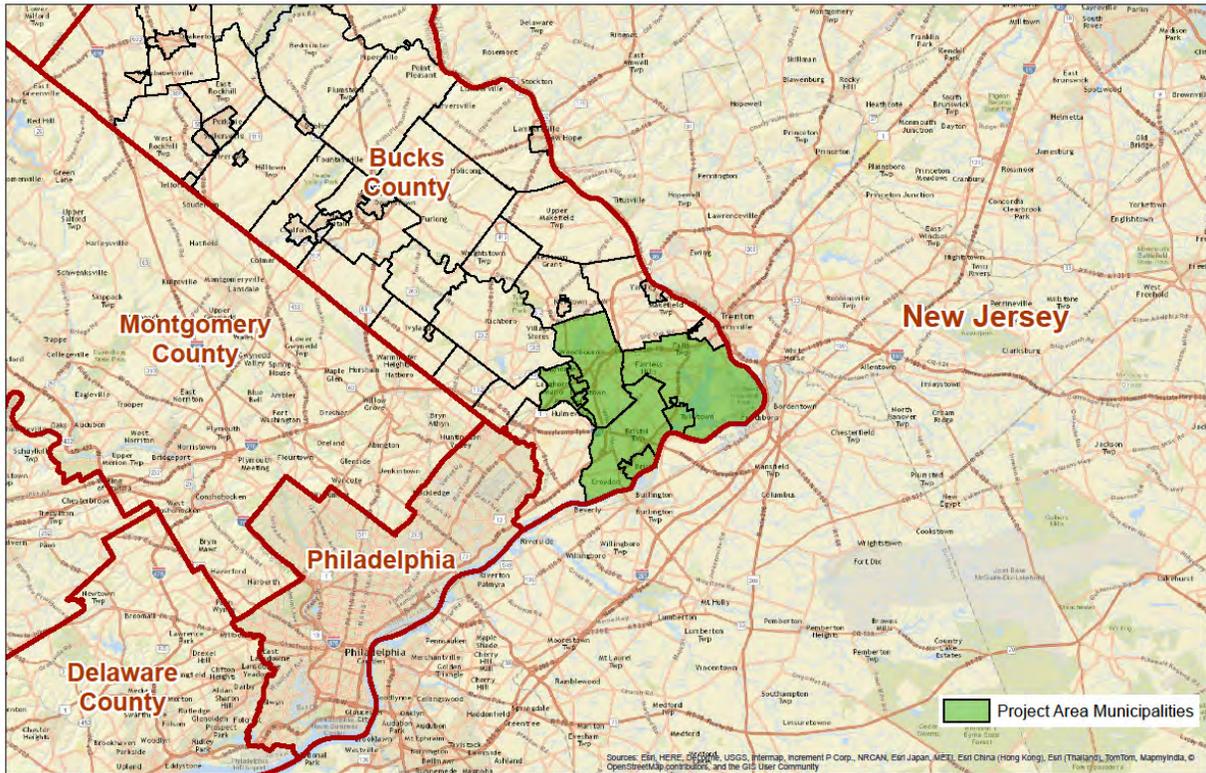
The Mill, Queen Anne and Black Ditch Creek stream corridors traverse five municipalities:

- Bristol Township
- Falls Township
- Middletown Township
- Bristol Borough
- Tullytown Borough

These five municipalities have a combined population of 145,916, representing over 23 percent of the County's total population.

The project area is primarily an interesting mix of suburban development and historic boroughs. The area is well-served by public transportation with the SEPTA Trenton train line having two train stations on this line, Bristol and Levittown-Tullytown, and SEPTA Bus Routes 127, 128, 129 and 304 traverse many of the major roadways in the area. CONRAIL and AMTRAK rail lines also serve the area.

Map 5 – Mill-Queen Anne-Black Ditch Creeks Project Area - Regional Perspective



BENEFITS OF THE TRAIL

Creation of the Mill-Queen Anne-Black Ditch Creeks Trail will provide recreational, environmental, quality-of-life and economic benefits including:

Recreational Benefits

- Provides a network of on-road and off-road connections to the five communities in the study area.
- Provides connections outside of these communities via the Delaware and Lehigh Canal Towpath Trail and the East Coast Greenway Trail.
- Offers safe walking and biking routes to various schools and institutions close to the trail.
- Provides access to various historic sites including historic Bristol Borough.
- Provides increased access to the creeks for fishing and water-based recreation.
- Provides connections between five County-owned park facilities.
- Offers opportunities for nature study and bird watching.

Environmental Benefits

- Encourages removal of invasive plants.

- Provides the opportunity to improve stormwater management, re-establish and rehabilitate riparian buffers along the creek and conduct streambank restoration.
- Provides opportunities for environmental education programs at schools in the area.
- Gives citizens the choice to either walk or bike, reducing the need to drive.
- Reinforces the sense of a watershed to users of the trail.
- Provides opportunities for job training programs and youth groups that could result from ongoing maintenance and stewardship tasks.
- Provides public access points to relatively inaccessible sections of the creeks enabling easier environmental monitoring of the creek.

Quality of Life Benefits

- Encourages physical activity to improve the health and welfare of users of the trail.
- Inspires local residents to participate in the ongoing maintenance of the trail and create a sense of community.
- Allows for the opportunity to use a bicycle as an alternative transportation mode to access employment centers and other community facilities, while also connecting to public transportation.

Economic Benefits

- Routing the trail close to historic boroughs and commercial centers will prove to be of benefit to both businesses and trail users. Businesses provide trail amenities to trail users in the form of restaurants and shops, thus bringing in a new source of income to help grow current businesses and create opportunity for the development of new ones.

PROJECTED USES

The Mill-Queen Anne-Black Ditch Creeks Trail will appeal to a broad spectrum of users, and will initially focus primarily on recreational users including anglers, runners, bicyclists, cross-country skiers, water trail users and pedestrians. Given its proximity to several schools, the trail is also designed to provide a safe route to encourage students to bicycle and walk to school. The eventual development of a trail along the stream corridors will also serve as a commuter route for those interested in commuting to work by bicycle.

Trail users will vary by trail type, as well as by age, by experience, and by when they are using the trail and with whom they may be traveling. Individuals may fall into multiple categories at different times of day or different times in their lives. These diverse users share common interests in the following areas:

- **Safety** - The trail system should be safe for all users, and to the extent possible, provide alternatives to traveling along and across roadways.
- **Easy to Use** - The system should be user-friendly, with signage, maps and wayfinding information.
- **Well Maintained** - The system should be maintained with surfaces that are smooth and free of debris and litter.

In addition to these common interests, individual trail user groups also have specific concerns, including:

- **Pedestrians** - Prefer a smooth walking surface, benches and shades for resting, and connections to nearby residential areas for easy access and frequent use over short distances.
- **Runners** - Often prefer soft shoulders as an alternative to running on asphalt or concrete.
- **Bicyclists** - Include users with a variety of skill levels, from children and seniors who ride more slowly, to highly skilled cyclists capable of sustaining higher speeds, to mountain bicyclists who may use the trail for access to more rugged single track trails. All require smooth, firm surfaces and slightly greater height clearances as compared to pedestrians.
- **Disabled** - People with mobility impairments require smooth, firm, ADA-compliant pathways, with rest areas on steep grades, maximum 2 percent cross slopes, barrier-free facilities, and accessibility information at trailheads.
- **Cross-Country Skiers** - Includes both skating and track skiers and snowshoe users, all of whom require different groomed surfaces.
- **Water Trail Users** - Canoeists, kayakers and tubers are all potential users of the trail and will require places to enter and exit the creek safely and safety information regarding seasonal flood conditions. In addition, potential conflicts with anglers can also arise.
- **Birdwatchers** - Areas for stepping off the main trail should be provided to minimize potential conflicts with higher-speed users such as bicyclists.

STUDY GOALS AND OBJECTIVES

The purpose of this study is to assess the feasibility of developing a multi-use trail system along the Mill, Queen Anne and Black Ditch Creeks Greenways to link residential, commercial, and institutional destinations. As the study progressed, meetings were held with the Steering Committee and workshops were held to engage the public in sharing information and ideas. Through these meetings and workshops the following objectives for the study were established:

- Assess the potential for connecting to existing trails, parks, recreational areas and neighborhoods along the project corridor.
- Evaluate various alternative trail routes, trailhead locations, and the potential for establishing loop trails along the project corridor.
- Develop a conceptual trail plan that takes advantage of the natural, scenic, and historical and cultural features in the area.
- Provide recommendations for trail safety, maintenance, operations and accessibility.
- Identify priorities for trail segment development.
- Provide an overview of right-of-way acquisition methods.
- Identify resources needed to move the study to the implementation phase.

STUDY ORGANIZATION

The *Mill-Queen Anne-Black Ditch Creek Trail Feasibility Study* contains the following sections:

- **Introduction:** Background information for the study, previous planning studies, a discussion of community support and partners, and a discussion of public input to the planning process.
- **Existing Conditions:** An inventory and analysis section that contains an overview of conditions and key features in the trail corridor including:

- Location of key natural features including steep slopes, water features, woodlands, and natural areas;
 - Discussion of land use and land ownership along the trail corridor;
 - Location of existing trails, park and recreational facilities, and transportation connections;
 - Identification of existing utilities, easements and rights-of-way; and
 - Identification of historic resources that would serve as points of interest along the trail.
- **Proposed Trail Plan:** An overview of trail design standards, trail signage, surfaces, and widths; examples of similar trail systems; the proposed trail alignment; identification of easements needed; and an opinion of probable costs for developing the Mill-Queen Anne-Black Ditch Creeks Trail.
 - **Implementation Strategies:** Strategies related to the development and implementation of the trail including recommended construction phasing; trail operation, management and maintenance; security and risk management measures; an overview of potential funding sources; and recommendations for future action.

STUDY METHODOLOGY

The study is based upon the previous studies identified earlier, synthesized with an assessment of current conditions based on field surveys and aerial photography, and input received from the public participation workshops.

Assessment of Existing Conditions

Existing conditions were identified through the use of high-resolution aerial photographs. This information was supplemented and updated by field observation work conducted from May 2013 through February 2014. Information on rights-of-way was obtained from municipal engineering records and the Pennsylvania Department of Transportation. Property ownership records were obtained from the Bucks County Board of Assessment.

Public Participation

The public participation component of the study was critical to the success of the *Mill-Queen Anne-Black Ditch Creeks Trail Feasibility Study*. The objectives of the public participation process included:

- Encouraging an exchange of ideas amongst stakeholders;
- Building consensus to help minimize future conflict and project delays;
- Promoting early involvement by stakeholders and other community members to help develop support for the proposed trail; and
- Identification of a trail system that can be implemented based on the identification of issues and opportunities and weighing of trade-offs.

Key components of the public participation process included:

- Establishment of a Study Steering Committee;
- Public planning workshops; and
- Interviews with municipal officials and other key stakeholders.

The steering committee was comprised of major stakeholders in the trail project area including municipal representatives and representatives from various recreational user groups. The committee met twice during the study process: February 27, 2013 and December 10, 2013.

In addition to the steering committee meetings, two public workshops were held during the process on April 30, 2013 and February 20, 2014. Presentations were made to the Bristol Township Environmental Advisory Council and Greenbelt Overhaul Alliance Levittown (GOAL) on July 24, 2013 and November 20, 2013. Public input was also sought at Bristol Township Earth Day on April 27, 2013.



April 30, 2013 Public Workshop



February 20, 2014 Public Workshop

Further direct outreach with key individuals and organizations resulted in meetings and communications with the following:

- Louis Belmonte, PE Pennsylvania Department of Transportation, Division 6
- Mary Lang Pennsylvania Department of Transportation, Division 6
- Jeff Marshall Heritage Conservancy, President
- Jay Roth, PE Jacobs Engineering Group, Inc.

Following the public workshop on February 20, 2014, the presentation from the workshop was posted on the Bucks County website at <http://www.buckscounty.org/government/CommunityServices/PlanningCommission>.

Finally, press releases were sent out announcing the availability of the draft version of the study for public comment on the Bucks County Planning Commission website.

Details about the public participation process are found in Appendix A.

EXISTING CONDITIONS

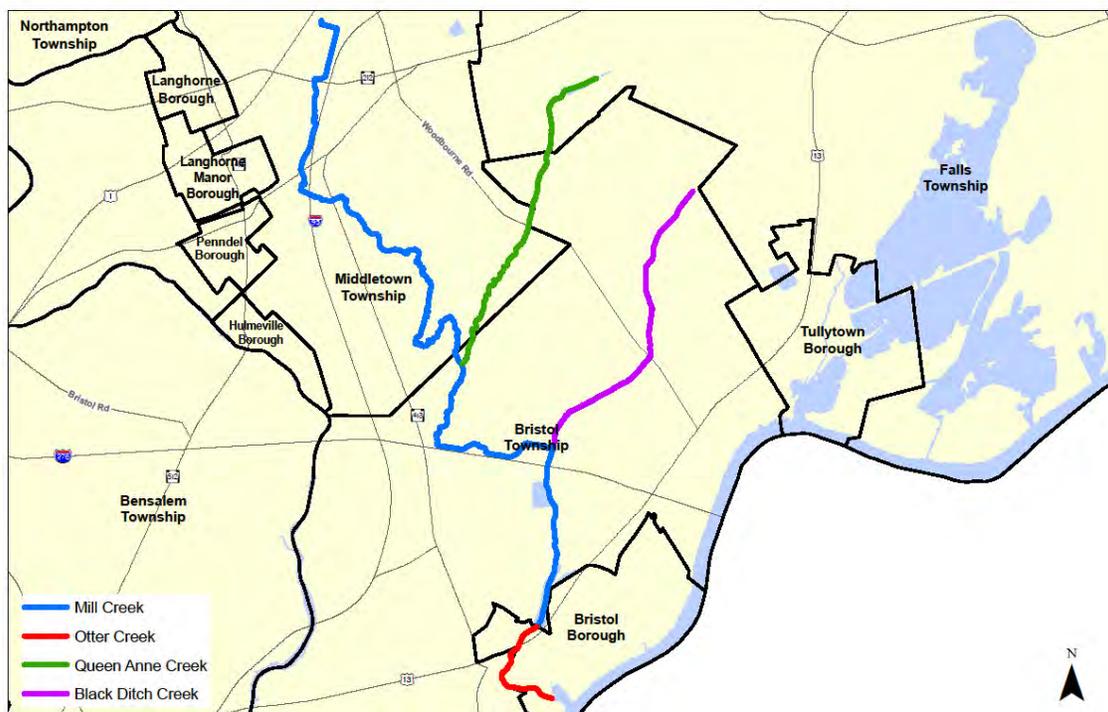
The *Mill-Queen Anne-Black Ditch Creeks Trail Feasibility Study* begins with an examination of current conditions within the proposed trail corridor including:

- Natural Features
- Land Use and Ownership
- Historic Sites
- Parks, Trails and Transportation
- Utilities, Easements and Rights-of-way

The study area is situated in the southern portion of Bucks County and includes the floodplain and riparian areas adjacent to the Mill, Queen Anne and Black Ditch creeks. Collectively these creeks comprise the 26.2 square mile Otter Creek watershed, which is a sub-watershed of the Lower Delaware River watershed.

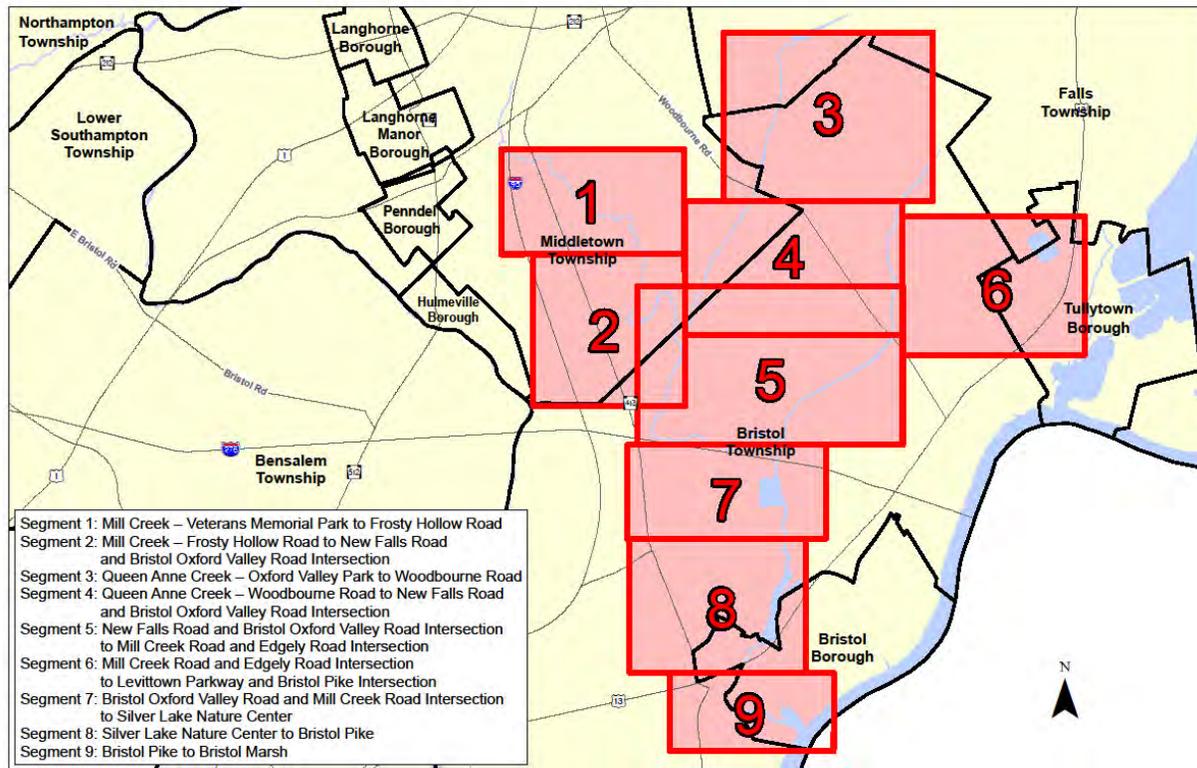
There is some confusion regarding the name of the creek and the watershed. Mill Creek is the main tributary within the Otter Creek watershed, with Queen Anne and Black Ditch creeks being tributaries to Mill Creek. The main stem of Mill Creek begins in Middletown Township near the intersection of North Woodbourne and Big Oak roads. Mill Creek generally flows southerly, crossing under the Pennsylvania Turnpike just south of where Black Ditch Creek joins Mill Creek, into Magnolia Lake. From Magnolia Lake, Mill Creek travels a very short distance before discharging into Silver Lake. The total distance of Mill Creek from its headwaters to Silver Lake is approximately 9 miles. From the dam located at the southern end of Silver Lake, the stream, now known as Otter Creek, flows only about 1 mile before entering the Delaware River.

Map 6 – Creek Segments



For presentation and analysis purposes, the *Mill-Queen Anne-Black Ditch Creeks Trail Feasibility Study* divides the project area into nine different segments.

Map 7 – Mill-Queen Anne-Black Ditch Creeks Trail Segments



NATURAL FEATURES

The project area is part of the Atlantic Coastal Plain which is a physiographic province band 5 - 8 miles wide between the Delaware River and the Fall Line, the boundary between the Atlantic Coastal Plain and Piedmont Uplands physiographic provinces. The area includes floodplain and riparian areas and is characterized by wetlands, forested areas, and significant natural resource areas including some of the best remaining examples of coastal plain forest in Pennsylvania including Black Ditch County Park, Delhaas Woods, Silver Lake County Park, Frosty Hollow Park and Queen Anne Park which provide habitat for small populations of rare plants and animals and Bristol Marsh, a high quality fresh water tidal marsh which contains rare plant species and is used by a diversity of birds for habitat.

Physiography and Topography

The Mill-Queen Anne-Black Ditch Creeks lies within the Atlantic Coastal Plain physiographic province. A physiographic province is the expression of bedrock at the surface of the land. The study area topography is fairly flat with typically less than a 10 percent grade in the southern portion and gently sloping in the central and northern portions. Elevations range from 0 feet at Mean Sea Level near the confluence of Otter (Mill) Creek and the Delaware River to 100 feet in the northwestern section of the study area near Veterans Memorial Park, just north of the intersection of Route 413 and Trenton Road.

Although elevations are not great in the Atlantic Coastal Plan, there is one area in the project study area containing steep slopes. This area is located in Segment 1, along the Mill Creek corridor, just north of where the creek passes under Frosty Hollow Road. The placement of trail facilities in this area will require careful planning and consideration of these slopes.



Topography change along Snowball Drive just north of Frosty Hollow Road



Lowest elevation in Study Area at Bristol Marsh

Surface Water

Mill Creek, and its tributaries, Queen Anne and Black Ditch creeks, are classified as a Warm Water Fishery (WWF) under Pennsylvania Department of Environmental Protection Chapter 93 Water Quality Standards. The Lower Delaware River, of which the Mill Creek watershed is a part, is listed on the Pennsylvania Department of Environmental Protection's 303(d) List of Impaired Waters. The Mill Creek watershed consists of large tracts of heavily developed urban, commercial and industrial lands which are primarily intermixed with residential land uses. The Mill Creek watershed, and trail study area, contains three lakes including Silver Lake, Magnolia Lake, and Lake Caroline, all of which are owned and maintained by the Bucks County Department of Parks and Recreation and serve as focal points for two of the county parks, Silver Lake Park and Oxford Valley Park. Over the years, nonpoint source pollution, namely sediments and nutrients, has degraded the water quality and aquatic habitats of the streams and lakes within the watershed.



Mill Creek looking south from Lakeland Avenue Bridge



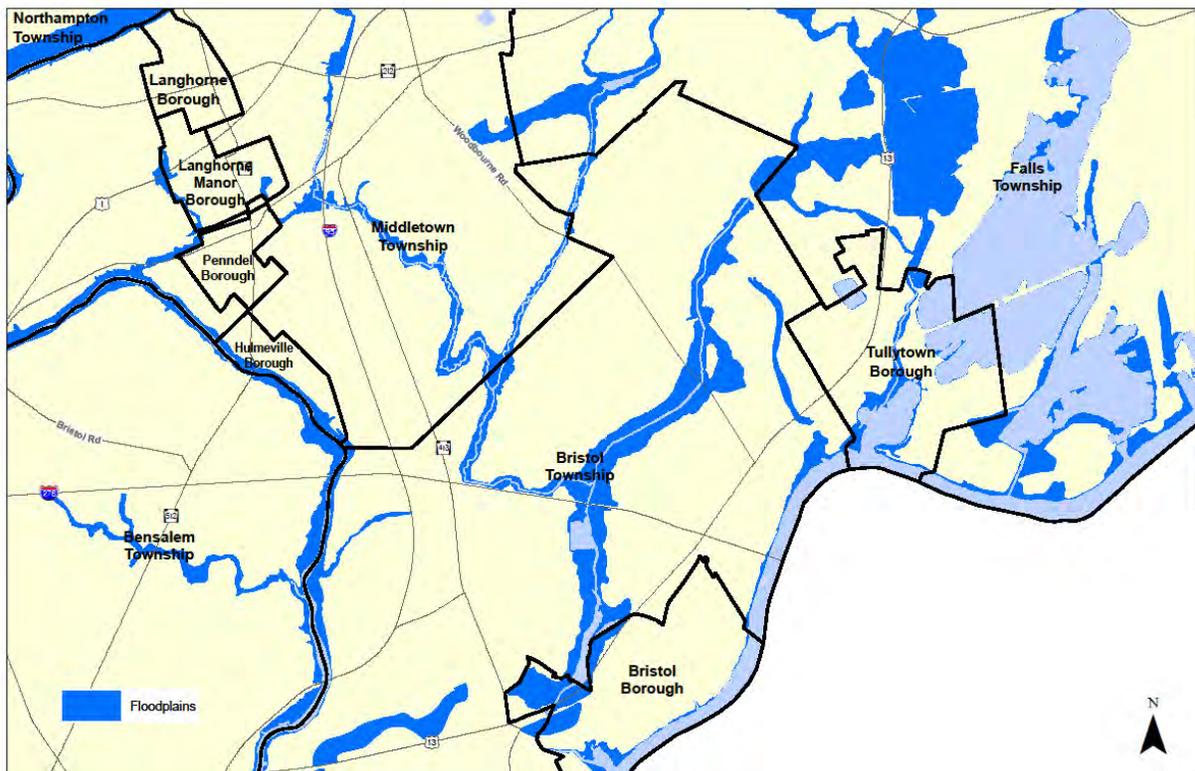
Magnolia Lake

Floodplains

Floodplains are delineated by the Federal Emergency Management Agency (FEMA) and consist of areas that are subject to periodic flooding from storms. FEMA defines the 100-year flood as a storm event that has a 1 percent chance of happening in any year over a 100-year span. Floodplains serve primarily to protect the creek and provide critical stormwater management and flood control functions by accommodating floodwater during periods of heavy precipitation. Floodplains intercept and reduce

unmanaged sheet flow runoff from uplands and temporarily store out-of-bank flows as stormwater runoff volume increases. Floodplains also recharge aquifers, serve as wildlife habitats, and provide opportunities for recreation, including trails. In most municipalities, recreational uses, including trails, are one of the few uses typically permitted within the floodplain.

Map 8 – FEMA 100-Year Floodplain



Floodplains are also an important consideration in the design of bike paths and trails. Much of the proposed Mill-Queen Anne-Black Ditch Creeks Trail is near floodplains and stream corridors which present both negative and positive influences to trail design. A floodplain curtails the use of a trail when it is inundated by water and can increase trail maintenance with mud, debris or washout during a flood occurrence. Conversely, trails are well suited to stream corridors as flood damage to a trail is minor compared to above ground structures. Floodplains are usually left in a natural vegetative state, which provides an enhanced environment for trail users, and a large variety of plants and animals congregate along stream corridors because of the availability of water, food and habitat.

The width of the floodplain along the Mill-Queen Anne-Black Ditch Creeks ranges from approximately 150 feet wide in areas along the Mill and Queen Anne Creeks to more than 1,600 feet wide along the Black Ditch Creek and is widest in areas where the creek bends and in confluence such as where Black Ditch Creek flows into Mill Creek. Some areas with the widest floodplain by trail segment include:

- Segment 1: Bend in Mill Creek in the Highland Park neighborhood near the intersection of Snowball Drive and Forsythia Crossing
- Segment 2: Sharp bend in Mill Creek at Frosty Hollow Park behind residences along Juniper Drive
- Segment 3: Oxford Valley Park and Oxford Valley Golf Course and along Queen Anne Creek on the north side of S. Olds Boulevard

- Segment 4: Queen Anne Creek near intersection of Quincy Drive and New Falls Road
- Segment 5: Confluence of Mill Creek with Queen Anne Creek
- Segment 6: Black Ditch Creek within PECO right-of-way and behind homes located on Dogwood Drive
- Segment 7: Confluence of Mill Creek and Black Ditch Creek, Magnolia Lake, and Mill Creek corridor
- Segment 8: Silver Lake County Park
- Segment 9: Bristol Marsh

Wetlands

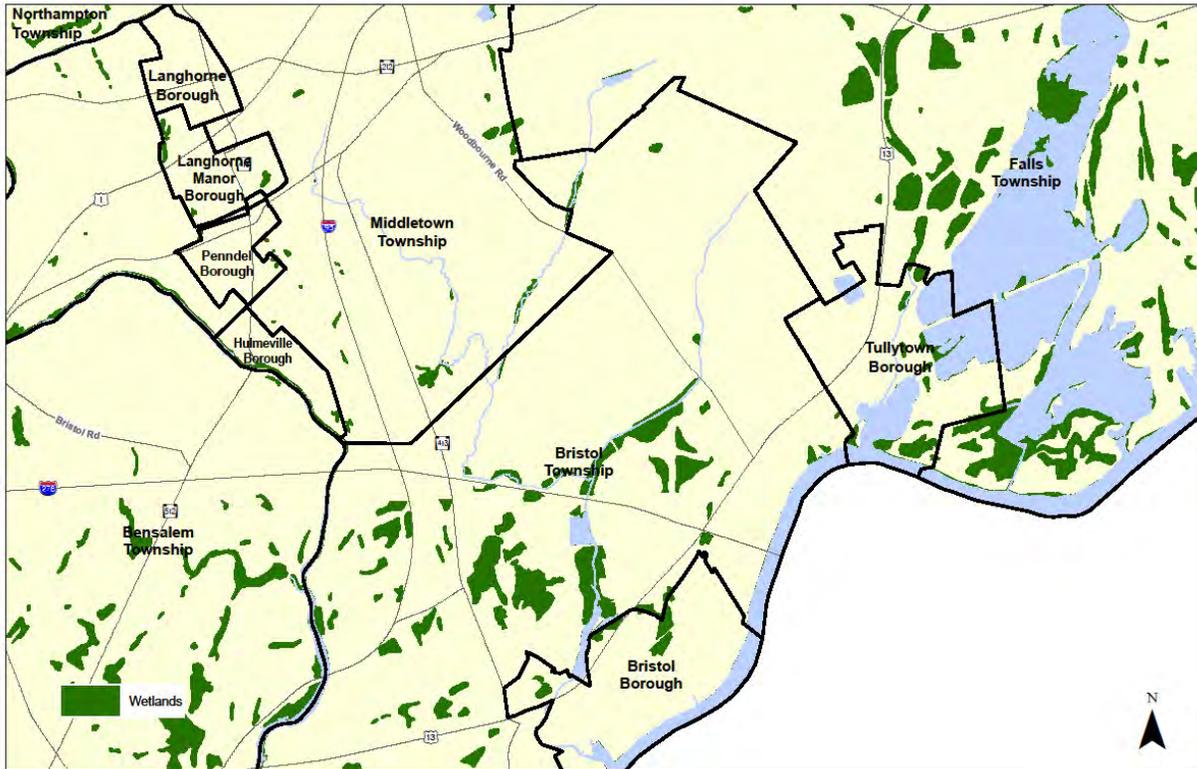
A wetland can be defined as an area that is 1) saturated for most of the year, 2) contain plants typical of saturated soils, and 3) experience surface ponding, flooding and flow. Significant wetland areas are found along the Mill-Queen Anne-Black Ditch Creeks. Wetlands are extremely important to the health of rivers and streams because they:

- Improve water quality by acting as filter, removing metals, nutrients, toxins and other pollutants;
- Provide fish and wildlife habitat;
- Assist in flood control by storing flood waters and decreasing the amount and velocity of flow;
- Facilitate groundwater discharge and recharge;
- Decrease the rate of streambank erosion because wetland plants anchor the soil with their roots; and
- Provide recreational and aesthetic value.

The National Wetlands Inventory (NWI) Maps indicate the estimated locations of protected wetlands and are produced by the U.S. Fish & Wildlife Service using aerial flyovers. NWI maps do not show all wetlands, but attempt to show most photointerpretable wetlands given considerations of map/photoscale and wetland delineation practices. It is important to note that maps produced through photointerpretation are not as accurate as one prepared from on-the-ground surveys, so NWI boundaries are generalized. A formal delineation will be necessary to identify all wetlands prior to any proposed disturbances.

Generally, wetlands should be avoided in trail development. If wetlands cannot be completely avoided, boardwalk-type walkways and pedestrian footbridges should be utilized to protect the wetlands from human disturbance.

Map 9 – Wetlands



Predominant wetland areas for various trail segments include:

- Segment 1: Area between Snowball Drive and Mill Creek just north of Frosty Hollow Road
- Segment 2: Significant portions of Frosty Hollow Park, particularly within PECO powerline corridor
- Segment 3: West side of Queen Anne Creek between Wistar Road and Woodbourne Road
- Segment 4: Both sides of Queen Anne Creek between approximately 1,200 feet north of New Falls Road and 2,400 feet south of Woodbourne Road
- Segment 5: Queen Anne Creek between New Falls Road and its confluence with Mill Creek
- Segment 7: Confluence of Mill Creek and Black Ditch Creek
- Segment 8: Mill Creek corridor throughout Silver Lake Nature Center and Silver Lake County Park



Black Ditch Creek wetlands



Silver Lake Nature Center wetlands

The Black Ditch Creek corridor between its confluence with Mill Creek northeast to Edgely Road is a significant and vast wetland area. Because of the presence of these vast wetlands, the trail alignment for Segment 5 between Bristol Oxford Valley Road and Edgely Road will consist of two alternative trail routes. The first makes use of the PECO powerline corridor further north, extending from Ironwood Road to Edgely Road. The second alignment consists of a trail placed both within the right-of-way along Mill Creek Road and on adjacent county-owned parcels on the southern side of Mill Creek Road.

Vegetation

The Mill-Queen Anne-Black Ditch Creeks project corridor, although heavily invaded by multiflora rose, Japanese honeysuckle, common reed and other non-native invasive species, also supports populations of at least eight species of rare coastal plants. Black Ditch Park is the only place in Pennsylvania where Virginia-willow is known to grow naturally. Other rare species include American strawberry-bush, Southern chain fern, Autumn Bluegrass, Sedge, Willow Oak, Southern Red Oak, and Swamp Fetterbush. The extensive wetlands in the area are dominated by Arrow-arrum, Rice Cutgrass, and Wool-grass. Cattail and Swamp Mallow are present along the upper reaches of Silver Lake.

Delhaas Woods contains 4 major plant communities: the Coastal Plain Forest, Meadows, Unglaciaded Bog, and Pond, supporting a total of 292 native species and 39 species of concern plants that are tracked by the Pennsylvania Natural Heritage Program (PNHP). In the Coastal Plain Forest, the canopy consists mainly of Sweet Gum trees, Red Maple, Black Gum and Pin Oak along with a few White Oak, Red Oak, and Willow Oak. There is also a scattering of Hickory, Ash, Silver Maple, Big-Toothed Aspen, and Sycamore. The understory includes species such as Sassafras, Sweet Bay, Umbrella Magnolia and (lingering) Crabapples. The shrub layer is mostly Southern Arrowwood, Spicebush, Sweet Pepperbush, Fetterbush, Highbush Blueberry, Poison Ivy, Virginia Creeper, Pussy Willow, American Holly, Winterberry, Bittersweet, Grapes, Black Huckleberry, and Swamp Azalea.



Delhaas Woods

The second plant community, the Meadows, was created as a result of the area being cleared for development of the powerlines. They consist of wet and dry meadows that provide refuge for a number of plant species on the Pennsylvania Species of Special Concern list. More notably the Maryland Meadow Beauty, New York Asters, Bushy Bluestem, Slender Sea Oats, and the Atlantic Blue-Eyed Grass.

The third plant community, Unglaciaded Bog, is also considered a Pennsylvania Community of Special Concern. Contained within are some of the plant species listed above as well as Sphagnum.

The fourth plant community is the Vernal (spring) Ponds. These are scattered throughout the woodlands. These provide excellent breeding grounds for frogs and toads.

Bristol Marsh, although surrounded by commercial and industrial development, provides habitat for eight species of endangered, threatened or rare plants that are components of the critically imperiled tidal marsh community.



Bristol Marsh

Birds, Reptiles and Amphibians

As indicated in the *Bucks County, Pennsylvania, Natural Areas Inventory Update* (2011), the Atlantic Coastal Plain Conservation Landscape, is known for its bird diversity. Forty-two species of birds have been recorded at the Silver Lake/Delhaas Woods/Magnolia Lake/Black Ditch Creek complex (Appendix E. Silver Lake Nature Center Bird List). In addition to a diversity of birds, the Atlantic Coastal Plain Conservation Landscape provides habitat for thirty species of reptiles and amphibians, including several not found elsewhere in Bucks County (Table E). Five species are classified as endangered or threatened by the Pennsylvania Natural Heritage Program. A notable recent discovery was the documentation of an extant population of eastern mud turtle, which had been believed to be extirpated in Pennsylvania.



Deer in Black Ditch Creek Corridor

Table 2 – Reptiles and Amphibians of the Atlantic Coastal Plain Conservation Landscape

Salamanders		Status (PNHP 2010)
Spotted Salamander	Ambystoma maculatum	
Northern Redback Salamander	Plethodon cinereus	
Northern two-lined Salamander	Eurycea bislineata	
Northern dusky Salamander	Desmognathus fuscus, fuscus	
Frogs and Toads		
Eastern Spadefoot Toad	Scaphiopus holbrookii holbrookii	endangered in PA
American Toad	Anaxyrus americanus americanus	
Fowler's Toad	Anaxyrus woodhouseii fowleri	
Spring Peeper	Pseudacris crucifer	
New Jersey Chorus Frog	Pseudacris feriarum kalmia	endangered in PA
Gray Treefrog	Hyla versicolor	
Wood Frog	Lithobates sylvaticus	
Southern Leopard Frog	Lithobates utricularius	endangered in PA
Pickrel Frog	Lithobates palustris	
Green Frog	Lithobates clamitans melanota	
Bullfrog	Lithobates catesbeianus	
Turtles		
Common Snapping Turtle	Chelydra serpentina serpentina	
Common Musk Turtle	Sternotherus odoratus	
Eastern Mud Turtle	Kinosternon subrubrum subrubrum	extirpated in PA
Spotted Turtle	Clemmys guttata	
Wood Turtle	Glyptemys insculpta	
Eastern Box Turtle	Terrapene carolina carolina	
Map Turtle	Graptemys geographica	
Red-eared Slider	Trachemys scripta elegans	
Redbelly Turtle	Pseudemys rubriventris	threatened in PA, proposed candidate at risk
Painted Turtle	Chrysemys picta /marginata	
Snakes		
Northern Water Snake	Nerodia sipedon sipedon	
Eastern Garter Snake	Thamnophis sirtalis sirtalis	
Northern Ringneck Snake	Diadophis punctatus edwardsii	
Northern Black Racer	Coluber constrictor constrictor	
Eastern Milksnake	Lampropeltis triangulum	

HISTORIC SITES

Historic features and sites are often destination points in a trail system. The project area has been occupied for more than three centuries since the first European settlers occupied the 262 acres along the Delaware River now known as Bristol Borough. A major land route linking Philadelphia and New York City passed through Bristol, and hotels along this road hosted a bevy of travelers when the United States capitol was located in Philadelphia just after the American Revolution. Several of the first foreign ambassadors to America selected Bristol for their homes. These homes are still standing and are part of three centuries of architecture reflected in the residences and public building of the town. The oldest known building is the Friends' (Quaker) Meeting House, built circa 1711.

The following historic sites and districts are located near or close to the proposed Mill-Queen Anne-Black Ditch Creeks Trail and are listed on the National Register of Historic Places.

- **Bolton Mansion** - Named for a location in England, the mansion was the second home of Phineas Pemberton who was instrumental in assisting William Penn in shaping a government in the wilderness. The house, consisting of four connected structures, was begun in 1687 and completed in 1790 and shows the evolution of architectural styles in early southeast

Pennsylvania. More recent, the mansion served as headquarters of Levitt & Sons during construction of Levittown.

- **Bristol Historic District** - The third oldest city in Pennsylvania, Bristol dates from 1681 when Samuel Clift began operating a ferry across the Delaware River. A settlement grew around the ferry and in 1697 residents petitioned the Provincial Council to establish the community as a market town. During the last half of the 18th century Bristol gained prominence as both a ferry landing and a way station for the New York to Philadelphia stagecoach. Shipbuilding and completion of the Delaware Division of the Pennsylvania Canal in 1832 transformed Bristol into a transportation hub. The historic district contains more than 300 residential and commercial buildings, some dating back to the early 18th century.
- **Bristol Industrial Historic District** - The five large mill complexes that comprise the majority of the Bristol Industrial Historic District are the products of a concerted local effort to attract industry to the community by erecting the buildings required by manufacturers. This promotional effort proved successful, transforming Bristol from a declining canal town into Bucks County's leading manufacturing center during the last quarter of the nineteenth century. The Grundy Mills and the Bristol Carpet Mills became the borough's largest employers and ranked among the largest employers in the entire county. This collection of industrial buildings illustrates the evolution of industrial architecture in the United States. It includes both massive stone masonry buildings, whose architectural origins may be traced to the period prior to the Civil War, and important examples of early reinforced concrete construction that are representative of the course taken by industrial architecture in the twentieth century.
- **Delaware Division of the Pennsylvania Canal** - Built in 1832, the Delaware Division of the Pennsylvania Canal connected the Lehigh Navigation at its terminus in Easton with a route for transporting anthracite to the upper tidal portion of the Delaware River and deep-water transportation. The construction of this canal remedied the problem of using river boats to carry goods to Philadelphia, since rapids and frequent low flows made the river an unpredictable and hazardous means of transport.
- **Dorrance Mansion** - One of the grandest riverfront mansions in Bristol, the Dorrance Mansion, built 1862-3, is an outstanding example of Italianate architecture, and is the only example of Italianate architecture in the borough. The house served as the home of John Dorrance, Sr. who was an investor in the Bristol Mills, eventually acquiring full ownership. He was also active in various improvement projects in the area including the digging of the Bristol portion of the Delaware Division of the Pennsylvania Canal and the construction of the Trenton and Bristol Railroad.
- **General Stores and Mold Loft Building** - Constructed in 1917, this building was one of the first buildings commissioned by the Emergency Fleet Corporation for construction at the Harriman Yard of the Merchant Shipbuilding Corporation, a World War I shipyard established in response to the United States' entry into the war. Following the war, around 1925 the building was purchased by the Manhattan Soap Company for the manufacture of soap. In 1956, Manhattan Soap Company was sold to Purex Corporation which became a subsidiary of Dial Soap in 1985. The site remained an active manufacturing facility until 2000.
- **Grundy Mill Complex** - The Grundy Mills complex consists of a number of buildings constructed over a 55 year period, which operated as one unit for the milling, storage, and power for the worsted mills of the William H. Grundy Co. This facility was the most successful of all the textile operations launched in Bristol in the 19th century and by 1920 it was the largest employer in

Bucks County, at one time employing approximately 30 percent of the town's industrial work force. Grundy Mills remained in operation until 1946.

- **Harriman Historic District** - A historically significant residential community closely associated with the massive mobilization of American industry that occurred during World War I. The United States Shipping Board's Emergency Fleet Corporation financed the construction of Harriman in order to provide needed housing for the thousands of workers employed at the nearby shipyard.
- **Jefferson Avenue School** - Built in 1908 in direct response to the unprecedented growth in Bristol brought about by the area's transformation into an industrial center between 1860 and 1910.
- **Jefferson Land Association Historic District** - This historic district contains five blocks of virtually identical row houses and commercial buildings constructed in 1917 and 1918. The district is architecturally significant as an unusual local response to working class residential requirements that arose in response to the housing shortage following the United States' entry into World War I.
- **Sotcher Farmhouse/Three Arches** - Adjacent to Oxford Valley Park is the Sotcher Farmhouse/Three Arches, an outstanding example of a rural Bucks County farmhouse, with its several stages of growth through the 18th century.



Grundy Mill



Jefferson Avenue School

PARKS, TRAILS AND TRANSPORTATION

Providing connections to parks, recreational areas, commercial centers, as well as existing trails within the project area, is one of the primary goals and objectives of the Mill-Queen Anne-Black Ditch Creeks Trail. These open space areas offer recreational, scenic, and education opportunities that enhance a trail user's outdoor experience. Additionally, recognizing that the trail will also serve as part of a larger transportation network, providing connections to public transportation, was also considered important. These various connections by trail segments are outlined below.



Forsythia Crossing Park



Levittown Town Center



Delaware Canal Towpath Trail

Table 3 – Parks, Trails, Open Space and Public Transportation

	Public Parks	School Recreational Sites	Commercial Centers	Trails	Public Transportation
Segment 1	<ul style="list-style-type: none"> • Veterans Memorial Park • Lions Park • Forsythia Crossing Park 	<ul style="list-style-type: none"> • Samuel Everitt Elementary 		<ul style="list-style-type: none"> • Veterans Memorial Park 	<ul style="list-style-type: none"> • SEPTA Bus Route 129
Segment 2	<ul style="list-style-type: none"> • Frosty Hollow Park 		<ul style="list-style-type: none"> • Intersection of Bristol Oxford Valley Road & New Falls Road and New Falls Road and PA 413 		<ul style="list-style-type: none"> • SEPTA Bus Route 129
Segment 3	<ul style="list-style-type: none"> • Oxford Valley Park • Queen Anne Park 	<ul style="list-style-type: none"> • Oxford Valley Elementary • Armstrong Middle • Conwell-Egan High • Bucks County Technical High 	<ul style="list-style-type: none"> • Fairless Hills Shopping Center 	<ul style="list-style-type: none"> • New Falls Road • Oxford Valley Park 	<ul style="list-style-type: none"> • SEPTA Bus Routes 127 & 128
Segment 4	<ul style="list-style-type: none"> • Cobalt Ridge Park 	<ul style="list-style-type: none"> • Miller Elementary School 			<ul style="list-style-type: none"> • SEPTA Bus Route 129
Segment 5		<ul style="list-style-type: none"> • Truman High • Franklin Middle • Emerson Elementary 			<ul style="list-style-type: none"> • SEPTA Bus Route 129
Segment 6		<ul style="list-style-type: none"> • Buchanan Elementary 	<ul style="list-style-type: none"> • Levittown Town Center 	<ul style="list-style-type: none"> • Delaware & Lehigh Canal Towpath Trail 	<ul style="list-style-type: none"> • SEPTA Bus Routes 127 & 128 • SEPTA Levittown / Tullytown Regional Rail Station
Segment 7	<ul style="list-style-type: none"> • Black Ditch County Park • Silver Lake Nature Center • Delhaas Woods • Bristol Township Municipal Complex 			<ul style="list-style-type: none"> • Silver Lake Nature Center 	<ul style="list-style-type: none"> • SEPTA Bus Route 129
Segment 8	<ul style="list-style-type: none"> • Silver Lake Nature Center • Silver Lake County Park 		<ul style="list-style-type: none"> • Bristol Commerce Park 	<ul style="list-style-type: none"> • Silver Lake Nature Center • Silver Lake County Park 	<ul style="list-style-type: none"> • SEPTA Bus Routes 128 & 129
Segment 9	<ul style="list-style-type: none"> • Bristol Marsh • Bristol Borough Park 		<ul style="list-style-type: none"> • Bristol Borough 	<ul style="list-style-type: none"> • Bristol Spurline Trail • Delaware & Lehigh Canal Towpath Trail 	<ul style="list-style-type: none"> • SEPTA Bus Routes 128, 129 & 304



SEPTA Levittown Train Station



Buchannan Elementary School

LAND USE AND OWNERSHIP

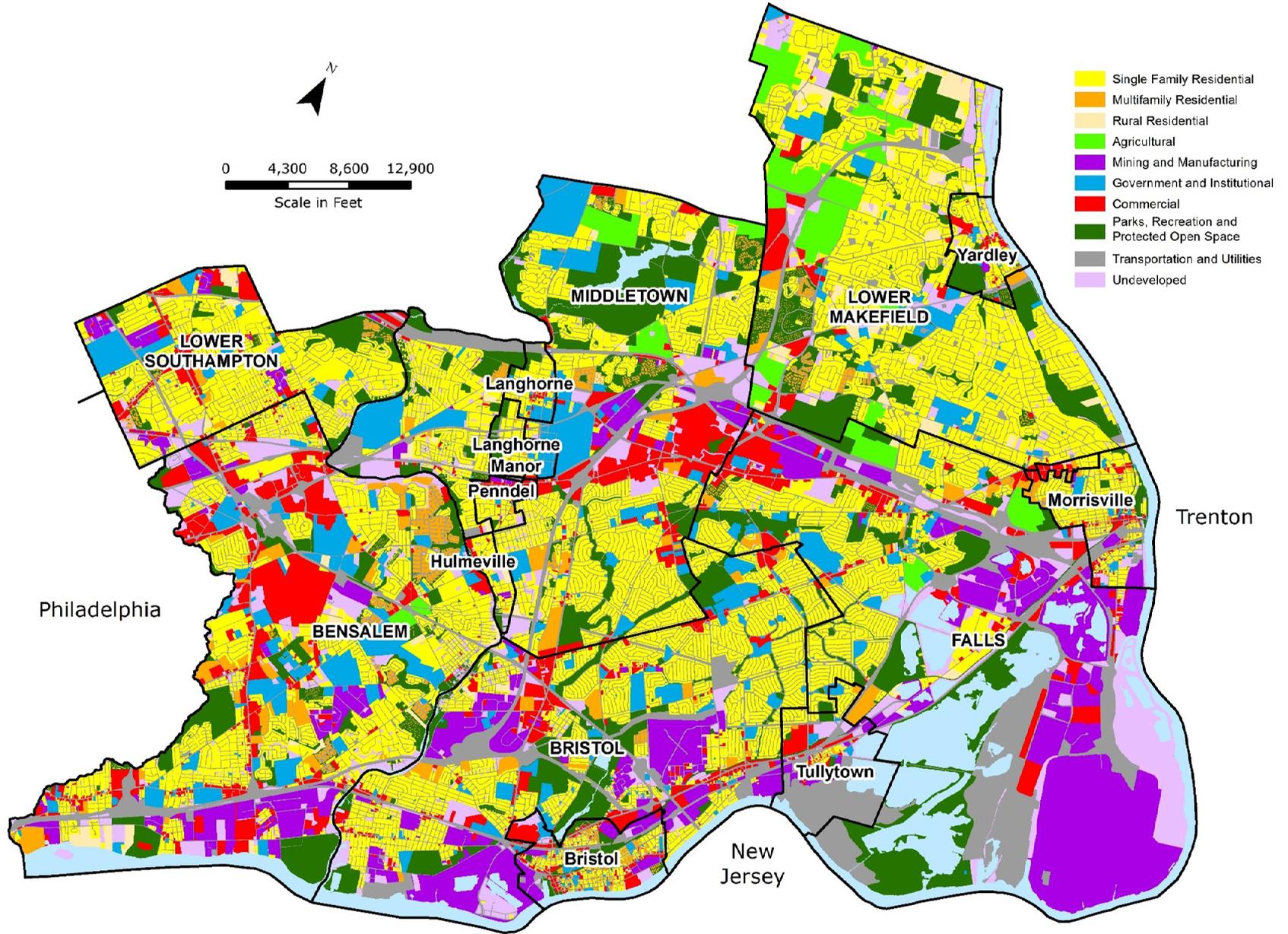
Land Use

Just as an inventory of natural resources and parks and open space paints a picture, a review of land use was developed using data from the Bucks County Board of Assessment office. The land use map indicates the general coverages of land uses and provides a snapshot of an area's character and physical surroundings. The ten land use categories shown on the existing land use maps include:

- Single-Family Residential
- Multifamily Residential
- Rural Residential¹
- Agricultural
- Mining and Manufacturing
- Government and Institutional
- Commercial
- Parks, Recreation, and Protected Open Space
- Transportation and Utilities
- Undeveloped

¹ The same as single-family residential except dwellings are on lots that are 5 acres or more (but do not qualify as agricultural).

Map 10 – Lower Bucks Land Use, 2012



Although the Mill-Queen Anne-Black Ditch Creeks Trail begins and ends in public parkland, and is contained within public parkland for most its length, there are a diversity of land uses along the corridor as represented on Map 10.

- Segments 1 - 4: These segments are composed primarily of single-family residential, parkland (Forsythia Crossing Park, Veterans Memorial Park, Lions Park, and county-owned Frosty Hollow, Queen Anne, and Oxford Valley parks), and commercial (Fairless Hills Shopping Center) with some presence of government and institutional land use in the form of schools (Everitt Elementary, Miller Elementary, and Armstrong Middle schools), libraries (Levittown Library) and churches.
- Segment 5: This segment is also primarily characterized by single-family residential, parkland, and commercial and institutional uses (Clara Barton Elementary, Franklin Middle and Truman High schools). However, land use is more diverse than Segments 1 - 4 as reflected by the mix of commercial and manufacturing land uses along Emilee Road and the presence of multifamily residential developments along Bristol Oxford Valley Road (Crestwood, Brittany Springs, and Avalon Court) and Mill Creek Road (Orangewood Park), and utilities in the form of the PECO powerline corridor which spans this segment.
- Segment 6: This segment is similar in land use to Segment 5 with the PECO powerline corridor, being bounded on each side by primarily single-family residential and institutional land uses in the forms of churches and schools. The terminating point of this segment, at Route 13 and Levittown Parkway, is made up of a mixture of commercial uses (Levittown Town Center), institutional uses (St. Michael the Archangel church), and transportation and utilities (Levittown-Tullytown SEPTA station and rail corridor).
- Segment 7: This segment is almost exclusively made up of parkland associated with Black Ditch Creek Park and Magnolia Lake.
- Segment 8: To the east side of Bath Road, the land use is almost exclusively parkland in the form of Silver Lake Nature Center and Silver Lake Park. To the west side of Bath Road, the land use is a mixture of single-family residential, some parkland (Delhaas Woods), and institutional (Lower Bucks Hospital).
- Segment 9: This is the most diverse segment in terms of land use featuring parkland (Bristol Marsh), commercial (Bristol Borough and Bristol Commerce Park), manufacturing, and a mix of single-family and multifamily residential within Bristol Borough.

Land Ownership

The issue of land ownership is critical in determining the feasibility of a proposed trails system. The size of parcels, number of owners to be considered, and the costs to acquire easements are often among the most important considerations in trail development. A trail will be more easily developed if the number of easements to be acquired is minimized. Trail maintenance is also a challenge when trails traverse private property.



Levittown Town Center



Cobalt Ridge Park



Miller Elementary School

In the Mill-Queen Anne-Black Ditch Creeks project area, most of the land within the proposed trail corridor itself is currently owned by either the county, local municipalities, school districts, or transportation and utility companies such as PECO and SEPTA. Although private residential property owners own much of the land surrounding the proposed trail corridor, the trail will be designed to avoid private residential properties to the greatest extent possible. Primary landowners within the proposed trail corridor include:

Table 4 – Primary Landowners by Segment

Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6	Segment 7	Segment 8	Segment 9
Government								
Middletown Township	Middletown Township	Falls Township	Middletown Township	Bucks County	Bristol Township	Bucks County	Bucks County	Bristol Borough
	Bucks County	Bucks County				Bristol Township		
		Middletown Township						
Transportation & Utilities								
	PECO		PECO	PECO	PECO	PECO		
					SEPTA			
Educational								
Neshaminy School District		Bristol Township School District	Neshaminy School District	Bristol Township School District	Bristol Township School District			
Commercial								
		Fairless Hills Shopping Center			Levittown Town Center			

UTILITIES AND EASEMENTS

Utilities

The primary utilities in the Mill-Queen Anne-Black Ditch Creeks Trail project area consist of the PECO powerline corridors, as well as the PECO substation located at the intersection of Edgely Road and Mill Creek Parkway. The first PECO powerline corridor in the project area extends easterly from Route 413, through Frosty Hollow Park, across Bristol Oxford Valley Road and New Falls Road just north of their intersection, ending at the PECO substation on Edgely Road. The length of this corridor from Route 413 to Edgely Road is approximately 2.0 miles.

The second PECO powerline corridor begins near Delhaas Woods, crosses the Bristol Township municipal complex, then the Pennsylvania Turnpike after which it parallels the Black Ditch Creek, before connecting to the PECO substation at Edgely Road. This PECO corridor also extends further east to Levittown Parkway, before turning southeasterly to extend along Bordentown Rd. The length of the powerline corridor from Delhaas Woods to the Edgely Road substation is approximately 2.6 miles. The segment from Edgely Road to Levittown Parkway is an additional 1.4 miles. These powerline corridors could potentially serve as routes for the trail. However, the powerline corridor that parallels Black Ditch Creek is located in a wetland and may not be suitable for a trail.

Easements and Permitting

Much of the land within the Mill-Queen Anne-Black Ditch Creeks Trail project area is publicly held land which minimizes the need for easements; however, in some cases easements will be required. For instance, if the PECO powerline corridors are to be used for trails, easements will need to be obtained from them. Additionally, if the proposed trail alignment crosses school district property, easements will need to be negotiated with the respective school district.

In addition to easements that might be required for the development of the trail, extensive permitting may be required. To assist in the protection of many of the existing resource features, trail construction on

Federal lands, or lands where Federal funds are involved, must conform to laws such as the National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA), and the Endangered Species Act (ESA). Although the proposed trail route for the Mill-Queen Anne-Black Ditch Creeks was designed to mitigate the impact to these resources, permitting, based on a more detailed analysis at the final design stage, will be required to minimize adverse effects.



PECO powerline corridor

MILL-QUEEN ANNE-BLACK DITCH CREEKS TRAIL PLAN

TRAIL DESIGN STANDARDS

The Mill-Queen Anne-Black Ditch Creeks Trail is being planned and designed to comply with various standards and guidelines for the design of trails and bicycle facilities including:

- American Association of State Highway and Transportation Officials (AASHTO) Guide for the Planning, Design, and Operation of Bicycle Facilities
- ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)
- ADA Standards for Accessible Design
- Federal Access Board Accessibility Guidelines for Outdoor Developed Areas (AGODA)
- Public Right of Way Accessibility Guidelines (PROWAG)
- Manual on Uniform Traffic Control Devices (MUTCD)
- Pennsylvania Trail Design & Development Principles

Bucks County has developed Trail Design Standards that will apply to all future trails, pedestrian and bicycle facilities developed by the County including the following types of trails:

Table 5 – Types of Trails

Trail Type	Description of Trail Type
Hiking Trails	Trails designed to provide hikers, joggers and walkers the opportunity to experience and interact with nature with minimal disturbance from other trail users. As these trails are not designed to accommodate wheeled traffic, these are most often natural surface trails.
Pedestrian Facilities in the Public Right-of-Way	These facilities include: <ul style="list-style-type: none"> ▫ Trails in the public right-of-way where the right-of-way is not wide enough to accommodate a multi-use trail ▫ Sidewalks that are widened or retrofitted to accommodate more than one pedestrian user group at a time In both cases, the intent is to provide a safe, two-way shared use area for pedestrians where a multi-use path cannot be accommodated. Although these would typically exclude wheeled traffic in most cases, there may be instances in which it is necessary to allow for wheeled traffic as well.
Multi-use / Shared-Use Trails	A trail that permits more than one user group including joggers, walkers, hikers, bicyclists, to occupy the trail at the same time. As the trail is designed to accommodate multiple users including wheeled traffic, these trails would most often be constructed of a hard paved or compacted cinder surface.
On-Road Bicycle Facilities	This type of trail consists of the creation or designation of the following: <ul style="list-style-type: none"> ▫ Bicycle Lane - A dedicated portion of the roadway that has been designated by striping, signage, and pavement markings for the exclusive use of bicyclists. ▫ On-road Bicycle Route - A shared right-of-way on roadways designated with appropriate information signs to help encourage use and warn motorists that bicycles may be present in the roadway.

The differentiation between these trail types, and the accompanying trail design standards, are designed to:

- Promote consistency of standards and guidelines across the County trail network.
- Increase user safety, comfort and convenience.

- Promote universal access, where possible, to users with a broad range of skill levels and abilities, including children, older adults and people with disabilities.
- Minimize impact to sensitive natural resources.
- Increase the ease of long-term trail and facility maintenance by recommending the use of materials and construction practices appropriate for the trail being developed.

The standards for trails in Bucks County outlined in Table 6 were derived from multiple sources and are intended as a planning tool to allow for flexibility in design, appropriate to the location, site-specific environmental conditions, and expected users. However, the guidelines are not intended to be engineering specifications or replace existing mandatory or advisory state and federal standards, nor the exercise of engineering judgment by licensed professionals.

Table 6 – Bucks County Trail Standards

	Trail Width (Min)	Shoulder Width each side (Min)	Trail Surface		Trail Running Slope		Trail Cross Slope		Vertical Clearance (Min)	Other
			Desired	Acceptable	Min	Max	Min	Max		
Hiking Trail										
Hiking Trail	6 feet *	-	Compacted Gravel	Compacted Earth / Natural Surface	0%	12.5%	2%	5%	8 feet	Trailhead Signage
Pedestrian Facilities in Right-of-Way										
Sidewalk	5 feet	2 feet	Concrete	Asphalt	1%	2%	1%	2%	8 feet ***	Wayfinding Signage
Trail	8 feet	2 feet	Asphalt	Asphalt	1%	2%	1%	2%	8 feet ***	Wayfinding Signage
Multi-Use										
Multi-Use Trail	10 feet	2 feet	Asphalt	Cinder	1%	5%**	1%	2%	8 feet ***	Trailhead and Wayfinding Signage
Boardwalk	10 feet	-	Concrete	Wood / Synthetic	1%	5%	1%	2%	8 feet ***	3" edge protection for boardwalks 30" or less above grade / 42" handrails for 30"+ above grade
On-Road Bike Facilities										
Bicycle Lane	5 - 6 feet	6 - 8 feet	Asphalt	Asphalt	-	-	-	-	10 feet	MUTCD ² : Pavement Markings and R3-17 Bike Lane sign
On-Road	-	-	Asphalt	Asphalt	-	-	-	-	10 feet	MUTCD: Shared Lane Markings and W6-101 Share the Lane sign
On-Road Pedestrian Facilities (To be minimized where possible)										
On-Road	-	-	Asphalt	Asphalt	-	-	-	-	-	MUTCD: R9-1 Walk on Left Facing Traffic sign

* Anything less than 5 feet requires a passing space at intervals no less than 1,000 feet

** Following variances are allowable: 8.3% maximum for distances up to 200 feet / 10% maximum for distances up to 30 feet / 12.5% maximum for up to 10 feet

*** Minimum clearance overpasses: 10

² Manual on Uniform Traffic Control Devices - U.S. Department of Transportation - Federal Highway Administration

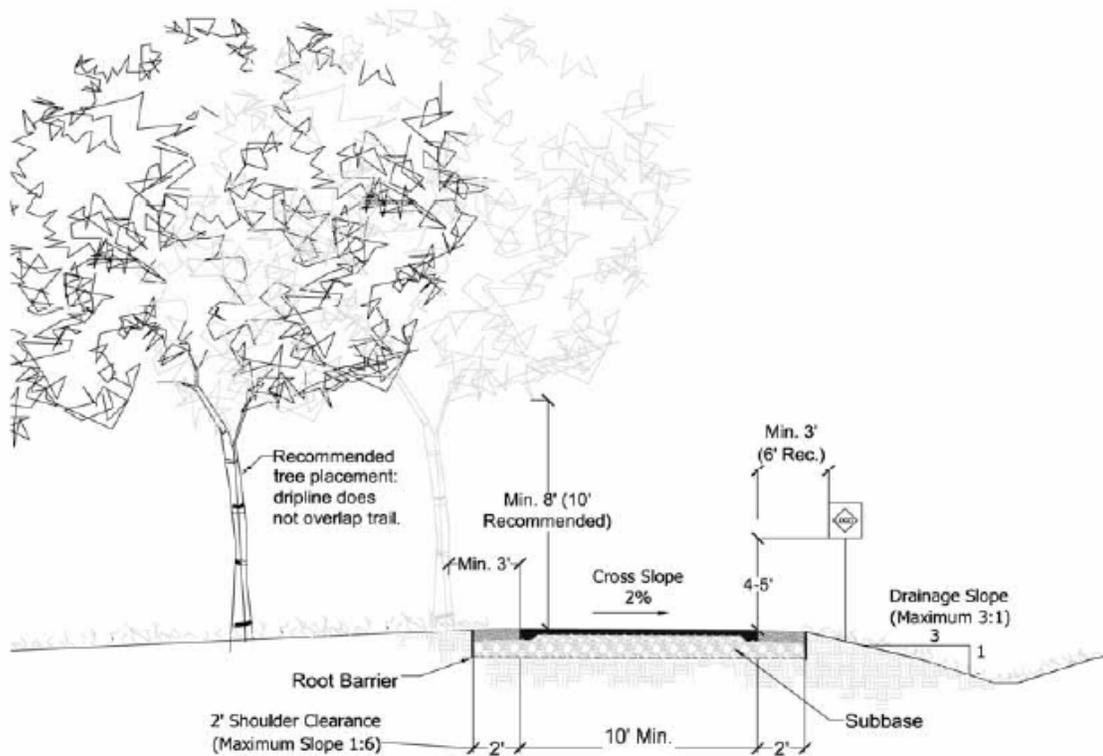
TRAIL DESIGN ELEMENTS

Trail Surface, Width, Slope and Vertical Clearance

The Mill-Queen Anne-Black Ditch Creeks Trail will be designed as a 10-foot wide, paved, multi-use recreational trail where possible. Standards for a two-way shared use path are 10 feet in width with a 2-foot wide graded shoulder [with maximum slope of 1:6], on either side of the trail. Therefore, the trail surface area alone should be 14 feet in width, plus a 3 to 6-foot buffer or grading area on either side of the trail. Bridges and any required boardwalk sections will also have a travel width of 10 feet.

Specific to the Mill-Queen Anne-Black Ditch Creeks Trail, one of the questions received at the public workshops was whether pervious pavement could be utilized. The use of pervious pavement is not practical for wooded or flood-prone areas due to sediment and leaf-litter filling the porous voids of the pavement. In addition, much of the underlying soil types in the proposed trail corridor are not well draining which would limit the effectiveness of any pervious pavement.

The recommended typical design cross-section is shown below. This design would be modified to fit various environmental conditions that are encountered. Additionally, off-road sections of the trail will be designed with adequate clearance and load-bearing capacity to support emergency vehicles.



TRAIL SAFETY SIGNAGE

Although the trail system is designed to minimize the extent to which users will be on-road, there may be sections where the trail will need to utilize existing streets or roadways which carry low volumes of motor vehicle traffic. In these situations, the *Manual on Uniform Traffic Control Devices* recommends a combination of signage and on-road pavement markings to help improve pedestrian safety.

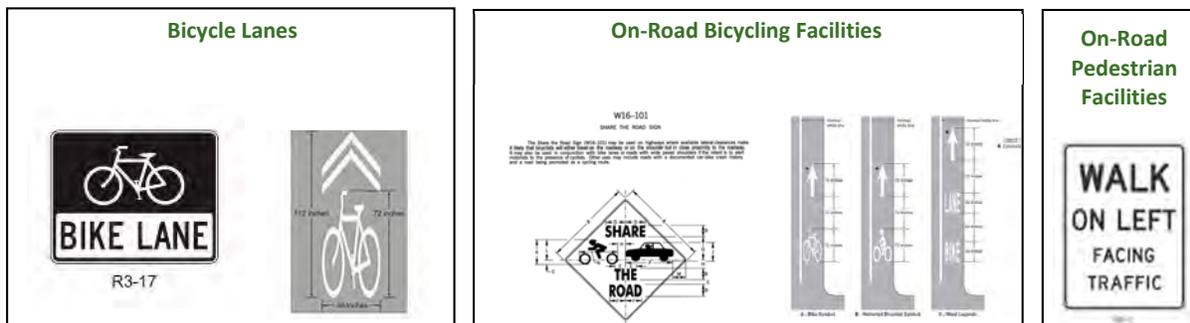
Pedestrians in Roadway: Section 2B.50 of the *Manual on Uniform Traffic Control Devices* recommends signage to help improve pedestrian safety on roadways with no adjacent sidewalks or shoulders.

Bicyclists in Roadway: The regulations and signage requirement vary dependent upon the speed limit of the road:

- **Roads with a speed limit of greater than 35 miles per hour:** Section 9B.18 of the *Manual on Uniform Traffic Control Devices* specifies that Share the Road signs should be used on roadways with a speed limit above 35 mph where there is a need to warn motorists to watch for bicyclists traveling along the roadway.
- **Roads with a speed limit 35 miles per hour or less:** Section 9C.07 Shared Lane Marking specifies the parameters for the use of Shared Lane Markings, also known as Bike Sharrows. Specifically, Shared Lane Markings may be used to:
 - Assist bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to travel side by side within the same traffic lane;
 - Alert road users of the lateral location bicyclists are likely to occupy within the traveled way;
 - Encourage safe passing of bicyclists by motorists; and
 - Reduce the incidence of wrong-way bicycling.

Examples of the recommended pavement markings and signage are shown below.

Manual on Uniform Traffic Control Devices – Pavement Markings and Signage



In addition to signage and pavement markings being used to alert motorists of the existence of trail users within or adjacent to the roadway, Rectangular Rapid Flashing Beacons and clearly marked crosswalks will be used anytime the trail crosses a roadway where the crosswalk approach is not controlled by a yield sign, stop sign, or traffic-control signal; or at a crosswalk at a roundabout.



Trail Informational Signage

The trail system will also be designed to incorporate additional signage such as wayfinding and trailhead signage. To comply with Americans with Disabilities Act accessibility requirements, trailhead signage will incorporate the following information:

- Length of the trail or trail segment
- Surface type

- Typical and minimum tread width
- Typical and maximum trail grade / running slope
- Typical and maximum cross slope

Emergency Signage

To improve emergency response to trail incidents, it is recommended that the Mill-Queen Anne-Black Ditch Creeks trail incorporate an Emergency Locator System. This system would place signage markers with unique location identifiers at every eighth of a mile. These assigned geographic coordinates would allow emergency crews, such as the Bucks County Department of Emergency Communications, to easily determine the best route for reaching the emergency.



Parking Areas / Trailheads

Trailhead parking areas will provide points of access for trail users. These access points will not only accommodate people from the immediate area, but those who have traveled farther to use the trail. Although a number of residents will likely walk or bike to the trail from their homes, it can be anticipated that many people will also choose to drive. Each of the parking options discussed below in the Trail Alignment section will need to be further explored as part of the Design Phase when more detailed survey information is available in order to further assess lot size, feasibility, practicality, permeability, and safety issues.

Boardwalks and Bridges

Site characteristics, property ownership and other constraints within the Mill-Queen Anne-Black Ditch Creeks Trail project area may require that the trail cross the creek or be constructed within wetland areas. Where the trail alignment crosses through the floodplain, much of the trail will be elevated and will occasionally cross the creek channel. The selection of construction methods will need to consider how the water surface elevations vary along the various creeks. Construction of bridge and boardwalk facilities within the floodway may impact surface water levels if these structures impede flow within the trail corridor. The proposed design should minimize blockage of flows within the floodplain and should recognize the potential for debris to accumulate on the upstream face of bridge sections. It is recommended that bridges be placed above the flood elevation.

Bridges and boardwalks can be surfaced with a variety of materials including timber or timber-plastic composites, concrete or steel. The main factors driving the frequent use of timber are its low initial cost, the perception that it is more suitable to natural environments, and the comparative simplicity of timber construction in sensitive environments, given its light weight and ease of fabrication. The disadvantage of timber is that it is susceptible to deterioration from exposure to the environment, even when pressure treated, and that timbers may be slippery in wet or merely damp conditions.

Physical Barriers

In certain areas, physical barriers such as wood rail fencing, dense shrubbery, or other type of physical barrier may need to be installed along the trail to prevent users from traversing the side slopes. Typically this barrier should be installed along the top of slope to protect trail users. In general, the greater the height of the drop-off, the greater the need for protection. According to AASHTO guidelines, the fence should be set at a height of 3.5 feet (42 inches). Rub-rails are recommended at a height of approximately 3-feet from grade to prevent snagging of handlebars. All fences should be smooth and free of protruding objects such as bolts.

Trail Furnishings

Trail furnishings will enhance the comfort and enjoyment of trail users. These amenities could include benches; picnic tables and shelters; trash receptacles; bike racks; information kiosks; educational signage; fishing piers; and canoe/kayak launch facilities. Primary considerations for recommending amenities and other trailside items should include:

- Appropriateness
- Functionality
- Attractiveness of design
- Durability
- Maintenance requirements
- Cost

EXAMPLES OF SIMILAR TRAIL SYSTEMS

The Wissahickon Creek Trail, also known as the Green Ribbon Trail, is a similar trail system to what is proposed for the Mill-Queen Anne-Black Ditch Creeks Trail. This trail is 20 miles in length and features a combination of both paved asphalt trail at its lower end, with natural surface or hard cinder surfaces at its northern end due to environmental concerns.



Wissahickon Green Ribbon Trail

The Pennypack Trail is a 10-mile paved asphalt trail running along the banks of the Pennypack Creek within the City of Philadelphia. The trail also continues into Montgomery County where the trail surface is crushed stone.



Pennypack Trail

Additional trails that are similar in nature, with the exception of different trail surfaces and other trail components, include the Perkiomen Trail (21 miles) and the Delaware Canal Towpath Trail.

TRAIL ALIGNMENT

The proposed trail alignment was submitted to the Steering Committee for their review and comment and was also presented to the public as part of the public participation process. The proposed alignment represents the consensus of these various groups.

Key factors considered in developing the proposed alignment included:

- Provide connectivity to adjacent neighborhoods, commercial areas, park and recreational sites, schools, and existing trail networks.
- To the extent possible, limit the impact to natural resource features.
- Ensure the safety of all trail users.
- Design the trail to minimize future maintenance requirements.
- Comply with ADA guidelines to the fullest extent possible.

Following is a segment-by-segment analysis that provides a detailed discussion of each trail segment.

SEGMENT 1: MILL CREEK - VETERANS MEMORIAL PARK TO FROSTY HOLLOW ROAD - 1.5 MILES

At its northwestern trailhead, the trail begins in Veterans Memorial Park where Mill Creek runs behind the park and then under Route 413. The parking lot at Veterans Memorial Park will serve as the trailhead location for this end of the trail.

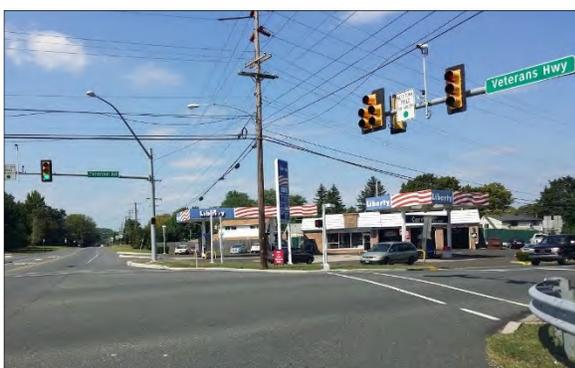


Veterans Memorial Park



Route 413 Right of way south of Veterans Memorial Park

Exiting Veterans Memorial Park, the trail will utilize the right-of-way along the eastern side of Route 413 to the existing gas station at the northeastern corner of the intersection of Route 413 and Trenton Road. An easement will be required for the trail to traverse the gas station property. The trail will cross Trenton Road and enter into Lions Park. Exiting Lions Park, heading east across the entrance into the Snowball Gate neighborhood off of Trenton Road, bicyclists will make use of Snowball Drive while other trail users will make use of a sidewalk to be installed in the right-of-way along the north side of Snowball Drive. At the point at which Snowball Drive makes a sharp right turn, a 10-foot wide trail will be installed along the east side of Snowball Drive in the greenway adjacent to Mill Creek owned by Middletown Township. Connections into the Forsythia Gate neighborhood, Forsythia Crossing Park and Everitt Elementary School will be made via existing sidewalks on Forsythia Cross and a sidewalk running between Snowball Drive and Forsythia Drive South.



Intersection of Route 413 and Trenton Road



Lions Park at entrance to Snowball Gate

The trail will continue within the greenway running parallel to Snowball Drive, remaining near the street to help minimize the impact to Mill Creek and the existing vegetated riparian buffer. As the trail continues toward Frosty Hollow Road, there is a designated wetland area and some steep slopes located between Snowball Drive and Mill Creek, which will require that the trail remain close to Snowball Drive until Snowball Drive makes a turn to the right. From this point, the trail will continue to Frosty Hollow Road through property owned by Middletown Township.



Snowball Drive at Forsythia Cross



Greenway along Snowball Drive

**SEGMENT 2: MILL CREEK - FROSTY HOLLOW ROAD TO NEW FALLS ROAD AND
BRISTOL OXFORD VALLEY ROAD INTERSECTION - 1.2 MILES**

Segment 2 of the trail will begin at the intersection of Frosty Hollow Road and Upper Orchard Drive, where a rectangular rapid flashing beacon will be used to alert motorists on Frosty Hollow Road to the presence of the trail crossing. The trail will continue along the eastern side of Upper Orchard Drive / western side of Mill Creek, within the Upper Orchard neighborhood. To minimize the impact to the existing vegetated buffer along Mill Creek, the trail will remain close to Upper Orchard Drive. At the point at which Upper Orchard Drive bends to the right, the trail will continue to parallel Mill Creek into Frosty Hollow Park. Within Frosty Hollow Park, the trail will bend to the left following Mill Creek, briefly crossing a wetland area requiring a boardwalk, to the PECO powerline corridor. At this point the primary trail will head east within the PECO powerline corridor, although a separate trail will branch off to the right to access existing trailhead parking by the tennis courts located in Frosty Hollow Park.

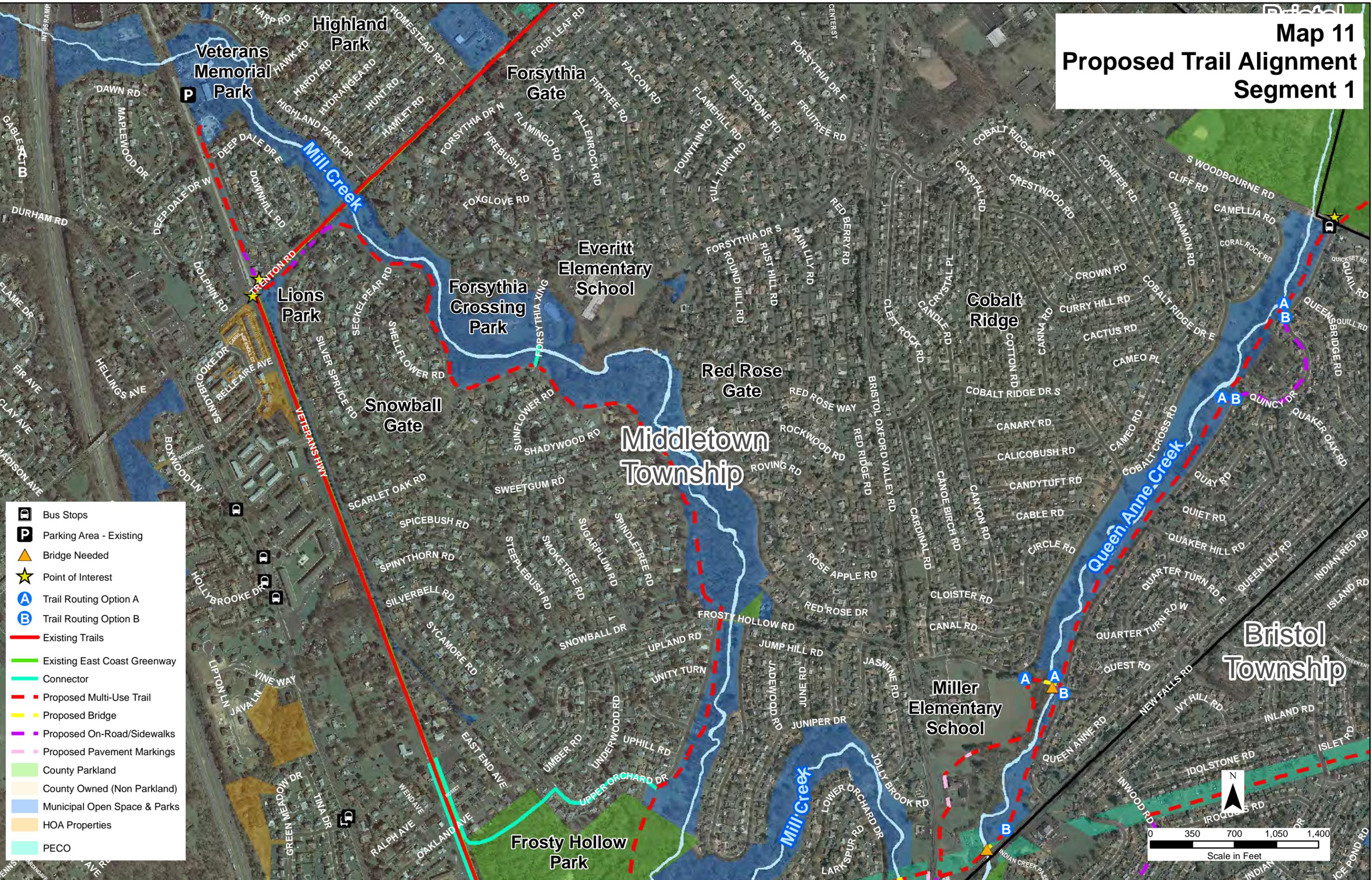


Frosty Hollow Road crossing at Upper Orchard Drive

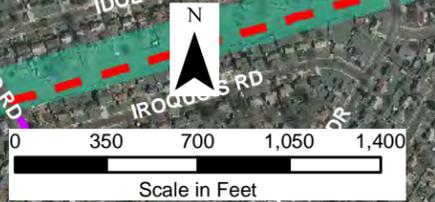


Upper Orchard greenway south of Frosty Hollow Road

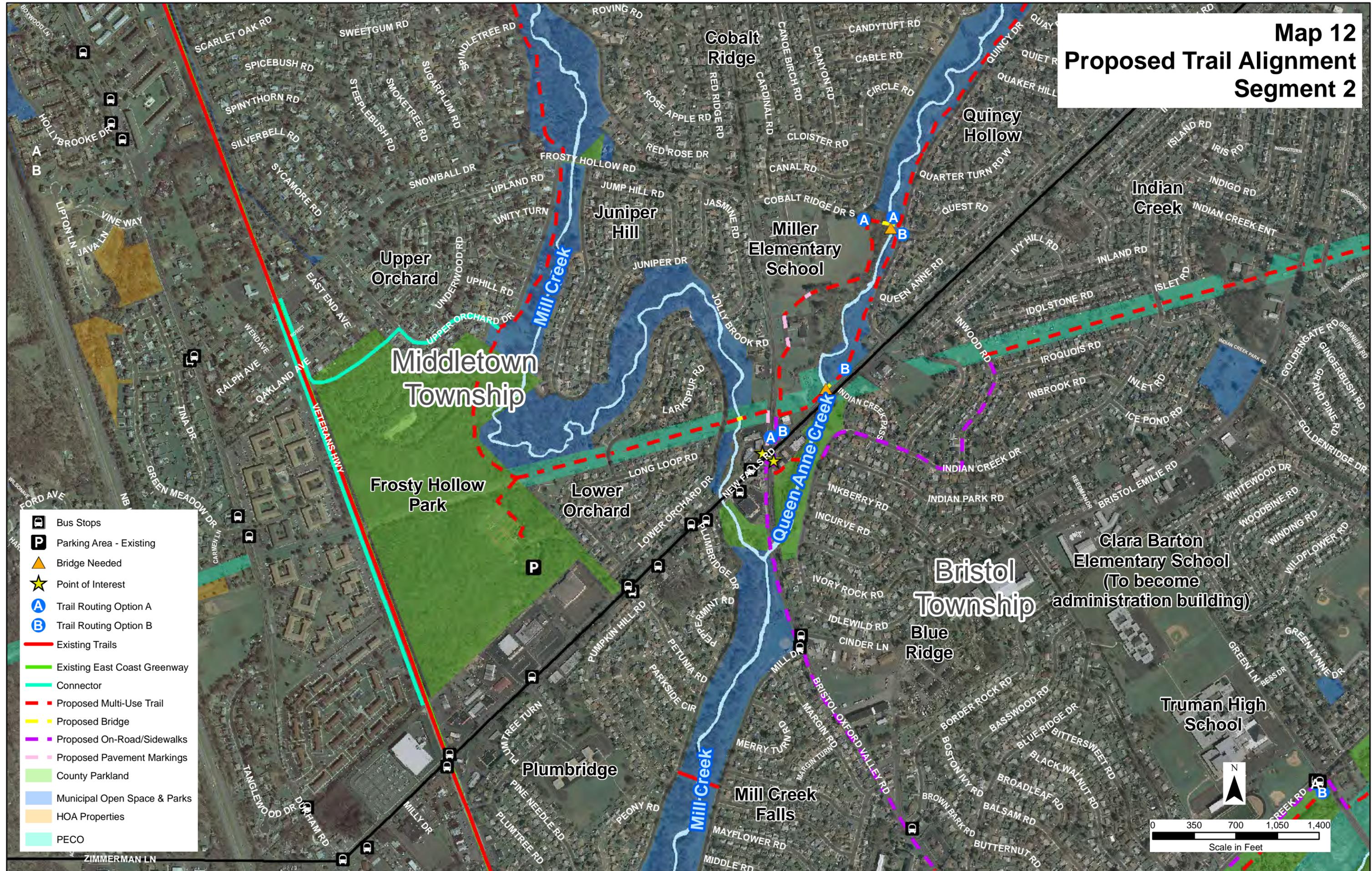
Map 11 Proposed Trail Alignment Segment 1



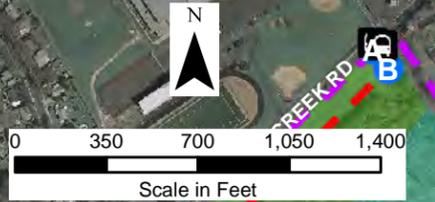
- Bus Stops
- Parking Area - Existing
- Bridge Needed
- Point of Interest
- Trail Routing Option A
- Trail Routing Option B
- Existing Trails
- Existing East Coast Greenway
- Connector
- Proposed Multi-Use Trail
- Proposed Bridge
- Proposed On-Road/Sidewalks
- Proposed Pavement Markings
- County Parkland
- County Owned (Non Parkland)
- Municipal Open Space & Parks
- HOA Properties
- PECO



Map 12 Proposed Trail Alignment Segment 2



- Bus Stops
- Parking Area - Existing
- Bridge Needed
- Point of Interest
- Trail Routing Option A
- Trail Routing Option B
- Existing Trails
- Existing East Coast Greenway
- Connector
- Proposed Multi-Use Trail
- Proposed Bridge
- Proposed On-Road/Sidewalks
- Proposed Pavement Markings
- County Parkland
- Municipal Open Space & Parks
- HOA Properties
- PECO





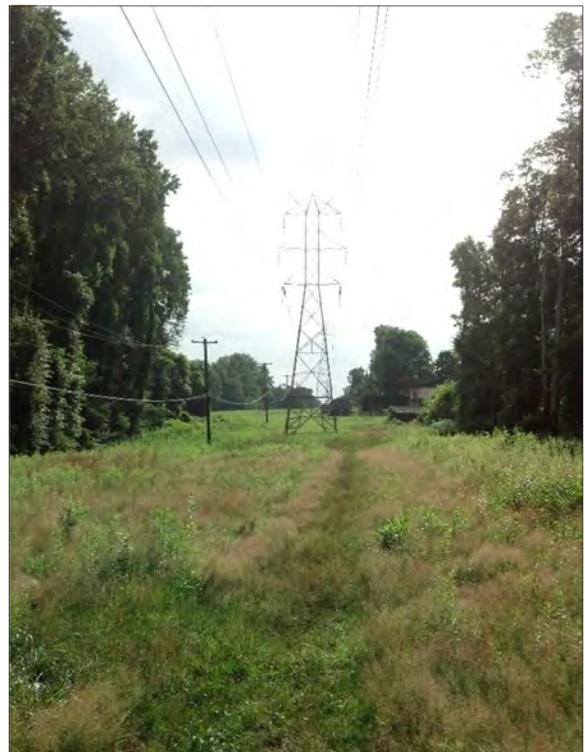
Parking area at Frosty Hollow Road



Wood within Frosty Hollow Park

Once within the PECO powerline corridor, the trail will pass through the Lower Orchard neighborhood, crossing Lower Orchard Drive twice, before crossing a bridge over Mill Creek to connect with Bristol Oxford Valley Road. Although this segment of the trail will require an easement from PECO, placement of the trail within the powerline corridor versus having the trail continue to follow the course of Mill Creek will eliminate the need to clear trees within the vegetated buffer area along Mill Creek. The trail within the PECO powerline corridor will pass behind homes located along Long Loop Road, where screening and/or fencing can be provided to provide privacy to these properties. A similar number of homes would have been impacted had the trail been placed adjacent to Mill Creek behind homes located along Juniper Drive within the Juniper Hill neighborhood, or behind homes located along Lower Orchard Drive. Routing the trail along the creek between the Juniper Hill and Lower Orchard neighborhoods would have required several bridges due to the meandering nature of the creek in this area and its proximity to property boundaries. Upon reaching Bristol Oxford Valley Road, the trail will turn south utilizing the existing pavement within the right-of-way, which will be marked with pavement markings to designate the trail, to reach the intersection with New Falls Road.

Public transportation connections along this trail segment include a connection to the SEPTA Bus Route 129 that runs along New Falls Road and continues south along Bristol Oxford Valley Road from its intersection with New Falls Road.



PECO corridor between Frosty Hollow Park and Bristol Oxford Valley Road



Mill Creek crossing approaching Bristol Oxford Valley Road

Frosty Hollow Park to Route 413 Connector Trail - 1.2 miles

In recognition that one of the stated goals and objectives of this study was to identify connections to neighborhoods and residential areas, and also recognizing the large number of residents living in the Racquet Club and Foxwood Manor apartment complexes located along Route 413, a connector trail is proposed which will connect these complexes to the primary trail. This same connector trail will also enable residents of the Meadows of Durham and Tanglewood developments along Durham Road to access the primary trail.



Upper Orchard Drive entrance into Frosty Hollow Park



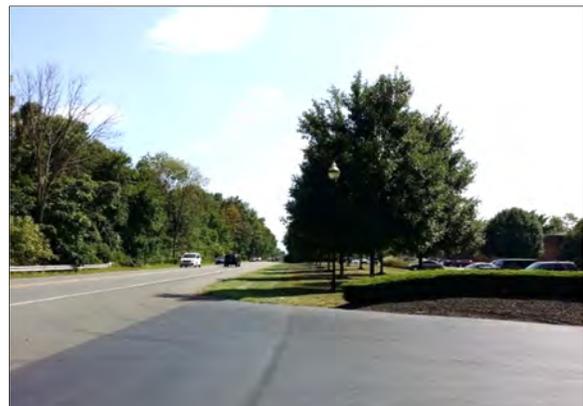
Upper Orchard Pass entry into Frosty Hollow Park

The connector trail will branch off the primary trail where it enters Frosty Hollow Park at the point where Upper Orchard Drive bends to the right as approached from Frosty Hollow Road. The trail will head east along Upper Orchard Drive making use of the roadway and sidewalks for approximately 950 feet to its intersection with Upper Orchard Pass on the left. The trail route will follow Upper Orchard Pass for approximately 125 feet until it dead ends into Frosty Hollow Park.

From its entry into Frosty Hollow Park, the trail will become a paved trail in the woods running easterly for a distance of approximately 750 feet before reaching the Route 413 right-of-way. The trail will be placed on County-owned property behind the residences and businesses located along Oakwood Avenue. As there are extensive woods in this area, and as the trail is located within the County-owned Frosty Hollow Park, the trail can be placed so as to minimize the impact to the properties located along Oakwood Avenue.

Upon reaching the Route 413 right-of-way, the trail will turn north toward the intersection of Route 413 and Frosty Hollow Road. Upon reaching this signalized intersection, the trail will cross Route 413, proceed south along the Route 413 right-of-way in front of the Racquet Club and Foxwood Manor apartment complexes for a distance of approximately 0.7 miles to the entrance to the Giant Food store at the intersection of Route 413 and New Falls Road.

This connector trail will also provide a public transportation connection to the SEPTA Bus Route 129 that runs along Durham Road.



*Right-of-way along Route 413
In front of Racquet Club apartments*

An alternative route was explored, and subsequently rejected, which would have placed the trail within Frosty Hollow Park running behind the businesses located along New Falls Road, through the parking lots of the businesses located at the northeast corner of the intersection of New Falls Road and Route 413. However, this routing was rejected due to extensive wet areas within this area. Additionally, the final stretch of this segment would have placed trail users within a heavily used parking lot with a high degree of vehicle entry and egress thereby creating safety concerns.



Intersection of New Falls Road and PA 413

SEGMENT 3: QUEEN ANNE CREEK - OXFORD VALLEY PARK TO WOODBOURNE ROAD - 1.4 MILES

This segment of the trail will begin at Oxford Valley Park. The trailhead will be located at the existing parking lot behind the Lower Bucks County Chamber of Commerce located on Hood Boulevard. From the trailhead, the trail will make use of the existing trail along the western side of Hood Boulevard to its intersection with South Oxford Valley Road. After crossing South Oxford Valley Road, bicyclists will be on-road along Southway Drive. Pedestrians and other trail users will make use of the existing sidewalk in front of Saint Frances Cabrini and a sidewalk to be installed in the right-of-way along the western side of Southway Drive extending to its intersection with South Olds Boulevard.



Trailhead parking at Oxford Valley Park – Lower Bucks County Chamber of Commerce

Trail users will cross South Olds Boulevard at this intersection, head west for approximately 140 feet where the trail, reverting to a 10' wide trail, will turn south onto the greenway owned by Falls Township. The trail will parallel Queen Anne Creek on the east side running behind the houses located on Buck Drive. Although there are existing trees along the streambank, additional privacy landscape screening and/or fencing will be required to minimize any potential disturbance to these homes.



Intersection of Hood Boulevard – Southway Drive and South Oxford Valley Road



Right-of-way along Southway Drive

After approximately 1,100 feet, the trail will enter onto property owned by Bristol Township. Shortly after entering Bristol Township there are two possible alignments for the trail. Trail Alignment A will continue the trail in the woods adjacent to Queen Anne Creek until arriving at Wistar Road. Upon reaching Wistar Road, bicyclists will be placed on-road for approximately 650 feet with other trail users making use of the existing sidewalk on the north side of Wistar Road up to the driveway entrance to Armstrong Middle School.



Crossing South Olds Boulevard west of Southway Drive

Trail Alignment B, the preferred option, will exit the property owned by Bristol Township and onto the Armstrong Middle School property owned by Bristol Township School District. The trail will remain in the wooded area so as to minimize any impact to the operations of the school, including the athletic field. An easement for this section of the trail will need to be acquired from the Bristol Township School District. Upon reaching Wistar Road, the trail will make use of the existing sidewalk, and a new sidewalk to be built to replace the existing deteriorated path extending 160 feet easterly to the driveway to the school. This alignment is preferred because it provides an off-road trail for bicyclists as well as pedestrians.



*Armstrong Middle School –
Edge of woods along athletic fields*

The option to continue the trail along the creek by going under the Wistar Road bridge over Queen Anne Creek was explored. However, due to a combination of a relatively low bridge clearance, some steep slopes, and the presence of wetlands along the creek on the other side of Wistar Road, this routing was determined to not be feasible.



*Wistar Road crossing at entrance to
Armstrong Middle School*

Upon reaching the driveway entrance to Armstrong Middle School, the trail will cross Wistar Road into Queen Anne Park owned by Bucks County. The trail will follow the alignment of an old roadbed located in the park for approximately 3,000 feet until it reaches Woodbourne Road at its intersection with Quincy Drive.



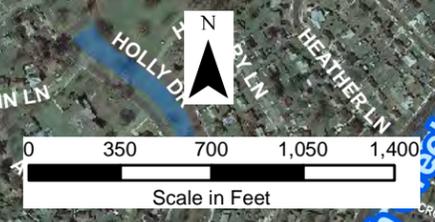
Old roadbed within Queen Anne Park

Public transportation connections along this trail segment include a connection to the SEPTA Bus Route 127 which services the Fairless Hills Shopping Center just to the southeast of the trailhead located on Hood Boulevard.

Map 13 Proposed Trail Alignment Segment 3



- Bus Stops
- Parking Area - Existing
- Point of Interest
- Trail Routing Option A
- Trail Routing Option B
- Existing Trails
- Existing East Coast Greenway
- Connector
- Proposed Multi-Use Trail
- Proposed On-Road/Sidewalks
- Proposed Pavement Markings
- County Parkland
- County Owned (Non Parkland)
- Municipal Open Space & Parks
- HOA Properties
- PECO





Entrance onto Appletree Drive at New Falls Road



Playground at Crabtree Drive near proposed intersection with Mill Creek Parkway connector trail

Connector Trails

Wistar Road to New Falls Road - 0.5 miles

To provide connections to the Levittown Public Library, Bucks County Technical High School, and Conwell Egan Catholic High School, a 0.5 mile connector trail is proposed along Wistar Road from Armstrong Middle School to New Falls Road. The trail will be comprised of bike sharrows along Wistar Road for the bicyclists, and a combination of proposed and existing sidewalks. Although there are existing sidewalks along the north side of Wistar Road in front of the Hidden Forest apartments, and along the south side of Wistar Road in front of Bucks County Technical High School, to complete the connection to New Falls Road, a sidewalk easement will be needed from both Christ United Methodist Church and from two private property owners on the south side of Wistar Road just east of its intersection with New Falls Road.



Wistar Road – Conwell Egan High School on left – Bucks County Technical High School on right



Intersection of Wistar Road and New Falls Road

This connector trail will also provide a public transportation connection to the SEPTA Bus Route 128 which runs along New Falls Road.



Map 14 – Wistar Road Connector Trail

New Falls Road to Mill Creek Parkway - 1.8 miles

Completion of the Wistar Road connector trail will also allow for the development of a proposed connector trail linking New Falls Road to Mill Creek Parkway through the Appletree, Crabtree Hollow and Oak Tree Hollow neighborhoods. From the intersection of Wistar Road and New Falls Road, the connector trail will follow the existing trail located in the right-of-way along the east side of New Falls Road to Appletree Drive. Upon entering the Appletree neighborhood, the trail will make use of the existing sidewalks for pedestrians with bicyclists being on-road. The trail will follow Appletree Drive southeasterly for approximately 700 feet to its intersection with Ambling Lane. The trail will follow Ambling Lane for approximately 250 feet to its intersection with Ailanthus Lane. The trail will continue approximately 1,750 feet to the intersection of Ailanthus Lane and Appletree Drive where it will cross Appletree Drive. Upon crossing Appletree Drive, the trail will make use of the existing trail/sidewalk located along Appletree Drive, Holly Drive, Holly Pass, and Crabtree Drive connecting to Washington Elementary School, part of the Bristol Township School District. This school is proposed to be closed under the proposed Bristol Township School District consolidation plan. The trail will continue across the school property to join up with the existing trail running alongside Oaktree Drive which terminates to the west at Mill Creek Parkway near its intersection with Dogwood Drive, and to the east at the playground located between Oaktree Drive and Crabtree Drive just north of Mill Creek Parkway. A separate connector trail is planned to extend along the right-of-way on the north side of Mill Creek Parkway from Levittown Parkway west to the existing trail just past Oaktree Drive.

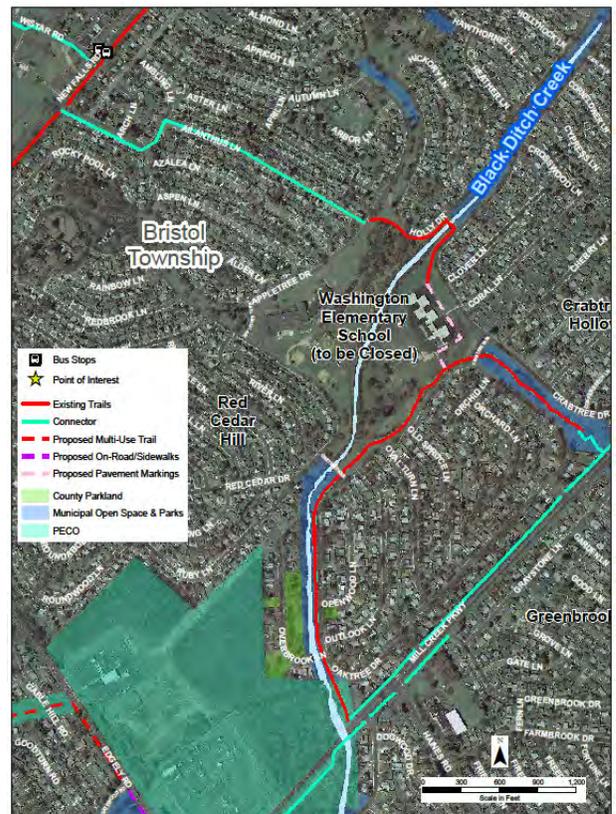


Intersection of Ailanthus Lane and Appletree Drive



Washington Elementary School

Map 15 – New Falls Road to Mill Creek Parkway Connector Trail



**SEGMENT 4: QUEEN ANNE CREEK - WOODBOURNE ROAD TO NEW FALLS ROAD AND
BRISTOL OXFORD VALLEY ROAD INTERSECTION - 1.4 MILES**

The trail alignment for Segment 4 begins at the intersection of Woodbourne Road and Quincy Drive in the Quincy Hollow neighborhood on the east side of Queen Anne Creek. The trail will be in the greenway area owned by Middletown Township adjacent to the creek and will continue for approximately 750 feet at which point two separate alignments are possible. Trail alignment A will continue the trail approximately 950 feet in the greenway and run behind the houses on Quincy Drive. However, as the distance from the streambank to the property line is 40 feet or less, this could raise some potential privacy concerns. Trail alignment B, instead of continuing the trail behind the houses located on Quincy Drive, will make use of the existing sidewalk and roadway on Quincy Drive, essentially placing the trail in front of the homes for an approximate distance of 1,450 feet. As Alignment B offers more privacy for the adjacent property owners, it is the recommended alignment.



Crossing Woodbourne Road at Quincy Drive



Basketball court in greenway along Quincy Drive



Greenway along Quincy Drive



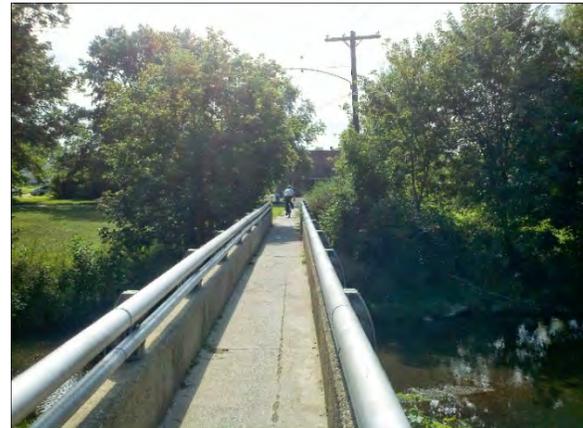
Man walking dog behind houses along Quincy Drive

Regardless of whether Trail Alignment A or B is chosen, the trail will continue in the greenway located between the east side of Queen Anne Creek and Quincy Drive for a distance of approximately 2,700 feet to the existing bridge over Queen Anne Creek opposite the intersection of Quincy Drive and Quest Road. The trail will be placed up closer to Quincy Drive as opposed to down by Queen Anne Creek due to wet conditions closer to the creek. Regardless of the alignment chosen, connections to the Cobalt Ridge neighborhood will be possible via the existing bridge at Quest Road, and a smaller existing bridge between Quiet Road and Candytuft Road.

Upon reaching the existing bridge near the intersection of Quincy Drive and Quest Road, the trail will follow one of two alignments. Trail Alignment A will continue the trail over the existing bridge over Queen Anne Creek and onto the Miller Elementary School property owned by the Neshaminy School District. Once on the school property, for which an easement will be required, the trail will be placed along the edge of the existing riparian buffer along the creek to minimize interference with the athletic fields at the school. The trail will continue for approximately 1,000 feet across the Emmaus Road Church property and make use of either the existing parking lot for the trail alignment or use a combination of the parking lot and a new trail to be built. Regardless of the alignment across the church property, an easement will be required. Exiting the church property, the trail will cross the PECO corridor, requiring another easement, before joining up with Segments 2 and 5 at the intersection of New Falls Road and Bristol Oxford Valley Road.



Existing bridge over Queen Anne Creek between Miller Elementary School and Quincy Drive at Quest Road



Existing footbridge over Queen Anne Creek between Cobalt Ridge Road South and Quincy Drive

Alignment B will continue the trail along the east side of Queen Anne Creek on Middletown Township owned property for approximately 1,000 feet before entering the PECO powerline corridor. Upon reaching the PECO corridor, for which an easement will be required, the trail will head southwest, cross over Queen Anne Creek on a new bridge to be built, before reaching Bristol Oxford Valley Road. Upon reaching Bristol Oxford Valley Road the trail will turn south to connect to Segments 2 and 5 at the intersection of New Falls Road and Bristol Oxford Valley Road.



Miller Elementary School



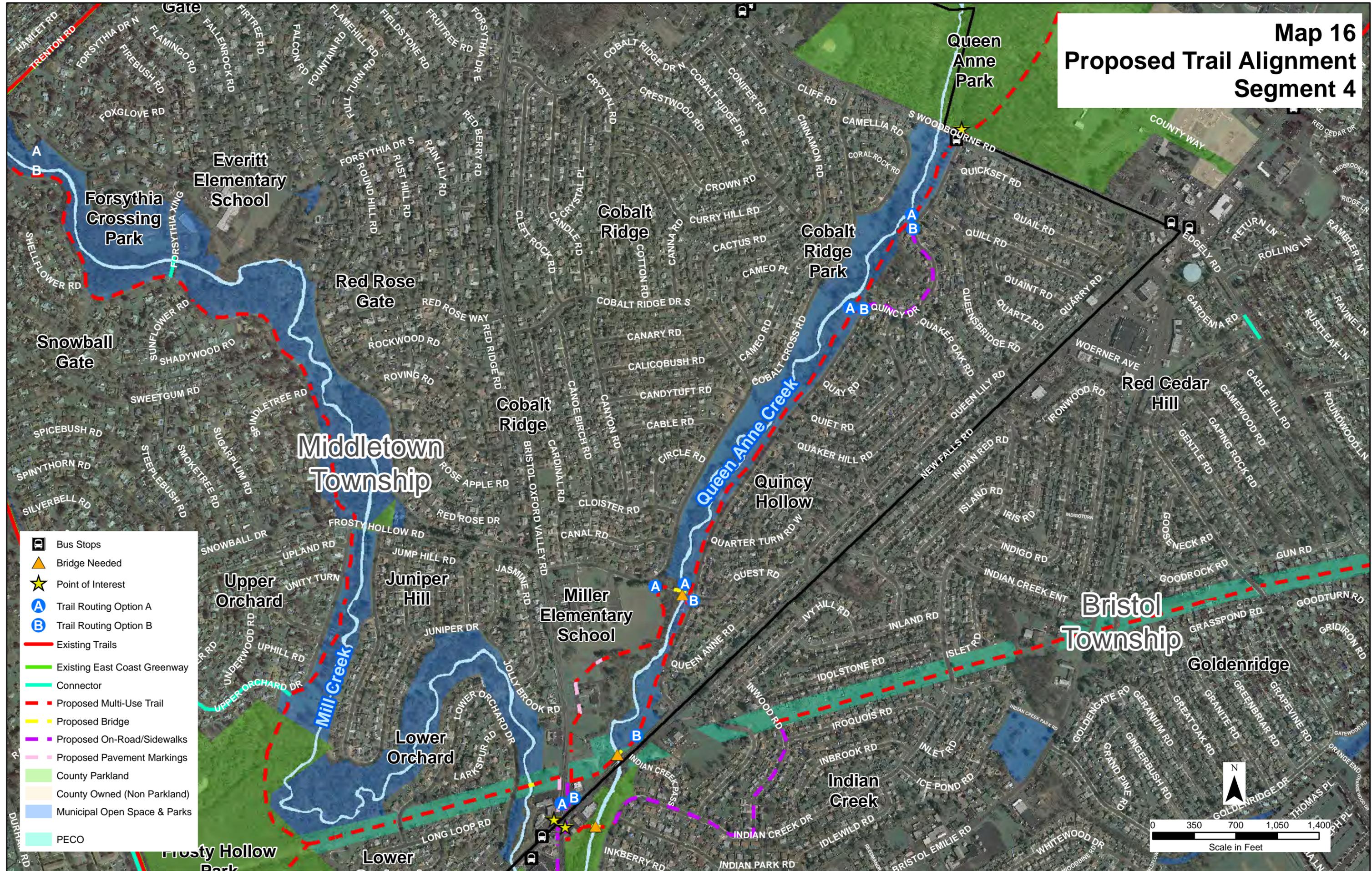
Emmaus Road Church



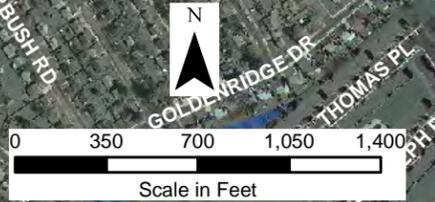
PECO corridor from Bristol Oxford Valley Road to Queen Anne Creek

Although Alignment B requires the construction of a new bridge over Queen Anne Creek, and an easement from PECO, it is the recommended trail

Map 16 Proposed Trail Alignment Segment 4



- Bus Stops
- Bridge Needed
- Point of Interest
- Trail Routing Option A
- Trail Routing Option B
- Existing Trails
- Existing East Coast Greenway
- Connector
- Proposed Multi-Use Trail
- Proposed Bridge
- Proposed On-Road/Sidewalks
- Proposed Pavement Markings
- County Parkland
- County Owned (Non Parkland)
- Municipal Open Space & Parks
- PECO



alignment as opposed to Alignment A which requires easements from PECO, Emmaus Road Church and the Neshaminy School District. Additionally, although there is an existing bridge over Queen Anne Creek between Quincy Drive and Miller Elementary School, the township has already indicated that it is in need of replacement so there is no cost savings to be obtained by making use of the existing bridge.

Public transportation connections along this trail segment include a connection to the SEPTA Bus Route 129 which, from the intersection of New Falls Road and Bristol Oxford Valley Road, runs southwest along New Falls Road and south along Bristol Oxford Valley Road.

**SEGMENT 5: NEW FALLS ROAD AND BRISTOL OXFORD VALLEY ROAD INTERSECTION
TO MILL CREEK ROAD AND EDGELY ROAD INTERSECTION - 4.6 MILES**

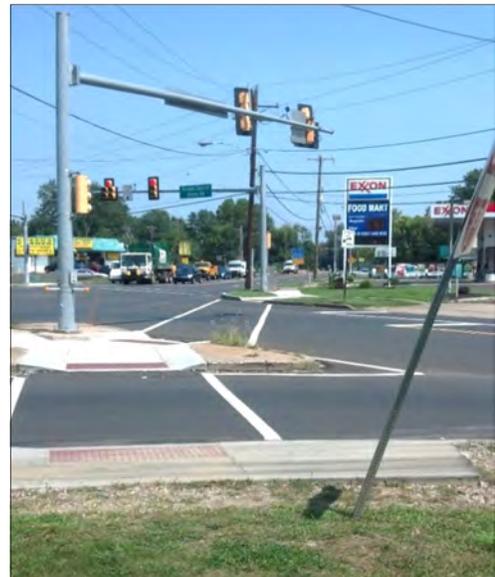
Segment 5 of the trail is the longest segment of the trail as it features two trail alignments, both of which are recommended. Both trails begin at the intersection of New Falls Road and Bristol Oxford Valley Road near the confluence of Mill Creek and Queen Anne Creek. As noted before, Segment 2 along Mill Creek, and Segment 4 along Queen Anne Creek, both terminate at this intersection. The boundaries of this segment are as follows:

- North: PECO powerline corridor extending from Bristol Oxford Valley Road to Edgely Road
- East: Edgely Road from the PECO powerline corridor to Mill Creek Road
- South: Mill Creek Road from Bristol Oxford Valley Road to Edgely Road
- West: Bristol Oxford Valley Road

The North and East segments are combined and noted as the Segment 5 North route with the South and West segments being combined and noted as the Segment 5 South route.

Segment 5 North Trail

The North Trail of Segment 5 is comprised of the PECO powerline corridor extending from Bristol Oxford Valley Road to Edgely Road, and Edgely Road from the PECO powerline corridor south to Mill Creek Road. The trail would begin at the intersection of New Falls Road and Bristol Oxford Valley Road. From this intersection, the trail would proceed south for approximately 160 feet on the east side of Bristol Oxford Valley Road making use of the sidewalk and entrances to the gas station located at the southeast corner of the intersection. After 160 feet, the trail would turn left and head east on County-owned property behind the gas station. This County-owned lot can serve provide trailhead parking. The trail would traverse the County-owned property for approximately 265 feet before crossing over Queen Anne Creek on a new bridge to be built. After crossing over the creek, the trail would become a boardwalk to avoid wet areas, before reaching Indian Creek Drive within the Indian Creek neighborhood.



Bristol Oxford Valley Road and New Falls Road

The trail would make use of the existing sidewalks and roadway to continue north and east along Indian Creek Drive until reaching Inwood Road where the trail would turn north, still making use of the roadway and sidewalks. The trail would continue along Inwood Road for approximately 1,050 feet until reaching the PECO powerline corridor. Upon reaching the PECO powerline corridor, the trail would follow the corridor for approximately 1 mile to Edgely Road crossing Indian Creek Drive, Bristol Emilie Road, Goldengate Road, Goldenridge Drive, and Gable Hill Road. Easements would need to be negotiated with PECO for this segment of the trail, as well as with First Baptist Church Bristol which owns a parcel between Indian Creek Drive and Bristol Emilie Road.

Upon reaching Edgely Road, the trail would head south for approximately 1,800 feet in the right-of-way along the west side of Edgely Road before reaching the intersection with Mill Creek Road where the trail would connect with both the Segment 5 South trail along Mill Creek Road and to the Segment 6 trail leading to Levittown Town Center, Route 13, the Delaware & Lehigh Canal Towpath Trail, and the Levittown/Tullytown SEPTA Regional Rail train station.

The proposed alignment along the PECO powerline corridor and Edgely Road would provide access to the Indian Creek, Goldenridge, Orangewood and Whitewood neighborhoods.



Indian Creek Drive



Entering PECO corridor at Inwood Road



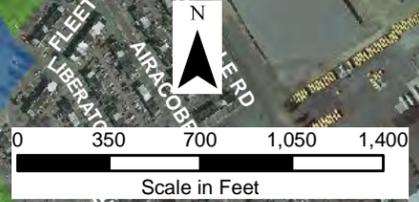
Crossing Emilie Road at First Baptist Church



PECO corridor at Edgely Road



- Bus Stops
- Parking Area - Existing
- Bridge Needed
- Point of Interest
- Trail Routing Option A
- Trail Routing Option B
- Existing Trails
- Existing East Coast Greenway
- Connector
- Proposed Multi-Use Trail
- Proposed Bridge
- Proposed On-Road/Sidewalks
- Proposed Pavement Markings
- County Parkland
- Municipal Open Space & Parks
- HOA Properties
- PECO



Map 17
Proposed Trail Alignment
Segment 5

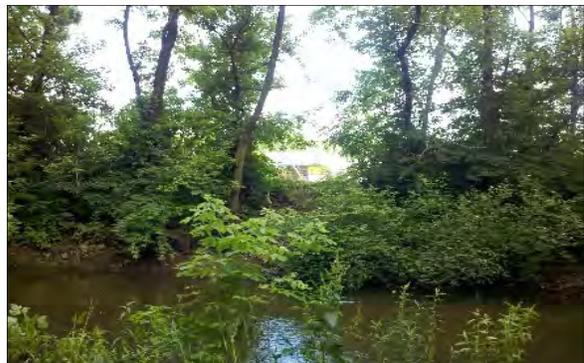
Alternative routes evaluated to access the PECO corridor

Two additional options for getting to the PECO corridor were evaluated, both of which were determined to not be feasible. The first option considered would have continued the trail along Queen Anne Creek from Segment 4 and across or under New Falls Road. Given the high volume and speed of traffic along New Falls Road, in addition to state regulations regarding the crossing of state-owned roads at locations other than intersections, also called a mid-block crossing, it was not possible to go across New Falls Road. Similarly, the opportunity to extend the trail under New Falls Road along the creek was assessed but there is not sufficient height clearance under the bridge.

The second option considered was to have the trail proceed northeast along the southern side of New Falls Road in front of the Exxon station and McStew’s Irish Pub, continue across Queen Anne Creek with a new bridge leading to the intersection of New Falls Road and Indian Creek Pass. The existing bridge on New Falls Road over Queen Anne Creek was not suitable for the trail. From the intersection of New Falls Road and Indian Creek Pass, the trail would have joined back up with the PECO powerline corridor. However, this option was determined to not be feasible as PECO does not own the corridor in this section. Instead, PECO has an easement for their powerline running across private property containing Yorke Pharmacy and Perfect Pools and Spas located on New Falls Road just northeast of Indian Creek Pass.



Parking areas behind Exxon Station – Entrance to bridge over Queen Anne Creek will be in woods to the right



Queen Anne Creek crossing behind Exxon station



Right-of-way along Edgely Road



Intersection of Edgely and Mill Creek roads

Segment 5 South Trail

The South Trail for Segment 5 consists of two sections including Bristol Oxford Valley Road between New Falls Road and Mill Creek Road, and Mill Creek Road between Bristol Oxford Valley Road and Edgely Road. The trail would begin at the intersection of New Falls Road and Bristol Oxford Valley and travel south along the west side of Bristol Oxford Valley Road. For the first 400 feet of this trail segment, bicyclists would need to share the physical road with motorists, designated by bike sharrows and other signage, while other trail users would be able to make use of a combination of existing sidewalks and sidewalks to be built in the right-of-way along the Wawa property.

After the first 400 feet, the trail extending the full length of Bristol Oxford Valley Road down to Mill Creek Road, approximately 1 mile, would consist of a wide paved shoulder, averaging 8 - 10 feet wide, for bicyclists, and sidewalks for other trail users. This is also the route followed by SEPTA Bus Route 129 providing a public transportation connection for trail users.



Bristol Oxford Valley Road in front of Wawa and Walgreens



Bristol Oxford Valley Road bridge over Queen Anne Creek



Wide road shoulders along Bristol Oxford Valley Road



Sidewalks along east side of Bristol Oxford Valley Road behind houses on Margin Road



Intersections of Bristol Oxford Valley Road and Mill Creek Road at Rosenberger's Dairies



Yellowwood Drive

Upon reaching the intersection with Mill Creek Road, the trail would cross Bristol Oxford Valley Road. The Segment 5 South Trail would then continue along the southern side of Mill Creek Road with bicyclists being on-road and other trail users accessing a sidewalk to be built in the right-of-way along the Rosenberger's Dairies property and the County-owned parcel between Rosenberger's Dairies and Yellowwood Drive. The intersection of Mill Creek Road and Bristol Oxford Valley Road is also where the trail would connect to Segments 7 - 9 which would continue the trail down to the Delaware River and Bristol Marsh.



Right of way along Mill Creek Road by Rosenberger's Dairies



Intersection of Mill Creek Road and Green Lane



Right-of-way on east side of Green Lane at intersection with Mill Creek Road



Mill Creek Road right-of-way across from Truman High

Continuing along the Segment 5 South trail, the trail would reach Yellowwood Drive where two possible alignments for the trail exist. From the intersection of Mill Creek Road and Yellowwood Drive, Trail Alignment A would continue the trail along Mill Creek Road with bicyclists sharing the road with motorists, designated by bike sharrows and signage, and other trail users making use of a sidewalk to be built in the right-of-way along the south side of Mill Creek Road. This alignment would extend approximately 2,500 feet from Yellowwood Drive to Green Lane. Given the presence of some minor slopes within the right-of-way, a retaining wall and guiderail would be required for the segment along Mill Creek Road in front of the Yellowwood neighborhood. Upon reaching the County-owned property at the end of the Yellowwood development, the guiderail and retaining wall would not be required.



Example of guiderail protection to be provided along the east side of Green Lane approaching Mill Creek Road



Green Lane entrance into PECO powerline corridor

From the intersection of Mill Creek Road and Yellowwood Drive, Alignment B would continue the trail along Yellowwood Drive, a dead-end street, and its existing sidewalks, to its end at the County-owned parcel across from Truman High School. At this point, the trail would become a paved asphalt trail traversing the County-owned parcel to the intersection of Mill Creek Road and Green Lane. Alignment B is the recommended alignment as it provides an off-road route and does not require the construction of retaining walls and guiderails.



Parking lot and sidewalks in front of Gleason's Pub

Upon reaching the intersection of Mill Creek Road and Green Lane, the trail would cross Green Lane then turn south and consist of a sidewalk or narrow asphalt trail to be constructed in the right-of-way along the east side of Green Lane. The trail would extend for approximately 340 feet before turning left / east into the PECO corridor for a distance of approximately 450 feet. This diversion of the trail is necessary as there is not sufficient room in front of the houses and other structures located on Mill Creek Road just past its intersection with Green Lane. Public transportation connections are available along this route as the SEPTA Bus Route 129 runs along Green Lane.

After traversing the PECO corridor for 450 feet, the trail would continue onto County-owned property for approximately 1,400 feet before reaching the corner of this parcel at Mill Creek Road located, approximately 500 feet southwest of the intersection of Mill Creek Road and Violetwood Drive, opposite Franklin Middle School. From this point, the trail would continue in the right-of-way along the south side of Mill Creek Road to Violetwood Drive. After crossing Violetwood Drive, the trail would continue for approximately 1,200 feet along the existing trail in the right-of-way, which is proposed to be widened, until reaching the parking lot for Gleason's Pub. Residents in the Orangewood neighborhood and Orangewood Park apartments would be able to connect to the trail at the signalized intersection of Mill Creek Road and Orangewood Drive. From this intersection, the trail would continue in the right-of-way along the south side of Mill Creek Road. However, due to a narrower right-of-way and existing parking lots, the trail would narrow to become a sidewalk extending 1,400 feet to the intersection of Mill Creek Road and Edgely Road where the trail would connect to the Segment 5 North Trail and the Segment 6 trail leading to Levittown Town Center, Route 13, the Delaware & Lehigh Canal Towpath Trail, and the Levittown/Tullytown SEPTA Regional Rail train station.



Right-of-way along southern side of Mill Creek Road at Violetwood Drive

Alternative routes evaluated to Bristol Oxford Valley Road

As an alternative to the trail alignment being along Bristol Oxford Valley Road from New Falls Road down to Mill Creek Road, the option of continuing the trail along Mill Creek through property owned by Bristol Township, Bucks County and the Pennsylvania Turnpike Commission was evaluated. The initial segment of this alignment would have continued the trail in the greenway in the Mill Creek Falls and Plumbridge neighborhoods on land owned by Bristol Township. This site is where a significant amount of stream mitigation work was recently completed as part of the Interstate 95 and Pennsylvania Turnpike interchange project. Nearing the Pennsylvania Turnpike on Bucks County property, the trail would have turned left or east and proceeded along Mill Creek adjacent to the Turnpike, continued on land owned by the Pennsylvania Turnpike Commission, before connecting to the intersection of Bristol Oxford Valley Road and Mill Creek Road through land owned by Bucks County just south of the Crestwood development on Bristol Oxford Valley Road.



Existing trail in right-of-way along south side of Mill Creek Road opposite Emerson Elementary School and Orangewood Park apartments

This alignment was determined not to be feasible due to the heavily flooded conditions along Mill Creek in the stretch along the border of the Pennsylvania Turnpike driven in part by large drainage pipes in this area that carry a significant amount of runoff from the turnpike itself. Additionally, there were several significant wetland areas including a large area bordered by the turnpike to the south, Mill Creek Falls neighborhood to the north and west, and the Crestwood development to the east.

An additional alternative route evaluated was to continue the trail partially down Mill Creek in the greenway, exit the greenway and proceed on-road along either Mayflower Road or Middle Road in the Mill Creek Falls neighborhood, then proceed onto Mill Place, a dead-end street and open its connection into the back of the Brittany Springs apartments located on Bristol Oxford Valley Road making use of the road and parking lot system through the apartments to connect to Bristol Oxford Valley Road. However, due to potential traffic conflicts associated with the trail being routed through the apartment complex, and potential neighborhood opposition to opening the connection between the apartments and the Mill Creek Falls neighborhood, this alignment was also determined not to be feasible.



Bristol Oxford Valley Road in front of Brittany Springs apartments

Alternative route to Mill Creek Road

The southern boundary of the study area, Mill Creek Road, runs parallel to Black Ditch Creek. Site analysis was conducted along Black Ditch Creek within the PECO powerline corridor extending from Mill Creek Parkway near Dogwood Drive, to the Pennsylvania Turnpike, just south of the confluence of Mill Creek and Black Ditch Creek. The site analysis revealed that this area is prone to flooding during major storms and that the Black Ditch Creek overflows its banks often. This results in the stretch of land along the creek as being an extremely wet segment of land.

Because of the wetlands and underlying wet soils along the Black Ditch Creek, construction of a trail in this area would be extremely difficult and costly as the only means of construction would be via a boardwalk. Because of this, and in-line with a previously conducted study of the Black Ditch Creek corridor, *Black Ditch Creek Greenway Study* (October 2003) conducted for Bristol Township by Lord Worrell and Richter, Inc., the proposed trail alignment does not follow the Black Ditch Creek.

The trail alignment proposed both by this study, as outlined above, as well as the *Black Ditch Creek Greenway Study*, are relatively similar for the most part, placing the trail along Mill Creek Road from Bristol Oxford Valley Road to Green Lane, then on County-owned property from Green Lane to the Violetwood neighborhood. Upon reaching the Violetwood neighborhood the proposed trail alignments differ. The *Black Ditch Creek Greenway Study* proposes placing the trail behind the Violetwood neighborhood utilizing an existing gravel service road. In contrast, this study, recognizing the concerns of residents within the Violetwood neighborhood, and the need to cross two extensions to the creek if the trail is run parallel to Violetwood Drive, recommends continuing the trail from the Violetwood neighborhood to Edgely Road by completing the sidewalk and trail network already present in locations along the south side of Mill Creek Road, as outlined above.



Sidewalks in front of apartments at Mill Creek and Edgely roads



Intersection of Mill Creek and Edgely roads

**SEGMENT 6: MILL CREEK ROAD AND EDGELY ROAD INTERSECTION TO
LEVITTOWN PARKWAY AND BRISTOL PIKE INTERSECTION - 2.1 MILES**

Segment 6 of the Mill-Queen Anne-Black Ditch Creeks trail would begin at the intersection of Edgely Road and Mill Creek Road / Parkway at the jointure of the Segment 5 North and Segment 5 South trail segments.



*Sidewalk along east side of Edgely Road
in front of Bottom Dollar Foods*



*Right-of-way along east side of Edgely Road
looking north toward Mill Creek Parkway*

Beginning at the southeast corner of this intersection in front of Bottom Dollar Foods and headed south along Edgely Road, the initial 425 feet of trail would consist of the sidewalk in front of the Bottom Dollar Foods. After this initial section, the trail would become an asphalt trail in the right-of-way along the east side of Edgely Road for approximately 700 feet before entering onto the PECO property adjacent to Black Ditch Creek. To ensure the safety of trail users, a guiderail or other fencing would be provided to separate the trail from the road.

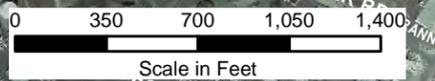
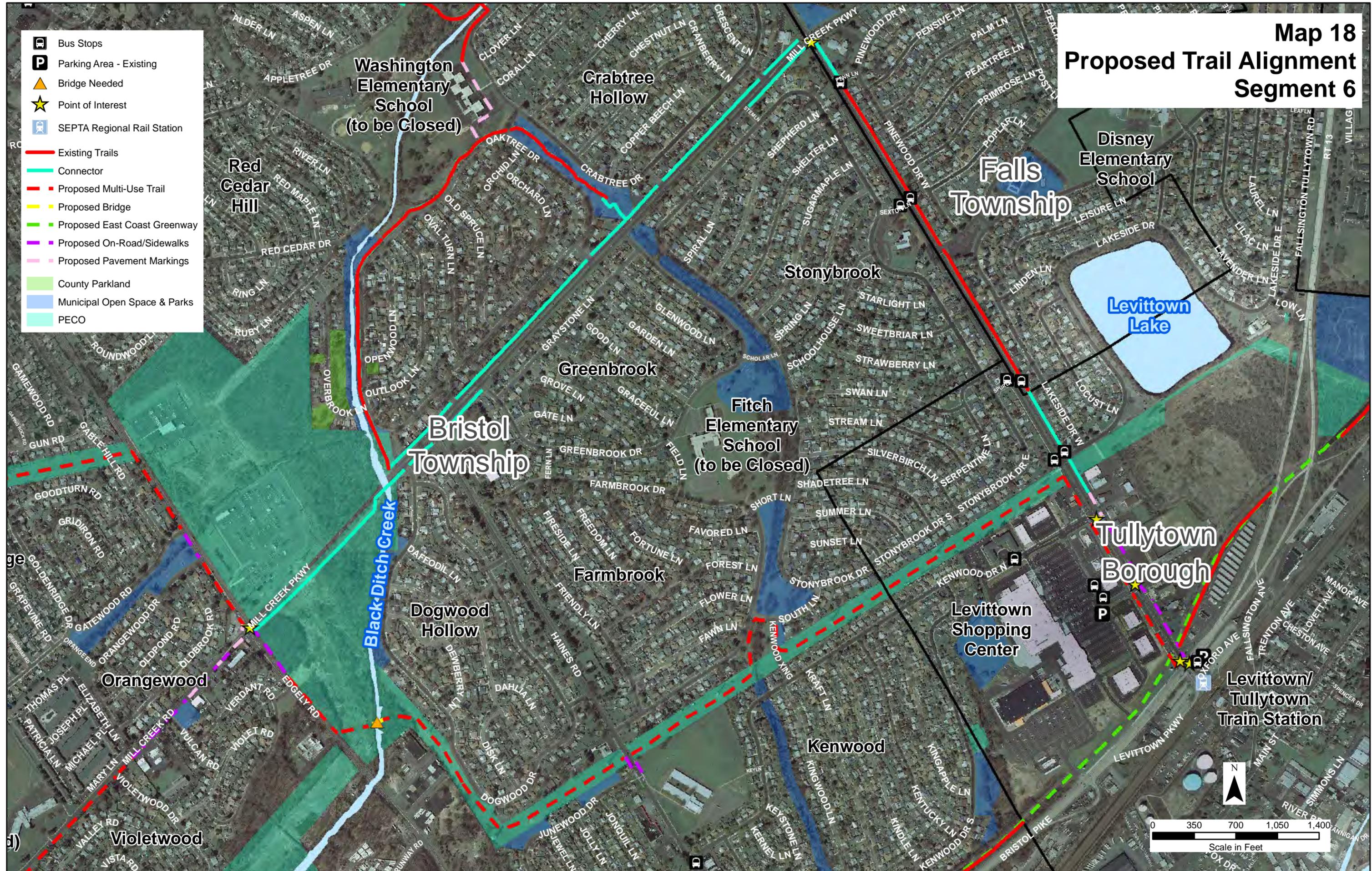
Upon entering the PECO property, the trail would turn easterly and become a boardwalk due to the wetlands present in this area. The boardwalk would extend for approximately 275 feet before crossing a new bridge to be constructed over Black Ditch Creek. After crossing the creek, the boardwalk trail would continue for an additional 275 feet to the point at which the trail would turn south, remaining in the PECO owned corridor, behind the houses located along Dogwood Drive. The trail would continue south, paralleling Dogwood Drive for approximately 1,200 feet before turning east to stay within the PECO corridor.



Black Ditch Creek crossing within PECO corridor

Map 18 Proposed Trail Alignment Segment 6

-  Bus Stops
-  Parking Area - Existing
-  Bridge Needed
-  Point of Interest
-  SEPTA Regional Rail Station
-  Existing Trails
-  Connector
-  Proposed Multi-Use Trail
-  Proposed Bridge
-  Proposed East Coast Greenway
-  Proposed On-Road/Sidewalks
-  Proposed Pavement Markings
-  County Parkland
-  Municipal Open Space & Parks
-  PECO





PECO corridor along Dogwood Drive



PECO corridor at Haines Road

After turning east, the trail would stay in the PECO corridor for approximately 1,200 feet to Haines Road. To take advantage of the existing crosswalk at the intersection of Haines Road and Junewood Drive, and provide safe access to James Buchanan Elementary School, one of the schools proposed to remain open under the proposed Bristol Township School District consolidation plan, upon reaching Haines Road, the trail would turn south for approximately 200 feet to the existing crosswalk at the intersection. The trail would cross Haines Road, then turn north to return to the PECO corridor.



Crossing of Haines Road at Buchanan Elementary School



PECO corridor approaching stream near Kenwood Crossing.

Once in the PECO corridor again, the trail would continue east, behind the houses located on Farmbrook Drive to the north, for approximately 1,200 feet until reaching a small stream at which point the trail would head northeast for approximately 475 feet to the intersection of Farmbrook Drive and South Lane. The trail would continue east approximately 180 feet in the right-of-way along the south side of South Lane, and go across Kenwood Crossing. The trail would turn south and continue in the right-of-way along Kenwood Crossing for approximately 250 feet before turning east into the PECO corridor again. This diversion up to South Lane and Kenwood Crossing would allow the trail to make use of the existing bridge crossing over the stream, thereby saving the costs associated with constructing a new bridge over the stream.

From Kenwood Crossing, the trail would continue in the PECO corridor running behind houses on Kenwood Drive North to the south and Stonybrook Drive to the north, for approximately 2,800 feet before reaching Levittown Parkway. At Levittown Parkway, the trail would turn south and proceed approximately 1,900 feet to the intersection of Levittown Parkway and Bristol Pike / Route 13 on a new trail that would replace the existing sidewalk along the west side of Levittown Parkway.



PECO corridor between Kenwood Crossing and Levittown Parkway

After reaching the intersection of Levittown Parkway and Bristol Pike, the trail would cross Levittown Parkway, then cross Bristol Pike to access both the Delaware & Lehigh Canal Towpath Trail as well as the Levittown / Tullytown SEPTA Regional Rail station. In addition to these connections, this segment of the trail would provide connections to the Dogwood Hollow, Farmbrook and Stonybrook neighborhoods, as well as to SEPTA Bus Routes 127 and 128 and Levittown Town Center. The parking lots at both the SEPTA train station and Levittown Town Center shopping center would serve as trailheads and provide ample parking.

As most of this trail segment is within the PECO corridor, an easement would need to be obtained to allow for development of the trail.



Levittown Town Center



Levittown Parkway looking south from PECO corridor

Connector Trails

To provide connectivity to the primary trail system to the neighborhoods located north of Mill Creek Parkway, and to the east of Levittown Parkway, as well as provide a loop system of trails, two separate connector trails are proposed, one along Levittown Parkway and one along Mill Creek Parkway. These connector trails would enable residents in these neighborhoods to connect more easily to the primary trail system without having to go out of their way. Additionally, these connector trails would provide a safe off-road connection to the Levittown Town Center shopping center, SEPTA Levittown Regional Rail station, and to the Delaware & Lehigh Canal towpath trail.

Levittown Parkway - Levittown Town Center to Mill Creek Parkway - 0.9 miles

The Levittown Parkway Connector Trail already exists to a great extent within the right-of-way along the east side of Levittown Parkway. Crossing Levittown Parkway at the traffic signal at Levittown Center, the initial section of the connector trail is located within Tullytown Borough and would extend 1,200 feet northwest in the right-of-way along the east side of Levittown Parkway from Beer-A-Rama to the border of Tullytown Borough and Bristol Township. There is already an existing sidewalk along most of this stretch that would be replaced with a 10-foot wide trail. At the border of Tullytown Borough and Bristol Township, an existing six-foot wide asphalt trail begins and extends approximately 3,100 feet to the northwest to Penn Lane. As with the sidewalk section in Tullytown Borough, the existing trail would be widened to 10 feet. After Penn Lane, a new trail approximately 375 feet would be constructed in the right-of-way in front of St. Paul's Episcopal Church, to extend the trail to the intersection with Mill Creek Parkway where the proposed Mill Creek Parkway connector trail would begin.

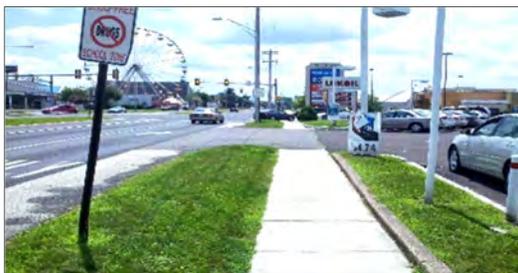
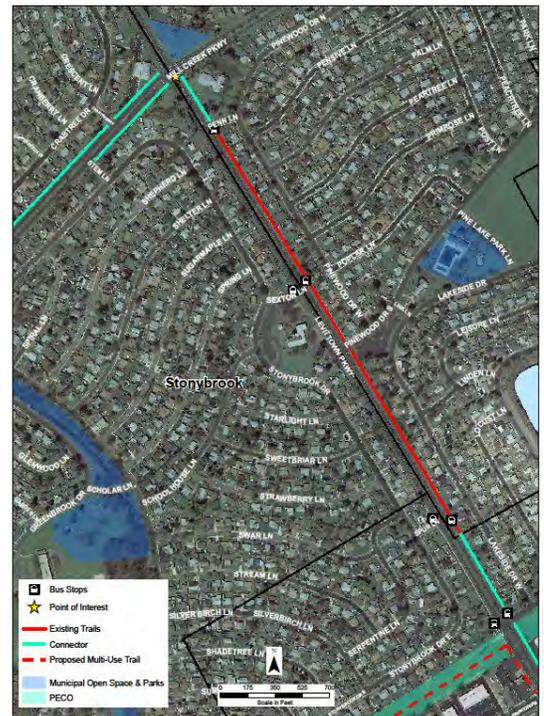


SEPTA Levittown Train Station



Connection to Delaware Canal State

Map 19 –Levittown Parkway Connector Trail



Crossing Levittown Parkway at entrance to Levittown Town Center opposite Beer-A-Rama



Existing trail in right-of-way along east side of Levittown Parkway

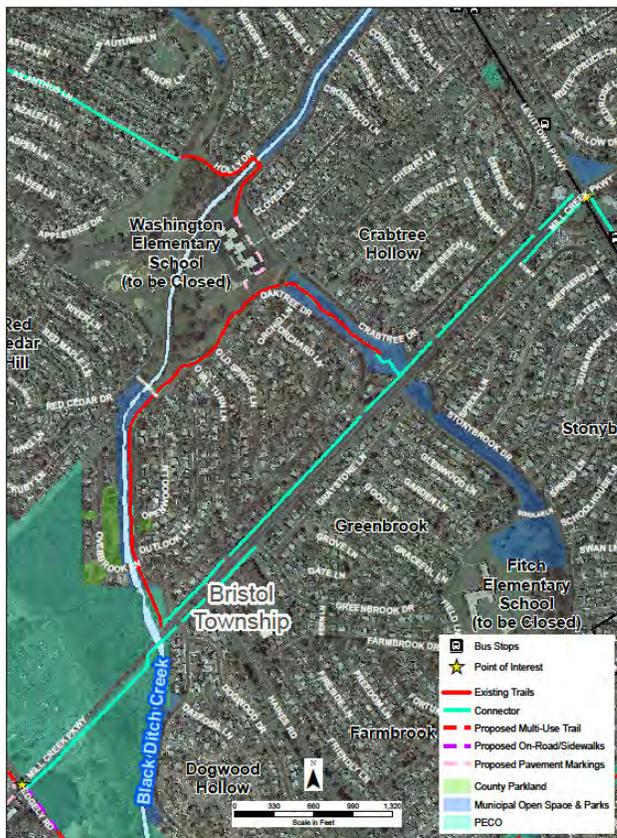


Area for trail across St. Paul's Episcopal Church property at intersection of Levittown Parkway and Mill Creek Parkway

Mill Creek Parkway - Edgely Road to Levittown Parkway - 1.6 miles

The Mill Creek Parkway Connector Trail would extend from the intersection of Mill Creek Parkway and Edgely Road to the intersection of Mill Creek Parkway and Levittown Parkway. Beginning at the intersection of Mill Creek Parkway and Edgely Road, the trail would initially consist of the sidewalk along Mill Creek Parkway in front of the Bottom Dollar Foods. After approximately 400 feet the sidewalk ends and a new 10 foot wide trail would be constructed within a powerline corridor located on PECO property extending approximately 1,450 feet northeasterly to Dogwood Drive. Although the initial section of this connector trail would be constructed on PECO property, as the trail approaches Black Ditch Creek, the trail would transition into the right-of-way along the south side of Mill Creek Parkway to take advantage of the existing bridge over Black Ditch Creek.

Map 20 – Mill Creek Parkway Connector Trail



PECO corridor along Mill Creek Parkway between Bottom Dollar Foods and Dogwood Drive



Sidewalk along south side of Mill Creek Parkway in front of Bottom Dollar Foods

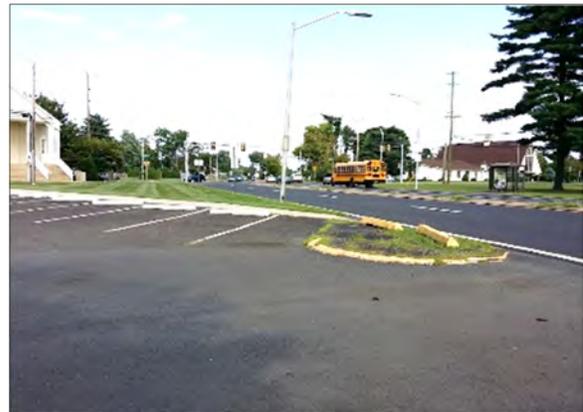
From Dogwood Drive, the trail would continue in the right-of-way along Mill Creek Parkway, replacing the existing sidewalk, to the signalized intersection with Haines Road where the trail would cross Mill Creek Parkway. To provide connectivity to the Greenbrook neighborhood, the trail would extend approximately 500 feet past the intersection with Haines Road to Greenbrook Drive. The trail along the south side of Mill Creek Parkway ends at Greenbrook Drive, as a trail along the north side is planned making two trails unnecessary. The trail would resume for approximately 675 feet along the south side of Mill Creek Parkway between Stream Lane and Levittown Parkway in order to enable residents of the Stonybrook neighborhood to access the connector trail system.

Returning to the trail crossing at Haines Road and Mill Creek Parkway, the trail would head southwesterly approximately 500 feet to connect to the existing trail along Black Ditch Creek that runs behind the homes located along Oaktree Drive in the Oak Tree Hollow neighborhood. This trail is part of the New Falls Road to Mill Creek Parkway connector trail mentioned as part of Segment 3. In addition to extending southwesterly along the right-of-way of Mill Creek Parkway, the trail would also extend northeasterly for approximately 4,400 feet to the intersection of Mill Creek Parkway and Levittown Parkway where it would connect with the Levittown Parkway connector trail. Along this trail, approximately 400 feet past its intersection with Oaktree Turn, this trail connects with the other end of the existing trail surrounding the Oak Tree Hollow neighborhood.

As the trail approaches the First Ukrainian Evangelical Baptist Church located at the northwest corner of the intersection, an easement may be needed. It is unclear as to whether the first few parking spaces closest to Mill Creek Parkway are in the right-of-way of Mill Creek Parkway, or are on property owned by the church.



Intersection of Mill Creek Parkway and Haines Road



Parking lot at First Ukrainian Evangelical Baptist Church at intersection of Mill Creek Parkway and Levittown Parkway



Right-of-way along north side of Mill Creek Parkway west of Oaktree Drive showing connection to existing trail

**SEGMENT 7: BRISTOL OXFORD VALLEY ROAD AND MILL CREEK ROAD INTERSECTION
TO SILVER LAKE NATURE CENTER - 1.2 MILES**

This was one of the more difficult segments for which to identify a feasible alignment due to the presence of the Pennsylvania Turnpike which separates the northern trail segments from the southern trail segments leading down to Bristol Marsh and the Delaware River. The difficulty involved identifying a way to traverse the Pennsylvania Turnpike that offered the safest experience for trail users, while minimizing the cost. Five possible options for traversing the Pennsylvania Turnpike were evaluated and considered:

- Option 1 - Going under the Pennsylvania Turnpike at Veterans Highway (Route 413)
- Option 2 - Placing the trail along the shoulder of the road on the recently reconstructed Bristol Oxford Valley Road bridge
- Option 3 - Cantilevering the trail off of the Bristol Oxford Valley Road bridge
- Option 4 - Constructing a separate dedicated bridge for the trail
- Option 5 - Going under the Pennsylvania Turnpike along Mill Creek

Option 1 was ruled out due to the primary trail alignment not being in this area. Although the trail proposed out of Frosty Hollow Park approaches the intersection of Route 413 and New Falls Road, the Route 413 corridor south of New Falls Road was not an option for the primary trail alignment due to narrow shoulders, the lack of space in the right-of-way to accommodate a sidewalk or trail, high traffic volumes, and a large number of curb cuts with vehicles entering and exiting parking lots. Even if Route 413 south of New Falls Road had been acceptable as the primary trail route, the current passage along Route 413 under the Pennsylvania Turnpike is narrow and could not accommodate a sidewalk. Although the underpass is to be widened associated with the new bridge to be built over Route 413 as part of the Interstate 95 / Pennsylvania Turnpike interchange project, the primary reason Option 1 was ruled out was due to the alignment of the primary trail not being feasible in this area.



Right-of-way along Bristol Oxford Valley Road in front of Rosenberger's Dairies



PECO access road (left) leading down from Bristol Oxford Valley Road (right)

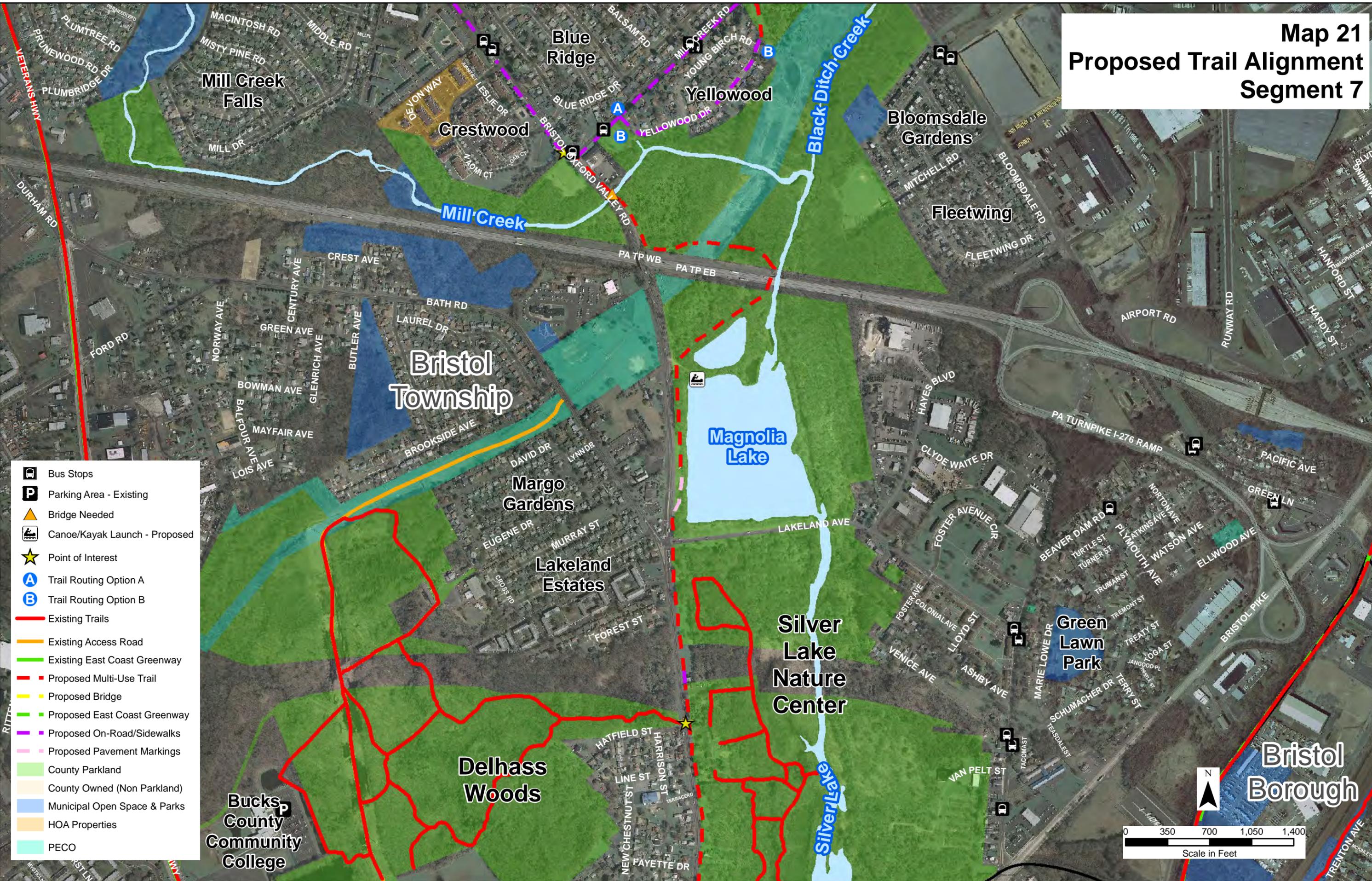


Entrance into parking area off Bristol Oxford Valley Road opposite Bristol Township municipal complex

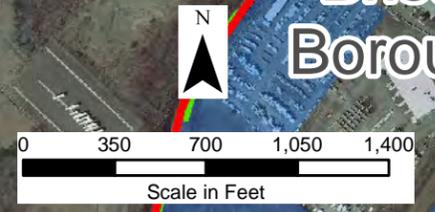


Area for trail between Bristol Oxford Valley Road to the west at top of slope and Magnolia Lake to the east

Map 21 Proposed Trail Alignment Segment 7



- Bus Stops
- Parking Area - Existing
- Bridge Needed
- Canoe/Kayak Launch - Proposed
- Point of Interest
- Trail Routing Option A
- Trail Routing Option B
- Existing Trails
- Existing Access Road
- Existing East Coast Greenway
- Proposed Multi-Use Trail
- Proposed Bridge
- Proposed East Coast Greenway
- Proposed On-Road/Sidewalks
- Proposed Pavement Markings
- County Parkland
- County Owned (Non Parkland)
- Municipal Open Space & Parks
- HOA Properties
- PECO





*Existing Bristol Oxford Valley Road bridge over Mill Creek.
Trail bridge to be constructed to the left and at a lower*



Shoreline of Magnolia Lake

Option 2 would have realigned the lane configuration on the recently constructed Bristol Oxford Valley Road bridge over the Pennsylvania Turnpike. However, this option was determined to not be feasible due to two concerns. First, the realignment of the lanes would have required providing an adequate safety barrier to separate the trail from the travel lanes on the bridge which would have added additional weight to the bridge. Although a detailed structural analysis of the bridge was not within the scope of this study, the bridge design may not have been able to support this additional weight. Similarly, in another design element relative to the bridge, the realignment of the lanes might have required regrading the bridge to allow for adequate stormwater runoff. Typically roads, including those on bridges, are designed with a crown in the middle and a slight slope to the shoulders to help shed water from the travel lanes. Realignment of the travel lanes on the bridge to allow for a trail along either of the shoulders, would have altered this pattern of runoff and necessitated regrading of the lanes.

Options 3 and 4 are similar in nature but were both ruled out based on discussions with representatives from the Pennsylvania Turnpike Commission and the Pennsylvania Department of Transportation who indicate that these would not have received approval. In addition, both of these options would have been extremely cost prohibitive.



Intersection of Lakeland Avenue and Bath Road

Option 5, the only feasible option, would take advantage of the rebuilding of the Pennsylvania Turnpike bridge over Mill Creek which was already planned as part of improvements to the Pennsylvania Turnpike. The new bridge is designed to be a single-span bridge with no intervening supports under the bridge. In previous discussions between Bucks County and the Pennsylvania Turnpike Commission, staff from Silver Lake Nature Center stressed the need to maintain a passage under the Pennsylvania Turnpike as this corridor serves as a wildlife migration corridor. This concern was taken into account in the design of the new bridge.

The alignment for Segment 7 begins at the southeast corner of the intersection of Bristol Oxford Valley Road and Mill Creek Road and is based upon Option 5 being the only feasible option. From this point in front of Rosenberger's Dairies, the trail would extend approximately 400 feet south in the right-of-way along the east side of Bristol Oxford Valley Road in front of Rosenberger's Dairies before crossing a new bridge built solely for the trail over Mill Creek.

After crossing the new bridge over Mill Creek, the trail would enter Black Ditch Park owned by Bucks County. The trail would remain close to the base of the embankment supporting the PECO access road leading down from Bristol Oxford Valley Road. Approximately 450 feet after crossing Mill Creek, the trail would connect with the existing access road as the trail approaches the Pennsylvania Turnpike. From this point, the trail and access road combine and would head east parallel to the Pennsylvania Turnpike to the south and Mill Creek to the north for approximately 1,100 feet before reaching Mill Creek south of its confluence with Black Ditch Creek. Although most of this section is on County-owned land within Black Ditch Park, it would cross the PECO powerline corridor which would require an easement. Given the wet soil conditions in this area, certain portions of the trail would need to take the form of a boardwalk. To minimize the extent to which the trail would be located in the wetland area, the trail would be placed as close as possible to the Pennsylvania Turnpike and away from Mill Creek.



PECO access road exiting from County-owned property into PECO powerline corridor just north of the Pennsylvania Turnpike



Current Mill Creek underpass under Pennsylvania Turnpike



Existing buildings close to road along east side of Bath Road north of Silver Lake Nature

Upon reaching Mill Creek, the trail would turn south and proceed under the Pennsylvania Turnpike for approximately 250 feet before reaching the wooded area just north of Magnolia Lake on County-owned land as part of Silver Lake Park. Given the wet conditions in this area and repeated flooding, this segment of the trail would be an elevated boardwalk which may not always be accessible following heavy storms.



Wooded area near Magnolia Lake illustrating need for a boardwalk trail along this section

The trail would then head southwest for approximately 950 feet toward Bristol Oxford Valley Road, running parallel to the northwest shoreline of the small pond located to the northwest of Magnolia Lake. This trail would be an elevated boardwalk due to the very wet soil conditions in this area.

Upon reaching Bristol Oxford Valley Road, opposite the entrance to the Bristol Township municipal complex, there is an existing parking area that would serve as a trailhead. Given the proximity of the parking area to Magnolia Lake, a canoe / kayak launch is could be constructed on Magnolia Lake. The primary trail would then continue for approximately 1,400 feet, primarily on County-owned land within Silver Lake Park to the intersection of Lakeland Avenue, Bath Road and Bristol Oxford Valley Road. As the trail approaches the intersection, it would need to be routed into the right-of-way along the east side of Bristol Oxford Valley Road due to the presence of a drainage channel at the intersection.



Silver Lake Nature Center

After crossing Lakeland Avenue, the trail would continue on County parkland, running parallel to Bath Road, for approximately 1,600 feet before reaching Silver Lake Nature Center which would serve as a trailhead location, the end of Segment 7, and the beginning of Segment 8. Just north of the nature center, the trail would need to be routed into the right-of-way along the east side of Bath Road for approximately 125 feet due to the presence of two buildings very close to Bath Road. Although the County owns one of these properties, the other is owned by a private landowner whose property extends back into the wooded area bordering Silver Lake property. Because of the depth of this private lot, and to discourage bicyclists from using the nature trails within the Silver Lake Nature Center, the alignment would remain close to Bath Road.



Existing parking area for Magnolia Lake off of Bristol Oxford Valley Road just north of its intersection with Lakeland Avenue

The nature center, which is on the east side of Bath Road, is just south of the intersection of Hatfield Street and Bath Road on the west side of Bath Road. At the Hatfield Street intersection is an existing entry into the nature trail system as part of Delhaas Woods which would serve as a connection to Bucks County Community College for pedestrians. Given the numerous rare plant species found both in Delhaas Woods and in the area surrounding Silver Lake Nature Center, the use of the existing nature trails in these areas is intended to be limited to pedestrians.



Entrance to Hatfield Street and connection to hiking trail through Delhaas Woods to Bucks County Community College

SEGMENT 8: SILVER LAKE NATURE CENTER TO BRISTOL PIKE - 0.9 MILES

Segment 8 of the trail is one of the shortest segments of the trail and is also partially developed already. The trail would begin at Silver Lake Nature Center with a continuation of the trail on County-owned land running parallel to Bath Road. The trail would extend approximately 1,700 feet south before joining up with the existing multi-use trail network with the County-owned Silver Lake Park.



Bridge over Otter Creek on Bath Road

Upon joining with the existing multi-use trail, the trail would continue approximately 2,300 feet to the dam located at the southern end of Silver Lake. Water flowing over the dam flows into Mill Creek, which is actually Otter Creek below the dam. Although the existing bridge on Bath Road over Mill / Otter Creek contains a sidewalk which is wide enough to accommodate pedestrian foot traffic, it is not wide enough to accommodate both pedestrians and bicyclists. As traffic on Bath Road is heavy in this area associated with vehicles turning off of Route 13, the construction of a new trail-dedicated bridge is recommended.



Existing Trail in Silver Lake Park



Bath Road approaching Bristol Pike (Route 13 Intersection)

After crossing over Otter Creek, the trail would continue to the northeast corner of the intersection of Bath Road and Bristol Pike / Route 13 via a new trail to be constructed replacing the existing sidewalk along the east side of Bath Road. This is the end point for Segment 8 of the trail and the beginning point for Segment 9.

Bucks County Community College Connector Trail (1.0 mile)

Providing connections to schools of all types is one of the stated objectives of this trail study. It was important to identify a bicycle-friendly connection to the Bucks County Community College. The challenge of providing a bicycle-friendly connection to the community college was complicated by the desire to protect the foliage and plant communities in Delhaas Woods from bicycle traffic. To accomplish this, a connector trail route was identified for bicyclists that would initially branch off of the existing trail in Silver Lake County Park near the intersection of Bath Road and Old Orchard Lane.

Upon reaching Bath Road across from Old Orchard Lane, approximately 300 feet north of the small shopping center on the east side of Bath Road, a trail crossing with a rectangular rapid flash beacon would be installed to allow bicyclists to cross Bath Road. This crossing location was identified as having good sight visibility in both directions along Bath Road for cyclists and pedestrians looking to cross Bath Road. Old Orchard Lane is the only street in the Bath Addition neighborhood with a partially completed sidewalk network that would help provide a safe route for pedestrians. The possibility of making this a fully signalized intersection could be explored as Old Orchard Lane serves as a secondary entrance into Lower Bucks Hospital. This would require a thorough traffic study of the intersection.

After crossing Bath Road onto Old Orchard Lane, pedestrians would use the sidewalks along the north side of Old Orchard Lane while bicyclists would be directed on-road along Old Orchard Lane. Appropriate bike sharrow markings and signage would be provided to alert motorists to their presence in the roadway. The section of the trail along Old Orchard Lane from Bath Road to its terminating point at Fayette Drive is approximately 1,700 feet. Upon



Intersection of Bath Road and Old Orchard Lane



Entrance to PECO service road running behind homes in Winder Village



Existing service road in PECO corridor between Delhaas Woods and Bucks County Community College

reaching Fayette Drive, the trail would turn left and continue in the form of a sidewalk / on-road trail for approximately 500 feet before reaching the service road entrance on the right-hand side of Fayette Drive at the entrance to the Winder Village neighborhood. The trail would then make use of the service road under the powerlines running behind the houses located along Winder Drive. Privacy concerns for these houses would need to be addressed via fencing and landscaping. The trail would follow the existing service road for approximately 1,900 feet before turning west into the woods just north of the pond located on County-owned property behind the Bucks County Office Center on Veterans Highway / Route 413 where there is already a footpath extending for approximately 450 feet to the parking area for the Lower Bucks campus of Bucks County Community College.

SEGMENT 9: BRISTOL PIKE TO BRISTOL MARSH - 0.8 MILES

The final segment of the Mill-Queen Anne-Black Ditch Creek Trail, Segment 9, would begin at the northeast corner of the intersection of Bath Road and Bristol Pike / Route 13. From this point, the trail would cross Bristol Pike / Route 13 utilizing the existing crosswalk in front of the Golden Eagle Diner. The trail would then turn southeast and cross Bath Street utilizing the existing crosswalk between the Golden Eagle Diner and the Lukoil gas station.

The trail would then turn south along Bath Street for approximately 1,900 feet to the intersection of Bath Street, Otter Street and Mill Street. This section of the trail along Bath Street would make use of the existing sidewalks along the west side of Bath Street for pedestrians with bicyclists sharing the road with motorists. Bike sharrows and signage would be provided. SEPTA Bus Routes 128 and 129 run along Bath Street providing a connection to public transportation.



Bath Street and Route 13 Intersection along the side of the Golden Eagle Diner opposite the Lukoil gas station

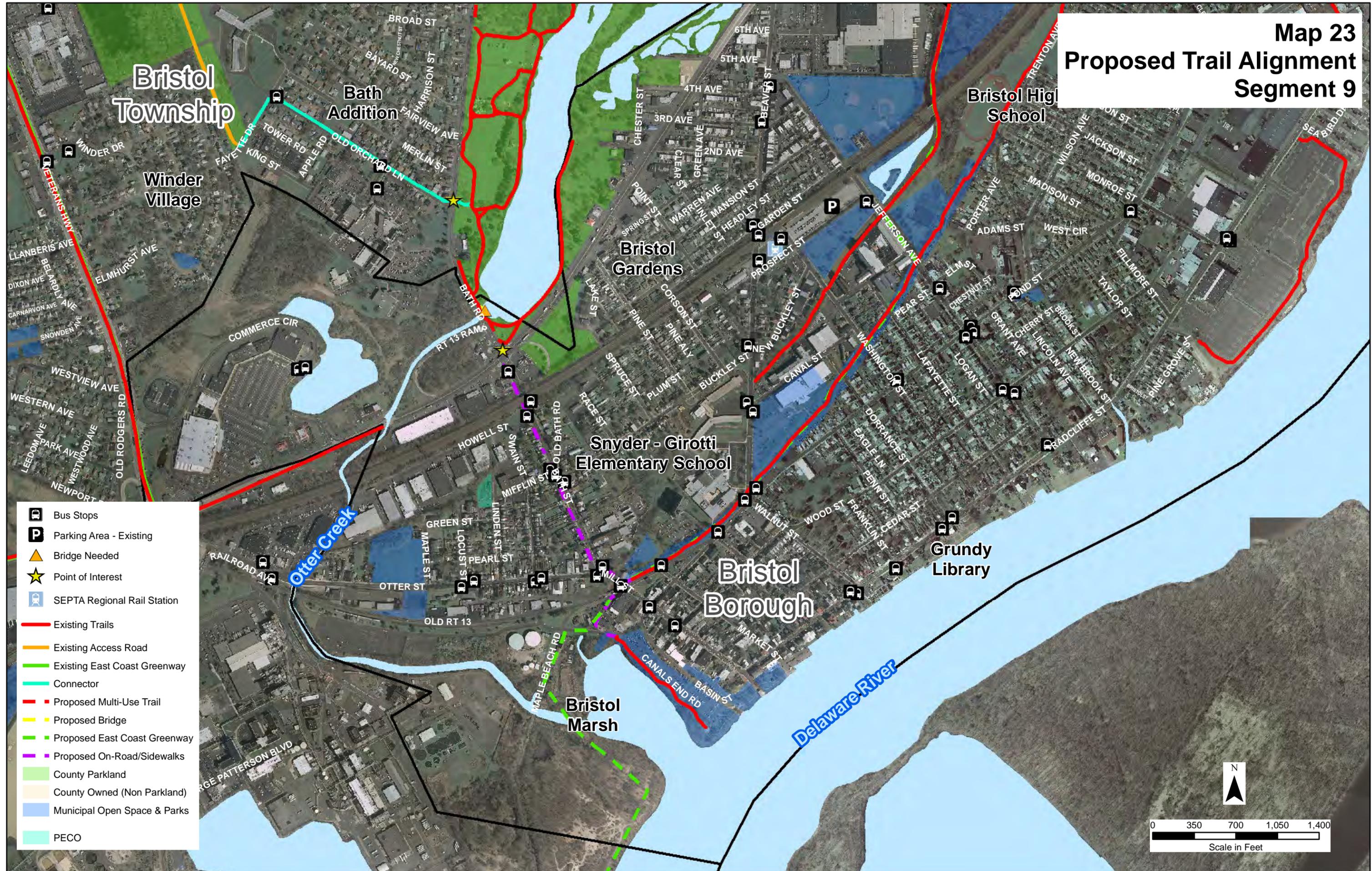


Intersection of Bath Street and Mill Street

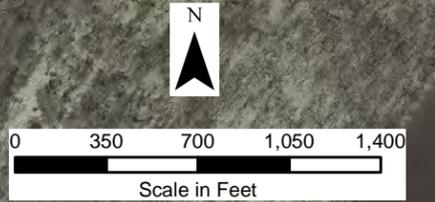


Bath Street headed south towards Bristol Borough

Map 23 Proposed Trail Alignment Segment 9



-  Bus Stops
-  Parking Area - Existing
-  Bridge Needed
-  Point of Interest
-  SEPTA Regional Rail Station
-  Existing Trails
-  Existing Access Road
-  Existing East Coast Greenway
-  Connector
-  Proposed Multi-Use Trail
-  Proposed Bridge
-  Proposed East Coast Greenway
-  Proposed On-Road/Sidewalks
-  County Parkland
-  County Owned (Non Parkland)
-  Municipal Open Space & Parks
-  PECO





Mill Street, Bristol Borough



Connection to Bristol Spurline Trail

Upon reaching the intersection of Mill Street / Otter Street, the trail would continue to consist of sidewalks and on-road facilities for bicyclists. The trail would head southeast along Mill Street for approximately 225 feet to its intersection with Old Route 13. At this intersection the trail would connect to the 2.5 mile Bristol Spurline trail, which serves as part of the East Coast Greenway. The Bristol Spurline Trail provides connections to the SEPTA Regional Rail Station in Bristol Borough, The Delaware & Lehigh Canal Towpath Trail, as well as the numerous historic and cultural sites as mentioned in the Existing Conditions section of this study.



Bristol Marsh



Delaware Canal Trail running along Canal's End Road

From the intersection of Mill Street and Old Route 13, the trail would cross Old Route 13, then cross Mill Street to follow the existing brick path trail running to the north side of Canal's End Plaza. This trail delineates the former alignment of the canal towpath. The trail would continue through the parking lot of Canal's End Plaza and cross Canals End Road at the currently existing crosswalk. From here, the trail would connect to the already existing Delaware Canal Trail running between Bristol Marsh to the west and Canals End Road to the east. There is a large parking lot in this area which would provide trailhead parking. Canoeists and kayakers would be able to access the Delaware River from this location.



Delaware Canal Trail through parking lot at Canal's End Plaza

This parking lot also provides parking for the adjacent shopping area along Mill Street in Bristol Borough. This shopping district can also be accessed by continuing on Mill Street south from its intersection with Old Route 13 at the connection to the Bristol Spurline Trail.

PROPOSED EASEMENTS

Although much of the trail alignment is on publically owned lands, easements for trail construction and maintenance would be needed. PECO is the major landowner with whom easements must be negotiated. Acquisition of easements would also be needed from several private owners, particularly in Segment 5. In addition to easements, agreements would need to be acquired from the Pennsylvania Department of Transportation for trails crossing and/or in the right-of-way along state-owned roadways.

OPINION OF PROBABLE COSTS

Acquisition Costs

Most of the proposed trail alignment is already in public ownership. For these sections, the investment in land acquisition has already been made. However, additional easements would be required to complete the trail. For cost estimating purposes a figure of \$1.60 per square foot was used. This is based on other trail projects in the region. However, these costs may vary based on a variety of factors including the final number of square feet in the easement; survey costs; fair market value; and tax appraisals. Based on the \$1.60 per square-foot estimate and the estimated length and width of easements required for the preferred trail alignment, these costs are estimated to be \$543,840 (Table 8, Column 3).

Design and Engineering Fees

Prior to actual construction, final design and engineering would be required. Based on other trail planning projects, these costs are typically estimated to be 15 percent of the construction costs. For the Mill-Queen Anne-Black Ditch Creeks Trail the design and engineering fees are estimated to be \$1,449,800 (Table 8, Column 4).

Construction Costs

Opinion of Probable Costs by Segment appears in Appendix B and is summarized in Table 7 below. These budgetary costs are based on an analysis of trail characteristics across each segment of trail. Costs are derived from Pennoni Associates' experience with trails of similar characteristics and are based on current material and labor costs as of the publication of this study. Costs may increase or decrease over time. Additionally, it should be noted that these construction costs include contingencies for potentially higher costs once actual design and engineering drawings are complete.

Table 7 – Estimated Construction Costs by Segment

Segment	Construction Costs	Miles	Cost per Mile
1	\$ 1,150,338	1.5	\$ 766,892
2	\$ 1,203,120	1.2	\$1,002,600
3	\$ 1,026,018	1.4	\$ 732,870
4	\$ 1,262,205	1.4	\$ 901,575
5	\$ 2,841,387	4.6	\$ 617,928
6	\$ 2,026,710	2.1	\$ 965,100
7	\$ 1,260,714	1.2	\$1,050,595
8	\$ 689,010	0.9	\$ 765,567
9	\$ 138,900	0.8	\$ 173,625
Total	\$11,598,402	15.1	\$ 768,106

Note: Costs cited are exclusive of alternative routes and connector trails and reflect only those costs associated with the primary trail.

Maintenance Costs

Maintenance costs for similar trails in the region generally range from \$6,000 to \$9,000 per mile/per year. It is recommended that the entities responsible for trail maintenance use a figure of \$7,500 per mile to estimate maintenance costs during the first year after development. This figure can then be evaluated and adjusted at the end of the first year. This cost can be used for fundraising purposes as well to help solicit volunteer help for maintenance. Based on the approximately 15.1 miles of the proposed trail route, total annual maintenance costs are estimated to be \$113,250. Table 8 summarizes the various costs by segment.

Table 8 – Costs by Trail Segment

Segment	Miles	Acquisition	Design and Engineering	Construction (Primary Trail Route)	Total	Annual Maintenance
1	1.5	\$ 6,080	\$ 143,792	\$ 1,150,338	\$ 1,300,210	\$ 11,250
2	1.2	\$ 66,880	\$ 150,390	\$ 1,203,120	\$ 1,420,390	\$ 9,000
3	1.4	\$ 24,960	\$ 128,252	\$ 1,026,018	\$ 1,179,230	\$ 10,500
4	1.4	\$ 19,360	\$ 157,776	\$ 1,262,205	\$ 1,439,341	\$ 10,500
5	4.6	\$187,040	\$ 355,173	\$ 2,841,387	\$ 3,383,600	\$ 34,500
6	2.1	\$229,920	\$ 253,339	\$ 2,026,710	\$ 2,509,969	\$ 15,750
7	1.2	\$ 9,600	\$ 157,589	\$ 1,260,714	\$ 1,427,903	\$ 9,000
8	0.9	-	\$ 86,126	\$ 689,010	\$ 775,136	\$ 6,750
9	0.8	-	\$ 17,363	\$ 138,900	\$ 156,263	\$ 6,000
Total	15.1	\$543,840	\$1,449,800	\$11,598,402	\$13,592,042	\$113,250

Connector Trails

The costs associated with construction of the various connector trails have been broken out separately. Although these trails are highly desirable based on the additional interconnectivity they would provide, they are not part of the primary trail.

Table 9 – Connector Trail Costs

Description	Length (Miles)	Acquisition	Design and Engineering	Construction	Total
Frosty Hollow Park to Route 413	1.2	-	\$107,205	\$857,640	\$ 964,845
Bucks County Community College to Silver Lake Park	1.8	-	\$ 38,805	\$310,440	\$ 349,245
Wistar Rd - Armstrong Middle School to New Falls Road	0.5	\$ 8,160	\$ 16,114	\$128,910	\$ 153,184
Mill Creek Parkway	1.6	\$ 57,720	\$110,588	\$884,700	\$1,053,008
New Falls Road to Mill Creek Parkway	1.8	\$ 36,800	\$ 16,702	\$133,620	\$ 187,122
Levittown Parkway - Mill Creek Parkway to Levittown Town Center	0.9	-	\$ 97,980	\$783,840	\$ 881,820
Total Connector Trails	7.8	\$102,680	\$387,394	\$3,099,150	\$3,589,224

IMPLEMENTATION STRATEGIES

RECOMMENDED CONSTRUCTION PHASING

Development of the entire Mill-Queen Anne-Black Ditch Creeks Trail in a single phase, while highly desirable, is unlikely given the easements and permitting required, as well as the substantial costs. Therefore, a phased development approach is recommended. In developing the recommended phasing plan for trail development, the following factors were taken into account:

- The status of current trail development efforts.
- The ability of each segment to serve as a stand-alone trail, i.e. the segment would receive significant usage, even if construction of the remaining segments is delayed.
- The connectivity of the segment to existing trails, adjacent neighborhoods and public transportation in the project area.
- Ownership and the need to acquire easements.
- Costs associated with construction and the acquisition of easements.
- Environmental constraints such as the presence of steep slopes and wetlands.

Each trail segment was evaluated on each of these criteria and rated as a 0, 5, or 10 in each of the categories and then a total score was calculated. These scores were then used to help determine the trail segment priorities. In reviewing the ratings, it is important to look at the rating/scoring scale for each factor individually. For example, construction costs are evaluated on an inverse scale with those segments having a high estimated construction cost receiving a lower rating. In contrast, connectivity was scored based on segments with a high degree of connectivity receiving higher scores. It should also be noted that connector trails are not included in the phasing schedule. Although connector trails are designed to connect nearby residential areas to the primary trail, they are of lesser importance than the development of the primary trail itself. However, in recognition of cost efficiencies, if funding is available, it is recommended that connector trails be constructed at the same time as the primary trail. The results of the evaluation are shown in Table 10.

Table 10 – Trail Segment Feasibility Evaluation Matrix

Segment	Status of Current Trail Development	Ability to act as a stand-alone trail	Connectivity to other trails, adjacent neighborhoods and public transportation	Extent of public ownership/ minimal need for easements	Costs including easements and construction *	Environmental constraints (Presence of steep slopes, wetlands and sensitive environmental areas)	Total Score (Higher scores reflect a higher degree of feasibility)	Recommended Phasing
	High = 10 Average = 5 Low = 0	High = 10 Average = 5 Low = 0	High = 10 Average = 5 Low = 0	High = 10 Average = 5 Low = 0	High = 0 Average = 5 Low = 10	High = 0 Average = 5 Low = 10		
1 Mill Creek - Veterans Memorial Park to Frosty Hollow Road	0	5	5	10	5	5	30	6
2 Mill Creek - Frosty Hollow Road to New Falls Road & Bristol Oxford Valley Road intersection	0	5	10	5	5	5	30	5
3 Queen Anne Creek - Oxford Valley Park to Woodbourne Road	5	5	10	10	5	10	45	3
4 Queen Anne Creek - Woodbourne Road to New Falls Road & Bristol Oxford Valley Road Intersection	0	10	10	10	0	5	35	4
5 New Falls Road & Bristol Oxford Valley Road Intersection to Mill Creek Road and Edgely Road Intersection	0	5	5	0	0	10	20	8
6 Mill Creek Road and Edgely Road Intersection to Levittown Parkway and Bristol Pike Intersection	0	5	10	0	0	5	20	9
7 Bristol Oxford Valley Road and Mill Creek Road Intersection to Silver Lake Nature Center	0	5	5	10	5	0	25	7
8 Silver Lake Nature Center to Bristol Pike	10	10	10	10	5	5	50	2
9 Bristol Pike to Bristol Marsh	10	10	10	10	10	10	60	1

* - Low <\$1,000,000 / High > \$1,500,000 / Average = \$1,000,000 - \$1,500,000

Recommended construction phasing is as follows:

Phase 1 - Bristol Pike to Bristol Marsh (Segment 9) - 0.8 miles

Costs		Cost Drivers	Number Required	Length (Feet)
Acquisition Cost	-	Easements	-	-
Design & Engineering Cost	\$ 17,362.50	Bridges	-	-
Construction Cost	\$138,900.00	Boardwalk	-	-
Total Cost	\$156,262.50	Road Crossings	8	N/A

As this segment is principally a combination of existing sidewalks for pedestrians, the primary costs associated with this segment of trail are the placement of bicycle sharrows along Bath Street and Mill Street leading down to the connection to the existing trail running alongside Bristol Marsh, trail signage, and upgraded intersection crossings. This segment of trail also provides connectivity to areas outside of the immediate project area based on its connections to the Delaware & Lehigh Canal Towpath Trail and the Bristol Spurline Trail.

Phase 2 - Silver Lake Nature Center to Bristol Pike (Segment 8) - 0.9 miles

Costs		Cost Drivers	Number Required	Length (Feet)
Acquisition Cost	-	Easements	-	-
Design & Engineering Cost	\$ 86,126.25	Bridges	1	120
Construction Cost	\$689,010.00	Boardwalk	-	-
Total Cost	\$775,136.25	Road Crossings	-	N/A

This segment rated high in terms of overall feasibility as much of the trail, 0.6 miles of the 0.9 miles, is pre-existing throughout Silver Lake Park. The remaining 0.3 miles of trail would be built in County-owned land making development of the trail less costly. This segment of trail would build upon and connect to the initial trail segment, Segment 9, leading to Bristol Borough and Bristol Marsh. Silver Lake Nature Center would anchor this segment of the trail and provides connections to a variety of nature/hiking trails both within the park and the adjacent Delhaas Woods property.

Phase 3 - Queen Anne Creek - Oxford Valley Park to Woodbourne Road (Segment 3 - Alignment B) - 1.4 miles

Costs		Cost Drivers	Number Required	Length (Feet)
Acquisition Cost	\$ 24,960.00	Easements	3	780
Design & Engineering Cost	\$ 128,252.25	Bridges	-	-
Construction Cost	\$1,026,018.00	Boardwalk	-	-
Total Cost	\$1,179,230.25	Road Crossings	3	N/A

This segment ranks high in the phasing schedule based on a variety of factors including:

- The proposed trail would connect two County park facilities, Oxford Valley and Queen Anne. Oxford Valley Park has some existing trails located within the park and is adjacent to both residential and commercial areas. This segment of trail would provide connections to Armstrong Middle School, and via the Wistar Road connector trail, the Lower Bucks Technical Institute,

Conwell Egan Catholic High School, Levittown Library, and SEPTA Bus Routes 127 and 128, while also serving as a primary link to the other connector trails.

- Relatively lower cost since 0.4 miles of the 1.4 miles of the trail is proposed to be a combination of sidewalks and on-road bike sharrows. Another 0.4 miles of the trail within Queen Anne Park has lower estimated cost due to the ability to make partial use of an existing service road, which does require some upgrading within the park.
- Most of the trail corridor is located on land owned by either the County or municipalities, thereby minimizing the need to acquire easements.

Phase 4 - Queen Anne Creek - Woodbourne Road to New Falls Road & Bristol Oxford Valley Road Intersection (Segment 4 - Alignment B) - 1.4 miles

Costs		Cost Drivers	Number Required	Length (Feet)
Acquisition Cost	\$ 19,360.00	Easements	1	605
Design & Engineering Cost	\$ 157,775.63	Bridges	1	130
Construction Cost	\$1,262,205.00	Boardwalk	-	-
Total Cost	\$1,439,340.63	Road Crossings	-	-

This trail segment would build on the other segment of trail along the Queen Anne Creek corridor recommended for construction in Phase 3. Although most of the length of this trail segment, the 0.9 mile portion extending from Woodbourne Road south to Quest Road, is located on land owned by Middletown Township, the remaining 0.5 miles would require easements from PECO, and potentially Neshaminy School District and a church. This final 0.5 mile segment would require either replacement of the existing bridge over Queen Anne Creek at Quest Road, or the construction of a new bridge paralleling the New Falls Road bridge. There are also some environmental constraints, primarily in the form of wetlands that would need to be addressed.

Phase 5 - Mill Creek - Frosty Hollow Road to New Falls Road & Bristol Oxford Valley Road Intersection (Segment 2) - 1.2 miles

Costs		Cost Drivers	Number Required	Length (Feet)
Acquisition Cost	\$ 66,880.00	Easements	3	2,090
Design & Engineering Cost	\$ 150,390.00	Bridges	-	-
Construction Cost	\$1,203,120.00	Boardwalk	2	325
Total Cost	\$1,420,390.00	Road Crossings	2	N/A

Although Segments 1 and 2 both ranked similarly, Segment 2 is recommended as a priority over Segment 1 as it would connect to Segments 3 and 4 which are recommended for Phase 3 and 4 of construction. The higher cost for Segment 2 over Segment 1 stems from the need for boardwalk in sections and that almost half of this trail segment (0.5 miles) would require easements from PECO which would require some time to secure. Development of Segment 1 first would leave a gap in the trail system which is the reason Segment 2 is rated higher than Segment 1.

Phase 6 - Mill Creek - Veterans Memorial Park to Frosty Hollow Road (Segment 1) - 1.5 miles

Costs		Cost Drivers	Number Required	Length (Feet)
Acquisition Cost	\$ 6,080.00	Easements	1	190
Design & Engineering Cost	\$ 143,792.25	Bridges	-	-
Construction Cost	\$1,150,338.00	Boardwalk	-	-
Total Cost	\$1,300,210.25	Road Crossings	2	N/A

Although much of the land that this trail segment would traverse is on land owned by Middletown Township, the initial segment from Veterans Memorial Park to Trenton Road is proposed to be in the right-of-way of PA 413, a state-owned road. At its lower end near Frosty Hollow Road there are some environmental constraints in the form of both wetlands and steep slopes that pose a challenge. Although not far from SEPTA Bus Route 129 that runs along Durham Rd, connections to public transportation aren't as direct as some other trail segments.

Phase 7 - Bristol Oxford Valley Road and Mill Creek Road Intersection to Silver Lake Nature Center (Segment 7) - 1.2 miles

Costs		Cost Drivers	Number Required	Length (Feet)
Acquisition Cost	\$ 9,600.00	Easements	1	300
Design & Engineering Cost	\$ 157,589.25	Bridges	1	100
Construction Cost	\$1,260,714.00	Boardwalk	1	1,570
Total Cost	\$1,427,903.25	Road Crossings	2	N/A

Segment 7 ranks low in the phasing schedule due to:

- The need for an easement from PECO;
- Higher construction costs associated with the construction of a bridge over Mill Creek just south of its confluence with Black Ditch Creek, as well as the need for extensive boardwalks associated with the trail traversing some wetland areas; and
- Lack of direct connectivity to schools and residential areas.

Although it does rank low in the phasing schedule, it is a critical segment that would link together the southerly trail segments connecting Silver Lake Nature Center, Bristol Marsh and Bristol Marsh (Segments 8 & 9) to the northerly trail segments running along the Mill and Queen Anne Creek corridors (Segments 1 - 4).

Phase 8 - New Falls Road & Bristol Oxford Valley Road Intersection to Mill Creek Road and Edgely Road Intersection (Segment 5) - 4.6 miles

Costs		Cost Drivers	Number Required	Length (Feet)
Acquisition Cost	\$ 187,040.00	Easements	13	5,845
Design & Engineering Cost	\$ 355,173.38	Bridges	1	100
Construction Cost	\$2,841,387.00	Boardwalk	-	-
Total Cost	\$3,383,600.38	Road Crossings	29	N/A

This segment of the trail ranks low in the phasing schedule due to its costs. The higher costs for this segment is driven by its overall length, which at 4.7 miles, is the longest segment of the overall Mill-Queen

Anne-Black Ditch Creeks Trail. The longer length of this segment is the result of there being two routes within this segment, either of which could be developed independent of the other. The North route, 1.9 miles, is the more expensive route as it is located primarily within the PECO powerline corridor and would require numerous easements, in addition to a bridge over Queen Anne Creek. The South route, 2.8 miles, is less expensive as it primarily uses a combination of wide paved shoulders and sidewalks along Bristol Oxford Valley and Mill Creek roads. If funding is only available for one of the routes, it is recommended that the North route be developed as it is the safer route, located almost entirely within the powerline corridor.

Segment 5 North (PECO corridor) - 1.9 miles

Costs		Cost Drivers	Number Required	Length (Feet)
Acquisition Cost	\$ 163,040.00	Easements	8	5,095
Design & Engineering Cost	\$ 185,490.75	Bridges	1	100
Construction Cost	\$1,483,926.00	Boardwalk	-	-
Total Cost	\$1,832,456.75	Road Crossings	13	N/A

Segment 5 South (Bristol Oxford Valley Road to Edgely Road) - 2.8 miles

Costs		Cost Drivers	Number Required	Length (Feet)
Acquisition Cost	\$ 24,000.00	Easements	5	750
Design & Engineering Cost	\$ 169,682.63	Bridges	-	-
Construction Cost	\$1,357,461.00	Boardwalk	-	-
Total Cost	\$1,551,143.63	Road Crossings	16	N/A

Phase 9 - Mill Creek Road and Edgely Road intersection to Levittown Parkway and Bristol Pike intersection (Segment 6) - 2.1 miles

Costs		Cost Drivers	Number Required	Length (Feet)
Acquisition Cost	\$ 229,920.00	Easements	5	7,185
Design & Engineering Cost	\$ 253,338.75	Bridges	1	150
Construction Cost	\$2,026,710.00	Boardwalk	2	560
Total Cost	\$2,509,968.75	Road Crossings	4	N/A

This final segment ranks lowest in the phasing schedule due to a combination of factors:

- Trail traverses all private land, principally PECO which would result in the need to acquire easements and contributes to a higher cost
- Construction costs are also significantly higher due to the need for a bridge crossing Black Ditch Creek and boardwalk segments on both sides of the bridge due to the wet conditions.

Despite these high costs and constraints, this segment also serves an important role in the Mill-Queen Anne-Black Ditch Creeks Trail as it provides connections to the Levittown / Tullytown SEPTA Regional Rail Station, the Delaware & Lehigh Canal Towpath Trail, and the Levittown Town Center shopping center.

ORGANIZATION, MANAGEMENT AND MAINTENANCE

Proposed Agency Responsibilities / Organization

Managing the Mill-Queen Anne-Black Ditch Creeks Trail, including all activities undertaken to plan, direct, maintain, fund and advertise, would be a complex task. The proposed trail crosses five municipalities, Bristol and Tullytown boroughs and Bristol, Falls and Middletown townships, as part of the Bucks County Trail network. The complexity is further complicated by the numerous departments and advisory boards within these municipalities, and the fact that sections of the trail would be located along the right-of-way of PennDOT-owned and maintained roads, as well as with the PECO powerline corridor. Although the scenario is complex, it is not unusual as many long-distance trail systems are multi-jurisdictional, crossing municipal boundaries for broad regional use that citizens desire.

There are various models available for developing, operating and maintaining recreational trails such as municipal, County, non-profit trail groups, land trust/conservancy, as well as those established by Pennsylvania Intergovernmental Cooperation Law including municipal/regional trail authorities and commissions. Each management structure has its strengths and weaknesses depending on the capacity and willingness of the participating partners. A myriad of tasks that need to be considered when determining the most effective management structure include: project management; acquisition of land or right-of-way or easement; property management; construction funding; maintenance agreements; insurance/risk management; operations; and public relations.

One local trail management and operation structure that might serve as a model for the Mill-Queen Anne-Black Ditch Creeks Trail project is the Doylestown Community Bike and Hike System. This system is overseen by the Doylestown Community Bike and Hike Committee which was originally a collaborative project between Doylestown Township and Doylestown Borough with each municipality contributing to the development of the trail system. Jointly, these two municipalities continue to plan for, develop and maintain the Doylestown Community Bike and Hike system. Subsequently, Chalfont and New Britain Boroughs, and Buckingham, New Britain and Warrington townships also became involved with the Doylestown Community Bike and Hike Committee in terms of planning efforts and in providing collaborative support for funding applications.

Although there has been cooperation in the planning of trails as evidenced by the initial formation of the Doylestown Community Bike and Hike System, and more recently, the *Tri-Municipal Master Trail & Greenway Plan*, developed collaboratively for Chalfont and New Britain Boroughs and New Britain Township, each of the municipalities has typically operated individually and autonomously in the development, management, and maintenance of trails within their municipal borders. While that has historically been the case, there has been an increased effort to band together to enhance the competitiveness for grant funding since projects across the state that feature multi-municipal and public/private sector support often receive more favorable consideration.

A critical next step in the trail implementation process is to clarify and formalize the responsibilities for each trail segment and trail partner. Specific tasks and roles that need to be addressed include:

Development Tasks

- Securing required easements and property acquisition.
- Activities associated with the actual development of the trail including acquiring the funding and permits required, as well as the physical construction of the trail itself.

Maintenance Tasks

- Short-term maintenance requirements including the removal of debris, trash, vegetation and tree maintenance.
- Long-term maintenance requirements including resurfacing the trail, replacement of damaged trail amenities, resurfacing of trailhead parking.

The more specifics on the planning, development, and maintenance and operations of the Mill-Queen Anne-Black Ditch Creeks Trail that can be determined in advance and negotiated in advance, the more successful the development and long-term cooperation will be.

Land Acquisition

Prior to the development of any trail, it is necessary to have control of the land. Much of the Mill-Queen Anne-Black Ditch Creeks Trail would be placed on land already under the ownership of either Bucks County or the municipalities. However, as is typically the case with long, linear trail projects, there are areas, such as the PECO powerline corridors, where it would be necessary to obtain the rights to use privately-held land. Some of the options for obtaining the rights include:

Easements: This is the most often used technique for acquiring the permission needed for a trail to cross private property. This is the preferred method as it is less costly than acquiring full ownership of the land. Specific to trails, an easement modifies the deed to a property to allow the use of a portion of the property for the construction of the trail and permanent use of the trail.

Fee simple purchase: Purchasing the needed land is an alternative to easements. However, fee simple acquisition of the land can be much more costly and time consuming as compared to easement.

Lease: Similar to easements, a lease agreement can be negotiated authorizing the use of the land for construction of the trail. However, in contrast to easements, leases have a specific time frame associated with them. Although this type of arrangement would allow for construction of the trail, if a private property owner opts not to renew the lease upon its expiration, this may leave a gap in the trail network.

Trail Development

Once the rights to the land for constructing the trail have been secured, there are a myriad of activities associated with the physical construction of the trail itself. These include securing the funding needed to develop the trail, obtaining the required permits, and management of the construction process itself including overseeing the Request-for-Proposal process typically needed for vendor selection, to overseeing the construction itself. Although it would be advantageous to have one entity responsible for managing these various activities to ensure design and construction consistency, these may not always be possible or desirable.

One additional option that should be considered is to require that developers construct trails as part of the development process. Although most of the area in the Mill-Queen Anne-Black Ditch Creeks Trail project area is already developed, this option can still be utilized for redevelopment projects. Currently, only Bristol Borough and Middletown Township have ordinance provisions requiring developers to provide trails, sidewalks, or bicycle facilities as part of the development process.

Table 11 - Ordinance Provisions Relative to Trails and Bicycle Facilities

Municipality	Ordinance Section
Bristol Borough	Subdivision and Land Development - Section 22-603.1.F / 22-604.1.D
Bristol Township	None
Falls Township	None
Middletown Township	Subdivision and Land Development - Section 440-427.B
Tullytown Borough	None

Maintenance

The quality, condition, and safety of a trail are all essential to the long-term success of the trail. To ensure successful operation of the trail, and to assist in minimizing risk both to trail users and the trail operator, a maintenance plan is necessary. A well-designed and executed maintenance program would help to reduce long-term costs by extending the costs of trail components, and would help win the continued support of residents, homeowners, and businesses. Such support can also translate into potentially lower operating costs if residents feel pride in the trail and donate volunteer time to assist in its upkeep.

The frequency of the maintenance tasks to be performed would vary based on the type of trail surface, the surrounding landscape character, and the particular segment of trail. One particular area of concern relative to the Mill-Queen Anne-Black Ditch Creeks Trail is the problem of drainage and flooding that may undermine pavement structures over time. Considering these challenges in the design and engineering phase is critical to help mitigate major maintenance expenses in the future.

Important short and long-term maintenance tasks that need to be addressed in the maintenance program are shown in Table 12 below.

Table 12 – Maintenance Tasks and Recommended Schedule

Short-term	Frequency	Long-term	Frequency
Mowing of trailside areas	Minimum of 4 times per year	Seal-coating trail	Every 4 - 5 years
Pruning	Semi-annual	Resurfacing of trailhead parking areas	Every 10 - 12 years
Removal of trees and limbs	Annual unless across path	Resurfacing the trail	Every 10 - 12 years
Signage / gates / bollards / benches maintenance	As needed		
Snow-plowing if the trail is to be plowed	As needed		
Trash removal	Weekly		
Bridge inspection and maintenance	Inspection by professional engineer every two years		
Drainage structures cleaning	Annually		
Graffiti removal	As needed		
Lighting	Monthly		

The County would be responsible for short-term maintenance tasks on County-owned properties and properties on which it holds trail easements such as PECO, SEPTA and private property. For trail sections located on non-County public land, the respective governing agency would assume responsibility for short-term maintenance tasks. The specific tasks to be assumed by each party should be clearly defined in any easement or lease terms. Regardless of who assumes responsibility for the maintenance of the trail, the costs associated with these activities should be incorporated into the budgets of the responsible entity.

SECURITY, LIABILITY AND RISK MANAGEMENT

Trail projects often generate concerns about trail security and liability. These concerns may come from individual property owners, organizations, and municipal, County and state governments. These concerns range from liability concerns associated with trail users injuring themselves to a perception that trails may bring additional crime to an area.

Security

Concerns about crime are typically expressed with most new trail projects. Fortunately over time as new trails have been developed, national studies (e.g., Rails-Trails and Safe Communities, Burke-Gilman Trails Effects on Property Values and Crime) have been conducted to assess the impact the trail has had on crime along the trail corridor. These studies most often indicate that trail projects have positive effects on adjacent neighborhoods. In fact, the rate of crime on suburban trails is usually lower than the national statistics for suburban crime on nearby streets and in homes (Rails-Trails and Safe Communities, 1998). Obviously, any crime committed is undesirable regardless of location, but there is no evidence that trails induce above-average crime rates.

The potential for crime can also be addressed in the design and maintenance plan of the trail. Specific recommendations to maximize trail security are:

- Design the trail to allow for access by local law enforcement.
- Manage the trail corridor to eliminate overgrowth immediately adjacent to the trail.
- Provide security lighting and emergency phones at call boxes at trailhead locations.
- Place benches and other amenities at high activity locations with good visual surveillance.
- Create a “Trail Watch Program” involving local residents.

In general, a well-used trail is the best deterrent to crime. Crimes are less likely to be committed if there is a high risk of being seen by other trail users.

Liability

Pennsylvania, like every state in the nation, has a statute that provides a degree of immunity to landowners who make their properties available to the public for free recreational use. Pennsylvania’s Recreational Use of Land and Water Act (RULWA) limits landowners liability for personal injury or property damage if they make their land available to the public for recreation. The purpose of the law is to encourage landowners to allow hikers, fishermen, and other recreational users onto their properties by limiting the traditional duty of care that landowners owe to entrants upon their land. So long as no entrance or use fee is charged, the Act provides that landowners do not have to keep their land safe for recreational users and have no duty to warn of dangerous conditions. This immunity from liability does not protect landowners who willfully or maliciously fail to warn of dangerous conditions.

Landowners who permit or invite members of the general public onto their properties for recreational purposes, free of charge, can raise this statute as a defense if they are sued for personal injury or property damage. RULWA does not prevent landowners from being sued; it provides them with an immunity defense to claims that their *negligence* caused the plaintiff’s injury. Negligence is the failure to exercise ordinary care such as a reasonably prudent and careful person under similar circumstances would exercise.

As noted above, although RULWA immunizes landowners from negligence claims, landowners remain liable for willful or malicious failure to guard or warn recreational users of a dangerous condition of the land. To determine whether a landowner’s behavior was willful, courts will look at whether the owner had

actual knowledge of the threat and whether the danger would be obvious to entrants. Actual knowledge might be presumed if the owner were aware of prior accidents at the same spot. But if the land contained a dangerous feature that should have been obvious to recreational users, they may be considered to be put “on notice,” which generally would preclude landowner liability. For more information, visit <http://conservationtools.org/guides/show/81-Recreational-Use-of-Land-and-Water-Act#ixzz3CAm0sug0>.

Pennsylvania’s governmental immunity statutes, the Tort Claims and Sovereign Immunity Acts, shield municipalities and commonwealth agencies from claims of willful misconduct. Liability may be imposed upon these entities only for their negligent acts.

Risk Management

The Pennsylvania Recreational Use of Land and Water Act and Tort Claims and Sovereign Immunity Act may limit the liability of property owners, trail managers and government entities in the event of a personal injury lawsuit. However, to minimize the possibility of injuries on the trail, risk management strategies should be taken to provide protection in the event of a lawsuit. These include:

- Identify and, to the extent possible, remove hazardous conditions and attractive nuisances during the original construction of the trail.
- Design the trail for safety.
- Conduct public educational and informational programs relative to safe trail usage as it applies to various user groups including bicyclists, dog walkers, in-line skaters, etc.
- Use prominent signage to warn users of potentially dangerous areas such as approaching road crossings.
- Regularly inspect the trail and correct any unsafe conditions and keep written records of inspections and maintenance activities performed.
- Prominently post hours of operation and other rules and regulations, along with emergency contact information.
- Develop procedures for handling medical emergencies.

POTENTIAL FUNDING SOURCES

Finding the funding for the design and construction of trail projects can be a challenge, but following is a list of possible funding sources for this project:

Federal Funding Sources

- MAP-21 - Transportation Alternatives Program
- United States Department of the Interior - National Parks Service (NPS)
 - Rivers, Trails and Conservation Assistance (RTCA) Program
- Land and Water Conservation Fund

State Funding Sources

- Pennsylvania Department of Conservation and Natural Resources (PA DCNR)
 - Recreational Trails Program
 - Community Conservation Partnership Program
- Pennsylvania Department of Community and Economic Development (PA DCED)
 - Greenways, Trails and Recreation Program

Local Sources

- Bond Issue via voter referendum
- Taxes

Private Funding Sources

- PECO Green Region Grants Program
- William Penn Foundation
- Kodak American Greenways Awards
- American Hiking Association - National Trails Fund

A comprehensive list of funding sources is provided in Appendix C of this study.

RECOMMENDATIONS FOR FUTURE ACTION

Development of the Mill-Queen Anne Black Ditch Creeks Trail depends upon several actions, the most important being the creation of the management structure involving the citizens and many governmental and other organizations with involvement in the trail. As the trail alignment crosses seven municipalities, County-owned land, and a variety of privately-owned properties, it is critical that a structure be established and determinations made regarding who will be responsible for the various tasks needed to make this trail a reality. Table 13 summarizes future actions that are critical to the implementation process.

Table 13 – Implementation Tasks

Key Tasks	Responsible Parties
Identify and establish the sponsoring organizational structure to be used for the funding, development, operation and maintenance of the trail.	Bucks County, Friends of the Trail group, Municipalities, private land owners, Delaware Valley Regional Planning Commission, Bicycle Coalition
Preserve the Right-of-Way for the trail by securing necessary easements and making local planning commissions and municipal leadership aware of trail alignment so they can secure easements and require trail development as part of land development proposals and incorporate the trail into municipal, recreation, and land use plans.	Bucks County, Friends of the Trail group, Municipalities, Bucks County Recreation Council
Look for “Early Win” / small success projects to help move the project forward	Bucks County, Municipalities, Friends of the Trail group
Initiate fund-raising and grant writing activities to secure funding for Phase 1 design and engineering	Sponsoring Organization (TBD)
Preliminary and Final Design	Sponsoring Organization (TBD)
Construction	Sponsoring Organization (TBD)
Set up a Maintenance Program and Endowment	Sponsoring Organization (TBD)

APPENDICES

APPENDIX A

Public Participation



APPENDIX A: PUBLIC PARTICIPATION

The Mill-Queen Anne-Black Ditch Creeks Trail Feasibility Study project included several public participation activities to gather public input, opinions and ideas concerning the trail project. The Steering Committee was one element of the public participation process, described in this appendix. Public meetings were also utilized to obtain feedback and input while newspaper articles were also utilized to generate publicity about the proposed trail. Finally, the draft study was posted on the county website for public comment and a press release advertising its availability was distributed to local newspapers and municipalities.

Steering Committee

Two (2) Steering Committee meetings were held during the project to discuss ideas and issues and to review progress of the Feasibility Study. Additionally, Steering Committee members were asked to provide thoughts and comments relative to the final study itself. Steering Committee members included:

Sherri Champey	Bristol Township Recreation Coordinator
Dale Frazier	Greenbelt Overhaul Alliance Levittown (GOAL) / Bristol Township Environmental Advisory Council
Andy Hamilton	Bucks County Bicycle Advisory Task Force / East Coast Greenway
Debby Lamanna	Middletown Township - Parks & Recreation Director / President -Bucks County Recreation Council
Bob Mercer	Silver Lake Nature Center
Phil Smythe	Lower Bucks County Joint Municipal Authority
Chet Szczucki	Landmark Towns Bicycle Strategy Committee / Bristol Borough resident

Public Meetings

The project included two public workshops, participation in the 2013 Bristol Township Earth Day, and two presentations made to the Bristol Township Environmental Advisory Council and Greenbelt Overhaul Alliance. The goal of these public outreach efforts was to engage residents in the trail planning process, described below. The workshops were publicized via a variety of methods including local newspapers, mentions on the County and municipal websites, and flyers distributed to local libraries.

April 27, 2013 - Bristol Township Earth Day

Bristol Township Municipal Complex

Information regarding the proposed trail, including a project area was provided to interested individuals stopping at the table. A total of 9 individuals stopped by the table to request information and ask questions and provide input.

April 30, 2013 - Public Workshop

Silver Lake Nature Center

The first public workshop was attended by ten (10) residents. This was a workshop type meeting in which attendees were given a handout to complete which asked for information relative to:

- Specific concerns or comments about the proposed trail
- Current trail-related activities they participate in
- Types of uses (bicycling, horseback riding, etc.) they would like to see encouraged / discouraged on the proposed trail

- Preferences relative to trail surfaces based on the attributes of each trail surface type
- Amenities they would like to see incorporated as part of the trail design (signage, park benches, trash receptacles, restroom facilities, etc.)
- Specific points of interest they would like to see the trail connect to.

Attendees were then invited to various tables around the meeting room and asked to mark preferred trail types and locations on larger maps and/or smaller individual maps. A copy of the form and a summary of the meeting comments are included in this appendix.

February 20, 2014 - Public Meeting

Levittown Library

The second public meeting was a presentation of the proposed trail alignment and was attended by ten (10) residents. No significant concerns were raised regarding the proposed trail alignment. Following the public workshop, the presentation from the workshop was posted on the Bucks County Planning Commission website at:

<http://www.buckscounty.org/government/CommunityServices/PlanningCommission>

Bristol Township Environmental Advisory Council / Greenbelt Overhaul Alliance Levittown (GOAL)

July 24, 2013 - Bristol Township Municipal Building

November 20, 2013 - Bristol Township Municipal Building

Presentations regarding the status of the study were presented. Additionally, information was shared by those in attendance which assisted in identifying factors that were taken into account in the development of the proposed trail alignment,

Public comment period on draft study

The final opportunity for public comment on the study was the posting of the draft study on the Bucks County Planning Commission website. The draft study was available on the website from October 3 - November 19, 2014. Press releases regarding the availability of the study were sent to local news agencies as well as to the municipalities in the project area.

**Mill-Queen Anne-Black Ditch Creeks
Trail Feasibility Study**

Community Visioning Workshop

Tuesday, April 30, 2013 7:00 PM - 9:00 PM
Silver Lake Nature Center

Welcome to the Community Visioning Workshop for the Mill-Queen Anne-Black Ditch Creeks Trail Feasibility Study. To assist the project team in understanding your personal needs, concerns, ideas, and other thoughts about this proposed trail system, we invite you to visit the three workstations set up around the room, take a copy of the maps, and mark them up with the following information. A member of the project team will be glad to assist you.

1 - What are your destinations? Please mark your origins/destinations with a colored dot as follows:

-  **Institutions (Schools, Libraries, Churches)**
-  **Commercial / Retail / Office**
-  **Parks**
-  **Home**

2 - What trail surfaces, and in what areas, would you like to see along the proposed trail?

- RED** **Hard surface trail such as asphalt or concrete**

- PURPLE** **Crushed aggregate or stabilized soils**

- GREEN** **Natural surface such as wood chips or other natural surfaces**

- BLUE** **Boardwalk**

- ORANGE** **Other (Please specify on sheet)**

**Mill-Queen Anne-Black Ditch Creeks - Trail Feasibility Study
Community Visioning Workshop**

Optional Information (Please complete if you would like to be notified of future trail developments:

Name _____ Email _____

Address _____

Concerns about the Proposed Trail:

Please share with us specific comments and/or concerns you have regarding the proposed trail:

Please specify the current trail related activities you participate in (Choose all that apply):

<input type="checkbox"/>	Hiking / Walking	<input type="checkbox"/>	Horseback Riding
<input type="checkbox"/>	Mountain Biking	<input type="checkbox"/>	Running
<input type="checkbox"/>	Road/Recreation Biking	<input type="checkbox"/>	Cross Country Skiing
<input type="checkbox"/>	Canoeing / Kayaking	<input type="checkbox"/>	Snowshoeing
<input type="checkbox"/>	Fishing	<input type="checkbox"/>	Other: (Please specify)
<input type="checkbox"/>	In-line skating		
<input type="checkbox"/>	Bird Watching		

Envisioning the Trail

Trail Usage

Please indicate those activities you would recommend encourage or discourage along the trail:

Activity	Encourage	Neutral	Discourage	Activity	Encourage	Neutral	Discourage
Hiking				Horseback Riding			
Mountain Biking				Running			
Road/Recreation Biking				Cross Country Skiing			
Canoeing / Kayaking				Snowshoeing			
Fishing				Other: (Please specify)			
In-line skating							
Bird Watching							

Trail Surface

Taking into consideration various attributes of the proposed trail including ability to accommodate multiple users, durability, initial installation costs, maintenance costs and requirements, environmental friendliness and other variables, please rank order your **top three** choices for the surface for the proposed trail.

Trail Surface – Summary of Attributes								
Rank (1 High 3 Low) Please choose only 3	Trail Surface	Accommodates a wide variety of users (**** Most to * least)	ADA	Long- term durability	Cost of Installation (\$\$\$\$ High to \$ Low)	Maintenance Costs / Requirements	Can be used in steep slope areas	Environmental Friendliness (**** Very friendly to * Least Friendly)
	Asphalt	*****	Yes	Medium	\$\$\$	Medium	Yes	**
	Concrete	*****	Yes	High	\$\$\$\$	Low	Yes	**
	Crushed Aggregate	****	Can be	Medium	\$\$	Medium	No	*
	Wood Chips	*	No	Low	\$\$	High	No	****
	Stabilized Soils	****	Can be	Medium	\$\$\$	High	Yes	***
	Natural Surface	***	No	Medium	\$	High	Yes	**
	Boardwalk	*****	Yes	High	\$\$\$\$	High	No	**

Trail Amenities

Please indicate the extent to which the following amenities should be incorporated along the trail:

Amenities	Don't want/not needed	No Opinion	Nice to Have	Must Have
Park Benches				
Trash Receptacles				
Emergency Phones				
Trail Signage				
Educational Signage				
Spots away from main trail for getting of the path to enjoy quieter activities				
Docks or other canoe/kayak launches				
Portable Toilets				
Drinking Fountains / Water Pumps				
Other (Please specify)				

Other Questions / Comments regarding the proposed Trail:

Please share with us any local knowledge, specific destination points, sensitive environmental areas, favorite fishing holes, bird watching sports etc. you feel we should be aware of in designing the proposed trail:

Mill-Queen Anne-Black Ditch Creeks Bristol Township Earth Day - April 28, 2013 Community Visioning Workshop - April 30, 2013

Public outreach efforts for the Mill-Queen Anne-Black Ditch Creeks Trail Feasibility Study were conducted on April 28 at Bristol Township Earth Day and via a Community Visioning Workshop held April 30 at 7:00 at Silver Lake Nature Center. A total of 20 people, including 3 members of the Planning Commission Staff, 2 steering committee members, and 15 members of the public attended the meeting.

Participation at the Bristol Township Earth Day event consisted of a display table with maps and information regarding the proposed trails. Participants were invited to complete a brief survey about the proposed trail and were encouraged to designate on maps specific locations and destinations they would like to see the trail provide connections to. The format of the community visioning workshop was an interactive presentation and survey outlining the background and purpose of the study; the specifics of the grant in terms of funding and timing; and a series of trail related topics such as trail usage, trail amenities, trail surfaces, etc. that respondents were asked to provide input on both verbally and through use of the survey form.

Following the presentation, attendees were encouraged to visit the three separate work areas, each featuring a different section of the project area. At these work areas, respondents were asked to identify trail destination points including cultural institutions (churches, schools, and libraries), their residence, parks, and commercial, retail and office destinations. Participants were also asked to identify the trail surface they would like to see incorporated along various segments of the proposed trail.

The results of the feedback received are presented below.

Survey responses received - 10

Specific Comments and Concerns regarding the proposed trail

How will ATV's and motor bikes be kept off the trails?

Would greatly benefit the community by giving people more places to exercise, dog walk, skate, & ride.

Concerns most often heard are safety concerns, noise problems, and trash/litter concerns.

Trails hopefully will allow students to walk/ride to schools.

Home values will increase near trails.

Current trail related activities people participate in:

Count	Pct	Activity	Count	Pct	Activity
10	100%	Hiking / Walking	1	10%	Horseback Riding
4	40%	Mountain Biking	3	30%	Running
6	60%	Road/Recreation Biking	1	10%	Cross Country Skiing
4	40%	Canoeing / Kayaking	0	0%	Snowshoeing
1	10%	Fishing			
1	10%	In-line skating			
7	70%	Bird Watching			

Trail activities that people would encourage or discourage along the proposed trail

(Only 9 participants responded to this question)

Activity	Count			Percentage		
	Encourage	Neutral	Discourage	Encourage	Neutral	Discourage
Hiking	9	-	-	100%	-	-
Mountain Biking	5	2	2	56%	22%	22%
Recreational Biking	7	1	1	78%	11%	11%
Canoeing / Kayaking	7	2	-	78%	22%	-
Fishing	8	1	-	89%	11%	-
In-line skating	4	3	2	45%	33%	22%
Bird Watching	9	-	-	100%	-	-
Horseback Riding	3	3	3	33%	33%	33%
Running	9	-	-	100%	-	-
Cross Country Skiing	5	3	1	56%	33%	11%
Snowshoeing	6	2	1	67%	22%	11%
Other:						
ATV's			1	-	-	-

Trail surfaces desired

(Based on 10 responses)

	Number of Votes based on ranking (1 - High to 3 Low)			
	1	2	3	No Votes
Asphalt	3	1	2	4
Concrete	-	1	1	8
Crushed Aggregate	5	2	3	-
Wood Chips	-	1	2	7
Stabilized Soils	1	1	2	6
Natural Surface	1	2	2	5
Boardwalk	-	2	1	7
Other:				
Trail surface should be similar to that found along the Delaware Canal trail				

Trail amenities desired

Amenities	Count				Percentage			
	Must Have	Nice to Have	Don't want/not needed	No Opinion	Must Have	Nice to Have	Don't want/not needed	No Opinion
Park Benches	4	6	-	-	40%	60%	-	-
Trash Receptacles	6	2	2	-	60%	20%	20%	-
Emergency Phones	-	2	6	2	-	20%	60%	20%
Trail Signage	8	2	-	-	80%	20%	-	-
Educational Signage	2	7	-	1	20%	70%	-	10%
Spots away from main trail for getting off the path to enjoy quieter activities	1	9	-	-	10%	90%	-	-
Docks or other canoe/kayak launches	-	9	-	1	-	90%	-	10%
Portable Toilets	2	3	4	1	20%	30%	40%	10%
Drinking Fountains / Water Pumps	-	5	4	1	-	50%	40%	10%
Bike Racks	1	1						
ADA Compliant Fishing Pier		1						
Small Parking Area								

Other comments:

Citizens need to be assured that trails would be maintained and kept up (trash, etc.). Would this responsibility fall to the local townships or the County?

Just need to ensure protection of rare plants in Bristol Marsh & Delhaas Woods

Because it is in Coastal Plain of PA, you may encounter issues with species of special concern. Wetlands will be an issue.

Silver Lake Nature Center has Christmas Bird Count information for Silver Lake, Queen Anne and Frosty Hollow if needed.

Consolidation and closure of some of the elementary and middle schools in the area is being proposed. Elementary schools slated for closure include Lafayette, Everett, Lincoln, and Fitch. Middle schools being slated for closure include Roosevelt.

Trail Routing Options and Notes

Bristol Marsh to PA Turnpike

- There is an existing natural surface/dirt trail in the woods located on the east side of Magnolia Lake that might be able to be incorporated.
- The corridor that was planned as the original location of the PA Turnpike has been subdivided with some property belonging to the County, PennDot and one other owner (check with Bob Mercer relative to parcel located along Beaver St)
- Trail routing options when headed south out of turnpike tunnel:
 - **East side of Magnolia Lake**
 - If a paved shared-use path is proposed, this routing would potentially allow for less environmental impact, especially in light of not wanting paved paths through the nature center.
 - This routing would also allow you to connect into existing shared-use paths on at the southern and on the eastern side of Silver Lake in the County Park portion.
 - Could also present alternative locations for crossing of Route 13, perhaps in area of former proposed PA Turnpike extension.
 - **PECO Utility Corridor**
 - This routing would require crossing Bath Rd / Bristol-Oxford Valley Rd just after it the bridge over the turnpike. Or alternatively, this bridge could be evaluated for the potential to establish a bike lane along it. The trail would then continue on to the Bristol Township municipal complex and follow the PECO corridor down to an existing nature path / old road along the eastern boundary of Delhaas Woods. The proposed trail would then follow this down behind the Bucks County Community College campus and Bucks County Office Center, eventually connecting into the back side of the Bristol Park Shopping Center.
- Route 13 Crossing Options
 - On road corridor along Bath Rd, across Route13 into Bristol Borough
 - Accessing municipal property located on the north side of Mill / Otter Creek at the jug-handle, then onto the STS Tire and Auto Center property, then crossing Route 13 at the other jug handle where there is a traffic light to get you into Bristol Park Shopping Center at the McDonald's. From there, you would cross Route 13, use the Mill Creek undercut under the Railroad tracks; then onto the PennCo Tech property.
 - If utilizing the PECO Corridor trail routing, option would be to cross Route 13 at the intersection with Route 413, although it was noted that this is a very busy intersection.
- Connection to Bristol Marsh area

- For a couple of these options, the alternative is to consider a rails-to-trails configuration utilizing the old unutilized railroad tracks along Old Route 13. This could also provide connection to the existing Bristol Spurline Park Trail.

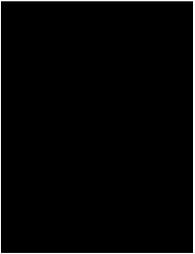
Mill Creek - Black Ditch Creek Loop

- Key issues identified included the crossing of several roads including New Falls Rd, Bristol Oxford Valley Rd, Edgely Rd, and Mill Creek Parkway
- It was noted that a new Bottom Dollar Grocery store is slated for development at the intersection of Edgely Rd and Mill Creek Parkway.
- Potential concerns were also expressed regarding the trail along the Levittown Shopping Center spur trail running behind houses located on Dogwood Dr, Farmbrook Dr, Stonybrook Dr on the north side of the PECO corridor, and on Kenwood Dr and Junewood Dr on the south side of the corridor.

Mill Creek & Queen Anne Creek (North of their confluence)

- The locations of a few additional footbridges were noted.
- A note was written on one of the maps regarding a possible tunnel under Route 413 (Check with Bob Mercer) outside of Frosty Hollow Park.
- Potential locations for parking lots / trail heads were noted as Frosty Hollow, and on the eastern side of Queen Anne Creek along Woodbourne Rd as part of Queen Anne Park.

APPENIDIX B
Opinion of Probable Costs



Mill-Queen Anne-Black Ditch Creek Trail Feasibility Study Summary - Opinion of Probable Construction Cost						
Segment	Location and Description	Miles	Construction	Design / Engineering	Acquisition	Estimated Cost
1	Veterans Memorial Park to Frosty Hollow Rd	1.5	\$ 1,150,338	\$ 143,792.25	\$ 6,080.00	\$ 1,300,210.25
2	Frosty Hollow Rd to New Falls Rd / Bristol Oxford Valley Rd	1.2	\$ 1,203,120	\$ 150,390.00	\$ 66,880.00	\$ 1,420,390.00
3	Oxford Valley Rd to Woodbourne Rd (OPTION A)	1.4	\$ 1,037,790	\$ 129,723.75	\$ -	\$ 1,167,513.75
3	Oxford Valley Rd to Woodbourne Rd (OPTION B)	1.4	\$ 1,026,018	\$ 128,252.25	\$ 24,960.00	\$ 1,179,230.25
4	Woodbourne Rd to New Falls Rd/Bristol Oxford Valley Rd (OPTION A)	1.4	\$ 1,354,269	\$ 169,283.63	\$ 75,200.00	\$ 1,598,752.63
4	Woodbourne Rd to New Falls Rd/Bristol Oxford Valley Rd (OPTION B)	1.4	\$ 1,262,205	\$ 157,775.63	\$ 19,360.00	\$ 1,439,340.63
5 South A	Bristol Oxford Valley Road to Mill Creek Road / Mill Creek Road to Green Lane / Green Lane to Edgely Road	2.6	\$ 1,656,591	\$ 207,073.88	\$ 24,000.00	\$ 1,887,664.88
5 South B	Bristol Oxford Valley Road to Mill Creek Road / Mill Creek road to Yellowood Dr / Yellowood Dr to Green Lane / Green Lane to Edgely Road	2.7	\$ 1,357,461	\$ 169,682.63	\$ 24,000.00	\$ 1,551,143.63
5 North	New Falls Rd/Bristol Oxford Valley Rd to Mill Creek Rd & Edgely Rd via PECO powerline and Edgely Rd (2.95 mi)	1.9	\$ 1,483,926	\$ 185,490.75	\$ 163,040.00	\$ 1,832,456.75
	Segment 5 Total	4.6	\$ 2,841,387.00	\$ 355,173.38	\$ 187,040.00	\$ 3,383,600.38
6	Mill Creek Pkwy / Edgely Rd to Levittown Pkwy / Route 13 intersection via PECO	2.1	\$ 2,026,710	\$ 253,338.75	\$ 229,920.00	\$ 2,509,968.75
7	Mill Creek Rd / Bristol Oxford Valley Rd / Silver Lake Nature Center (Hatfield St)	1.2	\$ 1,260,714	\$ 157,589.25	\$ 9,600.00	\$ 1,427,903.25
8	Silver Lake Nature Center to Route 13 (Bristol Pike)	0.9	\$ 689,010	\$ 86,126.25	\$ -	\$ 775,136.25
9	Route 13 (Bristol Pike) to Bristol Marsh	0.8	\$ 138,900	\$ 17,362.50	\$ -	\$ 156,262.50
	Total Preferred Primary Trail Route	15.1	\$ 11,598,402	\$ 1,449,800.25	\$ 543,840.00	\$ 13,592,042.25
	Connector Trails					
	Frosty Hollow Park to Route 413	1.2	\$ 857,640	\$ 107,205.00	\$ -	\$ 964,845.00
	Bucks County Community College to Silver Lake Park	1.8	\$ 310,440	\$ 38,805.00	\$ -	\$ 349,245.00
	Wistar Rd - Armstrong Middle School to New Falls Road	0.5	\$ 128,910	\$ 16,113.75	\$ 8,160.00	\$ 153,183.75
	Mill Creek Parkway	1.6	\$ 884,700	\$ 110,587.50	\$ 57,720.00	\$ 1,053,007.50
	New Falls Road to Mill Creek Parkway	1.8	\$ 133,620	\$ 16,702.50	\$ 36,800.00	\$ 187,122.50
	Levittown Parkway - Mill Creek Parkway to Levittown Town Center	0.9	\$ 783,840	\$ 97,980.00	\$ -	\$ 881,820.00
	Total Connector Trails	7.8	\$ 3,099,150	\$ 387,393.75	\$ 102,680.00	\$ 3,589,223.75
	Recommended Trail Alignment					
	<i>Assumptions/Clarifications:</i>					
	1. Linear Foot (LF) Costs based on historical data and Linear Foot cost averages for similar projects to create a weighted average Linear Foot price					
	2. PennDOT streetscape design & permitting work trends towards 15% of construction costs					
	3. PennDOT contingencies have trended between 20%					

Segment 3 Option B: South Oxford Valley Rd to Woodbourne Rd (1.4 miles)

Segment	Sub Segment	Segment Description	Multi-Use Trail - 8' Wide	Multi-Use Trail - 10' Wide	Pedestrian Walkway	Multi-Use Trail - 5' Concrete Sidewalk	Signage Wayfinding	Signage - Warning/Safety/Share the Road	Pavement Markings - Crosswalk	Pavement Markings - Trail / Bike Sharrows	Traffic Signal - RRFB	Structure - Bridge Crossing/Ramp	Structure - Canoe/Kayak Launch	Structure - Fence/Railing	Structure - Retaining Wall	Unit Cost	Total Cost	Comments		
Unit of Measure			LF	LF	LF	LF	LF	EA	LF	EA	EA	EA	EA	LF	LF					
SEGMENT 3 Option B	3A	South Oxford Valley Rd to South Olds Blvd (1,600 Linear Feet)		1,300												\$74.00	\$96,200.00			
						1,600											\$5.00	\$8,000.00		
								1,600										\$7.50	\$12,000.00	
									2									\$1,200.00	\$2,400.00	
										1,600								\$2.00	\$3,200.00	
												4						\$4,000.00	\$16,000.00	
	3B	OPTION B: South Olds Blvd to Wistar Rd via Armstrong Middle School (2,620 Linear Feet)		2,050													\$110.00	\$225,500.00		
					250												\$74.00	\$18,500.00		
						2,620											\$5.00	\$13,100.00		
							320										\$7.50	\$2,400.00		
												1					\$50,000.00	\$50,000.00		
										320							\$2.00	\$640.00		
	3C	Wistar Rd to Woodbourne Rd (3,025 Linear Feet)		3,025													\$110.00	\$332,750.00		
						3,025											\$5.00	\$15,125.00		
									1								\$1,200.00	\$1,200.00		
												1					\$50,000.00	\$50,000.00		
													2				\$4,000.00	\$8,000.00		
				SUBTOTAL CONSTRUCTION														\$855,015.00		
				CONTINGENCY (20%):														\$171,003.00		
			EASEMENT ACQUISITION:														\$24,960.00 at \$1.60/s.f.			
			DESIGN/ENGINEERING (15%):														\$128,252.25			
			TOTAL SEGMENT ROUTE														\$1,179,230.25			

Segment 4 Option B: Woodbourne Rd to New Falls / Bristol Oxford Valley Rd (1.4 miles)

Segment	Sub Segment	Segment Description	Multi-Use Trail - 8' Wide	Multi-Use Trail - 10' Wide	Pedestrian Walkway - 5' Concrete Sidewalk	Signage Wayfinding	Signage - Warning/Safety/Share the Road	Pavement Markings - Crosswalk	Curb Cut/ADA Ramp	Traffic Signal - RRFB	Structure - Bridge Crossing/Ramp	Structure - Canoe/Kayak Launch	Structure - Guiderail	Structure - Fence/Railing	Structure - Retaining Wall	Unit Cost	Total Cost	Comments		
Unit of Measure	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA					
SEGMENT 4 Option B	4A	OPTION B: Woodbourne Rd to Quest Rd (5,050 Linear Feet)		3,850												\$110.00	\$423,500.00			
					50												\$74.00	\$3,700.00		
						5,050												\$5.00	\$25,250.00	
							1,150											\$7.50	\$8,625.00	
											1							\$50,000.00	\$50,000.00	
									1,150									\$2.00	\$2,300.00	
	4B	OPTION B: Quest Rd to Bristol Oxford Valley Rd via Middletown Township / PECO (2,225 Linear Feet)		1,900													\$110.00	\$209,000.00		
					225												\$74.00	\$16,650.00		
						2,225												\$5.00	\$11,125.00	
							225											\$7.50	\$1,687.50	
											1							\$300,000.00	\$300,000.00	
	SUBTOTAL CONSTRUCTION																	\$1,051,837.50		
	CONTINGENCY (20%):																	\$210,367.50		
	EASEMENT ACQUISITION:																	\$19,360.00 at \$1.60/s.f.		
DESIGN/ENGINEERING (15%):																	\$157,775.63			
TOTAL SEGMENT ROUTE																	\$1,439,340.63			

Segment 5 South: New Falls Rd/Bristol Oxford Valley Rd to Mill Creek Rd & Edgely Rd via Bristol Oxford Valley Rd & Mill Creek Rd (2.6 miles)

Bristol Oxford Valley Road to Mill Creek Road / Mill Creek Road to Green Lane / Green Lane to Edgely Road

Segment	Sub Segment	Segment Description	Multi-Use Trail - 8' Wide	Multi-Use Trail - 10' Wide	Pedestrian Walkway - 5' Concrete Sidewalk	Multi-Use Trail - Wood Boardwalk	Signage Wayfinding	Signage - Warning/Safety/Share the Road	Pavement Markings - Crosswalk	Pavement Markings - Trail / Bike Sharrows	Curb CUL/ADA Ramp	Traffic Signal - FRFB	Structure - Bridge Crossing/Ramp	Structure - Canoe/Kayak Launch	Structure - Guiderrail	Structure - Fence/Railing	Structure - Retaining Wall	Unit Cost	Total Cost	Comments			
Unit of Measure	LF	LF	LF	LF	LF	LF	EA	LF	EA	EA	EA	EA	EA	LF	LF								
SEGMENT 5 South - Alignment A	5SAA	Bristol Oxford Valley Rd - New Falls Rd to Mill Creek Road (5,450 Linear Feet)		2,520														\$74.00	\$186,480.00				
						5,450														\$5.00	\$27,250.00		
								5,450													\$7.50	\$40,875.00	
										9											\$1,200.00	\$10,800.00	
											5,450										\$2.00	\$10,900.00	
	5SAB	Mill Creek Rd - Bristol Oxford Valley Road to Green Lane (3,025 Linear Feet)			3,025															\$4,000.00	\$72,000.00		
							3,025														\$74.00	\$223,850.00	
								3,025													\$5.00	\$15,125.00	
										3,025											\$7.50	\$22,687.50	
											3,025										\$2.00	\$6,050.00	
	5SAC	Mill Creek Rd - Green Lane to Edgely Road (5,385 Linear Feet)																		\$4,000.00	\$8,000.00		
										1										\$1,200.00	\$1,200.00		
																					\$60.00	\$94,500.00	
																1,575					\$100.00	\$135,000.00	
				1,675																	\$94.00	\$157,450.00	
					1,950																\$110.00	\$214,500.00	
						750															\$74.00	\$55,500.00	
								5,385													\$5.00	\$26,925.00	
							1,800												\$7.50	\$13,500.00			
																			\$4,000.00	\$32,000.00			
									4											\$1,200.00	\$4,800.00		
																				\$50.00	\$17,500.00		
									1,800											\$2.00	\$3,600.00		
	SUBTOTAL CONSTRUCTION																		\$1,380,492.50				
CONTINGENCY (20%):																		\$276,098.50					
EASEMENT ACQUISITION:																		\$24,000.00	at \$1.60/s.f.				
DESIGN/ENGINEERING (15%):																		\$207,073.88					
TOTAL SEGMENT ROUTE																		\$1,887,664.88					

5SAA 5S = Segment 5 South (5S)
A = Alignment A
A = Subsegment A / B = Subsegment B / C = Subsegment C

Segment 5 South: New Falls Rd/Bristol Oxford Valley Rd to Mill Creek Rd & Edgely Rd via Bristol Oxford Valley Rd & Mill Creek Rd (2.7 miles)

Bristol Oxford Valley Road to Mill Creek Road / Mill Creek road to Yellowood Dr / Yellowood Dr to Green Lane / Green Lane to Edgely Road

Segment	Sub Segment	Segment Description	Multi-Use Trail - 8' Wide	Multi-Use Trail - 10' Wide	Pedestrian Walkway - 5' Concrete Sidewalk	Multi-Use Trail - Wood Boardwalk	Signage Wayfinding	Signage - Warning/Safety/Share the Road	Pavement Markings - Crosswalk	Pavement Markings - Trail / Bike Sharrows	Curb Cut/ADA Ramp	Traffic Signal - RRFB	Structure - Bridge Crossing/Ramp	Structure - Canoe/Kayak Launch	Structure - Gulldetail	Structure - Fence/Railing	Structure - Retaining Wall	Unit Cost	Total Cost	Comments		
Unit of Measure	LF	LF	LF	LF	LF	LF	EA	LF	EA	EA	EA	EA	EA	LF	LF							
SEGMENT 5 South - Alignment B	5SBA	Bristol Oxford Valley Rd - New Falls Rd to Mill Creek Road (5,450 Linear Feet)			2,520													\$74.00	\$186,480.00			
						5,450													\$5.00	\$27,250.00		
								5,450												\$7.50	\$40,875.00	
										9										\$1,200.00	\$10,800.00	
											5,450									\$2.00	\$10,900.00	
	5SBB	Mill Creek Rd - Bristol Oxford Valley Road to Green Lane via Yellowood Dr (3,475 Linear Feet)			1,375														\$110.00	\$151,250.00		
						575														\$74.00	\$42,550.00	
								3,475												\$5.00	\$17,375.00	
												6								\$4,000.00	\$24,000.00	
										3										\$1,200.00	\$3,600.00	
									575											\$7.50	\$4,312.50	
											575									\$2.00	\$1,150.00	
																215				\$60.00	\$12,900.00	
	5SBC	Mill Creek Rd - Green Lane to Edgely Road (5,385 Linear Feet)		1,675															\$94.00	\$157,450.00		
						1,950														\$110.00	\$214,500.00	
								750												\$74.00	\$55,500.00	
									5,385											\$5.00	\$26,925.00	
										1,800										\$7.50	\$13,500.00	
													8							\$4,000.00	\$32,000.00	
											4									\$1,200.00	\$4,800.00	
																	350			\$50.00	\$17,500.00	
																		\$2.00	\$3,600.00			
																		SUBTOTAL CONSTRUCTION		\$1,131,217.50		
																		CONTINGENCY (20%):		\$226,243.50		
																	EASEMENT ACQUISITION:		\$24,000.00	at \$1.60/s.f.		
																	DESIGN/ENGINEERING (15%):		\$169,682.63			
																	TOTAL SEGMENT ROUTE		\$1,551,143.63			

5SBA 5S = Segment 5 South
 B = Alignment B
 A = Subsegment A / B = Subsegment B / C = Subsegment C

Segment 5 North: New Falls Rd/Bristol Oxford Valley Rd to Mill Creek Rd & Edgely Rd via PECO powerline and Edgely Rd (1.9 miles)

Segment	Sub Segment	Segment Description	Multi-Use Trail - 8' Wide	Multi-Use Trail - 10' Wide	Pedestrian Walkway - 5' Concrete	Multi-Use Trail - Wood Boardwalk	Signage Wayfinding	Signage - Warning/Safety/Share	Pavement Markings - Crosswalk	Pavement Markings - Trail / Bike	Curb Cut/ADA Ramp	Traffic Signal - RRFB	Structure - Bridge Crossing/Ramp	Structure - Canoe/Kayak Launch	Structure - Fence/Railing	Structure - Retaining Wall	Unit Cost	Total Cost	Comments	
Unit of Measure			LF	LF	LF	LF	LF	EA	LF	EA	EA	EA	EA	EA	LF	LF				
5NA	New Falls Road / Bristol Oxford Valley Road to PECO Corridor at Inwood Road (3,050 LF)		260														\$110.00	\$28,600.00		
				90														\$140.00	\$12,600.00	
					3,050													\$5.00	\$15,250.00	
								5										\$1,200.00	\$6,000.00	
									2,450									\$2.00	\$4,900.00	
											10							\$4,000.00	\$40,000.00	
5NB	PECO Corridor - Inwood Road to Edgely Road (5,400 Linear Feet)		5,200														\$300,000.00	\$300,000.00		
					5,400												\$110.00	\$572,000.00		
																	\$5.00	\$27,000.00		
										11							\$4,000.00	\$44,000.00		
5NC	Edgely Rd - PECO Corridor to Mill Creek Road (1,765 Linear Feet)		1,400														\$1,200.00	\$6,000.00		
				250													\$94.00	\$134,420.00		
					1,765												\$5.00	\$8,825.00		
									3								\$1,200.00	\$2,400.00		
										305							\$2.00	\$110.00		
											6						\$4,000.00	\$16,000.00		
SUBTOTAL CONSTRUCTION																	\$1,236,605.00			
CONTINGENCY (20%):																	\$247,321.00			
EASEMENT ACQUISITION:																	\$163,040.00	at \$1.60/s.f.		
DESIGN/ENGINEERING (15%):																	\$185,490.75			
TOTAL SEGMENT ROUTE																	\$1,832,456.75			

Segment 7 : Mill Creek Rd / Bristol Oxford Valley Rd / Silver Lake Nature Center (Hatfield St) (1.17 mi)

Segment	Sub Segment	Segment Description	Multi-Use Trail - 8' Wide	Multi-Use Trail - 10' Wide	Pedestrian Walkway - 5' Concrete	Multi-Use Trail - Wood Boardwalk	Signage Wayfinding	Signage - Warning/Safety/Share	Pavement Markings - Crosswalk	Curb Cut/ADA Ramp	Traffic Signal - Trail / Bike	Structure - RRFB	Structure - Bridge Crossing/Ramp	Structure - Canoe/Kayak Launch	Structure - Guiderail	Structure - Fence/Railing	Structure - Retaining Wall	Unit Cost	Total Cost	Comments		
Unit of Measure	LF	LF	LF	LF	LF	LF	EA	LF	EA	EA	EA	EA	EA	LF	LF							
SEGMENT 7	Mill Creek Rd / Bristol Oxford Valley Rd / Silver Lake Nature Center (Hatfield St) (6,185 Linear Feet)		4,225															\$110.00	\$464,750.00			
				1,500															\$140.00	\$210,000.00		
					6,185														\$5.00	\$30,925.00		
								1											\$1,200.00	\$1,200.00		
									360										\$2.00	\$720.00		
										2									\$4,000.00	\$8,000.00		
												1							\$300,000.00	\$300,000.00		
													1						\$35,000.00	\$35,000.00		
		SUBTOTAL CONSTRUCTION																		\$1,050,595.00		
		CONTINGENCY (20%):																		\$210,119.00		
EASEMENT ACQUISITION:																		\$9,600.00	at \$1.60/s.f.			
DESIGN/ENGINEERING (15%):																		\$157,589.25				
TOTAL SEGMENT ROUTE																		\$1,427,903.25				

Segment 8: Silver Lake Nature Center to Route 13 (Bristol Pike) (0.43 mi)

Segment	Sub Segment	Segment Description	Multi-Use Trail - 8' Wide	Multi-Use Trail - 10' Wide	Pedestrian Walkway - 5' Concrete Sidewalk	Multi-Use Trail - Wood Boardwalk	Signage Wayfinding	Signage - Warning/Safety/Share the Road	Pavement Markings - Crosswalk	Curb Cut/ADA Ramp	Traffic Signal - Trail / Bike Sharrows	Structure - RRFB	Structure - Bridge Crossing/Ramp	Structure - Canoe/Kayak Launch	Structure - Guiderail	Structure - Fence/Railing	Structure - Retaining Wall	Unit Cost	Total Cost	Comments	
	Unit of Measure		LF	LF	LF	LF	LF	EA	LF	EA	EA	EA	EA	EA	LF	LF					
SEGMENT 8	Silver Lake Nature Center to Route 13 (Bristol Pike) (4,785 Linear Feet)		2,275															\$110.00	\$250,250.00		
					4,785														\$5.00	\$23,925.00	
											1								\$300,000.00	\$300,000.00	
	SUBTOTAL CONSTRUCTION																		\$574,175.00		
	CONTINGENCY (20%):																		\$114,835.00		
	EASEMENT ACQUISITION:																		\$0.00 at \$1.60/s.f.		
	DESIGN/ENGINEERING (15%):																		\$86,126.25		
	TOTAL SEGMENT ROUTE																		\$775,136.25		

Connector Trails:

Segment	Sub Segment	Segment Description	Multi-Use Trail - 8' Wide	Multi-Use Trail - 10' Wide	Pedestrian Walkway - 5' Concrete Sidewalk	Multi-Use Trail - Wood Boardwalk	Signage Wayfinding	Signage - Warning/Safety/Share the Road	Pavement Markings - Crosswalk	Pavement Markings - Trail / Bike Sharrows	Traffic Signal - RRFB	Structure - Bridge Crossing/Ramp	Structure - Canoe/Kayak Launch	Structure - Guidedrail	Structure - Fence/Railing	Structure - Retaining Wall	Unit Cost	Total Cost	Comments	
Unit of Measure	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA				
Frosty Hollow Park to Route 413 - 1.2 miles	Frosty Hollow Park to Route 413 (6,200 Linear Feet)		5,200														\$110.00	\$572,000.00		
				1,100														\$74.00	\$81,400.00	
					6,300													\$5.00	\$31,500.00	
								3										\$1,200.00	\$3,600.00	
										6								\$4,000.00	\$24,000.00	
									1,100									\$2.00	\$2,200.00	
		SUBTOTAL CONSTRUCTION																\$714,700.00		
		CONTINGENCY (20%):																\$142,940.00		
		EASEMENT ACQUISITION:																at \$1.60/s.f.		
		DESIGN/ENGINEERING (15%):																\$107,205.00		
	TOTAL SEGMENT ROUTE																\$964,845.00			
Bucks County Community College to Silver Lake Park - 1.8 miles combined	Bucks County Community College to Silver Lake Park (Pedestrians - 4,350 Linear Feet) (Bicyclists - 5,400 Linear Feet)			975													\$74.00	\$72,150.00		
									2,500									\$2.00	\$5,000.00	
											7							\$4,000.00	\$28,000.00	
									4									\$1,200.00	\$4,800.00	
												2						\$50,000.00	\$100,000.00	
				9,750													\$5.00	\$48,750.00		
		SUBTOTAL CONSTRUCTION																\$258,700.00		
		CONTINGENCY (20%):																\$51,740.00		
		EASEMENT ACQUISITION:																at \$1.60/s.f.		
		DESIGN/ENGINEERING (15%):																\$38,805.00		
	TOTAL SEGMENT ROUTE																\$349,245.00			
Wistar Rd - Armstrong Middle School to New Falls Road - 0.5 miles	Wistar Rd - Armstrong Middle School to New Falls Road (2,825 Linear Feet)			725													\$74.00	\$53,650.00		
										2,825								\$2.00	\$5,650.00	
												7						\$4,000.00	\$28,000.00	
										5								\$1,200.00	\$6,000.00	
					2,825													\$5.00	\$14,125.00	
		SUBTOTAL CONSTRUCTION																\$107,425.00		
		CONTINGENCY (20%):																\$21,485.00		
		EASEMENT ACQUISITION:																\$8,160.00 at \$1.60/s.f.		
		DESIGN/ENGINEERING (15%):																\$16,113.75		
		TOTAL SEGMENT ROUTE																\$153,183.75		

Multi-Use Trail - 8' Wide

Clearing/removals	LF	\$	8.00	allowance
Earthwork	LF	\$	15.00	allowance
Asphalt Paving, 8' width	LF	\$	65.00	1 lf = 8 sf = 0.89 sy x \$72/sy = \$64.08
Drainage	LF	\$	4.00	allowance
Basic Landscaping	LF	\$	2.00	seed 1 lf = 8 sf = 0.88 sy x \$2.00/sy = \$1.77
total	LF	\$	94.00	

Multi-Use Trail - 10' Wide

Clearing/removals	LF	\$	8.00	allowance
Earthwork	LF	\$	15.00	allowance
Asphalt Paving, 10' width	LF	\$	80.00	1 lf = 10 sf = 1.11 sy x \$72/sy = \$79.99
Drainage	LF	\$	4.00	allowance
Basic Landscaping	LF	\$	3.00	seed 1 lf = 10 sf = 1.11 sy x \$2.00/sy = \$2.22
total	LF	\$	110.00	

Pedestrian Walkway - 5' Concrete Sidewalk

Clearing/removals	LF	\$	5.00	allowance
Earthwork	LF	\$	8.00	allowance
Concrete, 5' width	LF	\$	56.00	1 lf = 5 sf = 0.55 sy x \$100/sy = \$55.55
Drainage	LF	\$	4.00	allowance
Basic Landscaping	LF	\$	1.00	seed 1 lf = 5 sf = 0.55 sy x \$2.00/sy = \$1.10
total	LF	\$	74.00	

Multi-Use Trail - Wood Boardwalk

Clearing/removals	LF	\$	10.00	allowance
Earthwork	LF	\$	18.00	allowance
Boardwalk, 8' width	LF		112.00	1 lf = 8 sf = 0.89 sy x \$125/sy = \$111.25
total	LF	\$	140.00	

Signage Wayfinding

Signage	LF	\$	5.00	\$500 per 100 ft.
total	LF	\$	5.00	

Signage - Warning/Safety/Share the Road

	LF	\$	7.50	\$750 per 100 ft.
total	LF	\$	7.50	

Pavement Markings - Crosswalk

		\$		
Ped Crosswalks - Continental	EA		1,200.00	1 lf = 6 sf, 40 lf long, \$5 sf, typical striping only
total	EA	\$	1,200.00	

Pavement Markings - Trail / Bike Sharrows

Pavement Markings	LF	\$ 2.00	allowance
total	LF	\$2.00	

Curb Cut/ADA Ramp

		\$	
Mobilization/traffic control	EA	490.00	allowance
		\$	
Demolition	EA	900.00	9 sy per ramp, \$100/sy
		\$	
Installation	EA	2,610.00	9 sy per ramp \$290/sy
total	EA	\$4,000.00	

Traffic Signal - RRFB

		\$	
Traffic Signal - RRFB	EA	50,000.00	allowance
total	EA	\$50,000.00	

Structure - Bridge Crossing/Ramp

Bridge Crossing/Ramp	EA	\$300,000.00	10' wide truss, assumes 100' lf crossing, \$300/sf
total	EA	\$300,000.00	

Structure - Canoe/Kayak Launch

		\$	
Canoe/Kayak Launch	EA	35,000.00	allowance
total	EA	\$35,000.00	

Structure - Guiderail

Guiderail	LF	\$ 60.00	allowance
total	LF	\$60.00	

Structure - Fence/Railing

Fence/Railing	EA	\$ 50.00	allowance
total	EA	\$50.00	

Structure - Retaining Wall

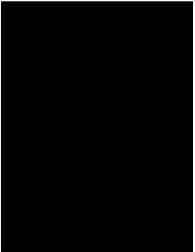
		\$	
Retaining Wall	EA	100.00	allowance
total	EA	\$100.00	

Miscellaneous

		\$	
Demo ex. concrete sidewalk	LF	14.00	1 lf = 4 sf = 0.44 sy x \$30.00 = \$13.33

APPENDIX C

Potential Funding Sources



APPENDIX C: POTENTIAL FUNDING SOURCES

The most likely means of implementing the Mill-Queen Anne-Black Ditch Creeks Trail plan identified in this feasibility study is through application to multiple funding sources. Most trails are developed using a combination of public funding from various government levels, private funding, local public forces and volunteer assistance. This appendix provides an overview of some of the potential funding sources for development of the Mill-Queen Anne-Black Ditch Creeks Trail.

Federal Funding

The Federal Government provides funding for transportation projects through various funding programs. These are typically in the form of block grants provided to states through funding formulas and are typically administered through the state or the Delaware Valley Regional Planning Commission.

MAP-21 - Transportation Alternatives Program - For the past two decades, the Surface Transportation Act (SAFETEA-LU) served as the largest single source of funding for the development of bicycle, pedestrian, trail and greenway projects. After the expiration of SAFETEA-LU in March 2012, President Obama signed a new multi-year appropriations bill referred to as MAP-21, or Moving Ahead for Progress in the 21st Century in July 2012. The new act created the Transportation Alternatives Program (TAP) which combines several SAFETEA-LU programs under a single heading, continuing funding for programs and projects defined as transportation alternatives, including:

- on and off-road pedestrian and bicycle facilities;
- community improvement programs;
- recreational trail program projects; and
- safe routes to school projects.

MAP-21 also continues the Surface Transportation Program (STP) and the Congestion Mitigation Air Quality Program (CMAQ) which also supply potential funding for trail improvements.

<http://www.fhwa.dot.gov/map21/guidance/guidetap.cfm>

United States Department of the Interior - National Parks Service (NPS) - Rivers, Trails and Conservation Assistance (RTCA) Program - A National Parks Service program which provides technical assistance to establish and restore greenways, rivers, trails, watersheds and open space.

<http://www.nps.gov/orgs/rtca/apply.htm>

Land and Water Conservation Fund - Created by Congress in 1965, the Land and Water Conservation Fund (LWCF) was a bipartisan commitment to safeguard natural areas, water resources and our cultural heritage, and to provide recreation opportunities to all Americans. The program uses revenues from the depletion of one natural resource - offshore oil and gas - to support the conservation of land and water. This is accomplished by using royalties paid by energy companies drilling for oil and gas on the Outer Continental Shelf (OCS). These royalties are placed in the fund for the purpose of creating and protecting national parks, areas around rivers and lakes, national forests, and national wildlife refuges from development, and to provide matching grants for state and local parks and recreation projects.

<http://www.lwcfcoalition.org/about-lwcf.html>

State Funding

The State of Pennsylvania offers multiple funding sources in support of open space, historic and cultural resource preservation, natural resource protection, recreation and park facilities, and greenways implementation. Similar to the federal funding programs, these programs are administered by a variety of different departments. The Pennsylvania Greenways Toolbox's Funding Guide provides additional information about these programs.

Pennsylvania Department of Conservation and Natural Resources (PA DCNR)

Recreational Trails Program - The Pennsylvania Recreational Trails Program (PRT) is an assistance program funded through the U.S. Department of Transportation's Federal Highway Administration (FHWA). FHWA provides funds to states to develop and maintain recreational trails and trail-related facilities for motorized and non-motorized recreational trail uses. The Department of Conservation and Natural Resources (DCNR) has been designated as the state agency responsible for administering this federal program in Pennsylvania.

http://www.dcnr.state.pa.us/cs/groups/public/documents/document/d_001241.pdf

Community Conservation and Partnership Program - Community Recreation and Conservation grants are awarded to municipalities and authorized nonprofit organizations for recreation, park, trail and conservation projects. These include planning for feasibility studies, trail studies, conservation plans, master site development plans, and comprehensive recreation, park and open space and greenway plans; land acquisition for active or passive parks, trails and conservation purposes; and new development and rehabilitation of parks, trails and recreation facilities.

http://www.dcnr.state.pa.us/cs/groups/public/documents/document/D_001230.pdf

Pennsylvania Department of Community and Economic Development (PA DCED)

Greenways, Trails and Recreation Program (GTRP) - Act 13 of 2012 establishes the Marcellus Legacy Fund and allocates funds to the Commonwealth Financing Authority (the "Authority") for planning, acquisition, development, rehabilitation and repair of greenways, recreational trails, open space, parks and beautification projects using the Greenways, Trails and Recreation Program (GTRP).

http://www.newpa.com/sites/default/files/uploads/GreenwaysTrailsRecreation_Guidelines-2014-v2.pdf

Local Funding

In addition to the various grant programs administered by Federal and State governments, there are a number of other government initiatives that can provide funding for implementing trail plans.

Bond Referendums

As evidenced by the success of the Bucks County Open Space Program, bonds are a proven and effective way to finance long-term recreational improvements. General obligation bonds are secured by the full faith and credit of the issuing entity. In this case, the local government issuing the bonds pledges to raise its property taxes, or use any other sources of revenue, to generate sufficient revenues to make the debt service payments on the bonds. A general obligation pledge is stronger than a revenue pledge, which typically translates into a lower interest rate than a revenue bond. With any type of bond referendum, an education and awareness program should be implemented to increase public and voter support in advance of any vote.

Property Tax and Earned Income Tax - Pennsylvania's Act 153 of 1996, which amended the Pennsylvania Conservation and Land Development Act, expanded the authority of municipalities to fund open space projects through local taxes. Under the Act, two different taxation tools were identified that can be used to purchase development rights or open space lands.

Property Tax - This is a tax charged to real property owners based on a percentage of the assessed property value, not to exceed the millage authorized by voter referendum. Property taxes provide a steady source of revenue. However, because communities are limited in the total level of the millage rate, the use of property taxes to fund open space activities may inhibit the ability of the municipality to raise money for other needed activities.

Earned Income Tax - This is a tax applied only to earned income, not to real estate assets or pensions. Because of this, it may prove to be more acceptable in municipalities with a higher percentage of retired senior citizens. Pennsylvania caps the earned income tax at 1.0 percent. However, Act 153 authorizes voters to approve the levy of an increased earned income tax beyond the 1.0 percent limit, exclusively for the purpose of financing purchases of open space.

Realty Transfer Tax - The realty transfer tax is a tax on the sale of real estate. The maximum levy is 1 percent of the sales price. If both the municipality and school district levy this tax, both must share the 1 percent.

Hotel Tax - The hotel occupancy tax, imposed at the same rate as sales and use tax, applies to room rental charges for periods of less than 30 days by the same person. The purpose of the hotel tax is to increase tourism and economic development in Pennsylvania. The tax supports advertising, development of publications related to tourism, capital and program projects to attract tourists, and in some counties open space conservation, trails and recreation facility improvements. Bucks County supports projects to increase tourism through its hotel tax.

Private Funding Sources

Grant funding is available through many private avenues, most of which have specific agendas. Key to obtaining such funding is a clear match of the project goals to the funding intent. Often, private grants require a non-profit entity [501(c)3] to receive and administer any funds. Frequently, private funding can be used to meet the matching requirements of many public programs which require some amount of local funding as a good faith indication of local support. Finally there are in-kind gifts and cooperative partnerships which permit a right of way through private lands and develop a cooperative agreement for use, maintenance and safety. These can frequently be seen in rails-with-trails as well as trails that use utility rights of way and cooperative maintenance.

PECO Green Region Grants Program - Green Region grants are available to municipalities in amounts up to \$10,000. The grants can be used with other funding sources to cover a wide variety of planning and direct expenses associated with developing and implementing open space programs, including consulting fees, surveys, environmental assessments, habitat improvement, and capital improvements for passive recreation.

<https://www.peco.com/Community/CharitableGiving/GreenRegion/Pages/ApplicationGuidelines.aspx>

William Penn Foundation - The William Penn Foundation's mission is to improve the quality of life in the Greater Philadelphia region through efforts that foster rich cultural expression, strengthen children's futures, and deepen connections to nature and community. In partnership with others, the Foundation works to advance a vital, just, and caring community. The Foundation works to improve

the quality of life in the Greater Philadelphia region by advancing dynamic and diverse communities that provide meaningful opportunity.

In 2011, the Foundation provided \$10 million in funding for The Regional Trails Program, administered by the Delaware Valley Regional Planning Commission, with the goal of capitalizing upon opportunities for trail development by providing funding for targeted, priority trail design, construction and planning projects that will promote a truly connected, regional network of multi-use trails with Philadelphia and Camden as its hub. Although the funding for this program provided by William Penn has been depleted, efforts are currently underway to replenish the funding stream via other funding sources.

<http://www.williampenfoundation.org/GrantmakingOverviewApplicationProcess.aspx>

<http://www.dvrpc.org/RegionalTrailsProgram/>

Kodak American Greenways Awards - The Conservation Fund, in conjunction with the Eastman Kodak Company and the National Geographic Society, provide small grants for the purpose of growing greenways, water trails, trails and natural areas. Funded projects typically advance one of the goals of the program including catalyzing new greenway projects; assisting grassroots greenway organizations; leveraging additional money for conservation and greenway development; and promoting use and enjoyment of greenways.

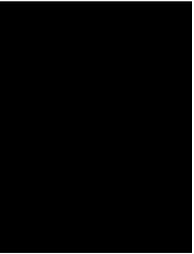
http://www.conservationfund.org/kodak_awards

American Hiking Association - National Trails Fund - Established by the American Hiking Society in 1998, this national grants program provides funding for establishing, protecting, and maintaining foot trails. Eligible projects include those that:

- Have hikers as the primary constituency
- Secure trail lands, including acquisition of trails and trail corridors
- Will result in visible and substantial ease of access, improved hiker safety and/or avoidance of environmental damage

<http://www.americanhiking.org/our-work/national-trails-fund/>

APPENDIX D
List of Easements Needed
for Trail Completion



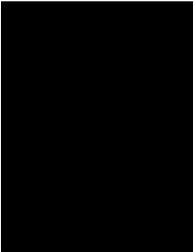
APPENDIX D: LIST OF EASEMENTS NEEDED FOR TRAIL COMPLETION

Easements Needed

Primary Trail

Segment	Route Option	Parcel	Owner	Length	Width	Total Square Feet	Cost per Square Foot	Total
1		22-049-045	Private	190	20	3,800	\$ 1.60	\$ 6,080
2		22-060-055	PECO Energy Company	790	20	15,800	\$ 1.60	\$ 25,280
2		22-060-284	PECO Energy Company	935	20	18,700	\$ 1.60	\$ 29,920
2		22-060-074	PECO Energy Company	365	20	7,300	\$ 1.60	\$ 11,680
3	B	05-031-059	Bristol Township School District	780	20	15,600	\$ 1.60	\$ 24,960
4	A	22-063-005-001	PECO Energy Company	200	20	4,000	\$ 1.60	\$ 6,400
4	A	22-060-358	Evangelical Lutheran Church	1,000	20	20,000	\$ 1.60	\$ 32,000
4	A	22-061-521-001	Neshaminy School District	1,150	20	23,000	\$ 1.60	\$ 36,800
4	B	22-063-005-001	PECO Energy Company	605	20	12,100	\$ 1.60	\$ 19,360
5		05-033-505	First Baptist of Bristol	400	20	8,000	\$ 1.60	\$ 12,800
5		05-038-224	PECO Energy Company	160	20	3,200	\$ 1.60	\$ 5,120
5		05-038-246	PECO Energy Company	960	20	19,200	\$ 1.60	\$ 30,720
5		05-037-209	PECO Energy Company	1,165	20	23,300	\$ 1.60	\$ 37,280
5		05-037-194	PECO Energy Company	155	20	3,100	\$ 1.60	\$ 4,960
5		05-037-020	PECO Energy Company	250	20	5,000	\$ 1.60	\$ 8,000
5		05-033-504	PECO Energy Company	530	20	10,600	\$ 1.60	\$ 16,960
5		05-033-119	PECO Energy Company	1,475	20	29,500	\$ 1.60	\$ 47,200
5		05-040-343-001	PECO Energy Company	450	20	9,000	\$ 1.60	\$ 14,400
5		05-042-316	Private	80	20	1,600	\$ 1.60	\$ 2,560
5		05-042-053	Private	80	20	1,600	\$ 1.60	\$ 2,560
5		05-042-054	Private	80	20	1,600	\$ 1.60	\$ 2,560
5		05-042-055	Private	60	20	1,200	\$ 1.60	\$ 1,920
6		05-042-116	PECO Energy Company	1,365	20	27,300	\$ 1.60	\$ 43,680
6		05-071-551	PECO Energy Company	1,690	20	33,800	\$ 1.60	\$ 54,080
6		05-071-444	PECO Energy Company	1,300	20	26,000	\$ 1.60	\$ 41,600
6		05-072-187	PECO Energy Company	1,050	20	21,000	\$ 1.60	\$ 33,600
6		46-003-170	PECO Energy Company	1,780	20	35,600	\$ 1.60	\$ 56,960
7		05-029-161-001	PECO Energy Company	300	20	6,000	\$ 1.60	\$ 9,600
Total				19,345				\$ 619,040
				Segment 1	190			\$ 6,080
				Segment 2	2,090			\$ 66,880
				Segment 3	780			\$ 24,960
				Segment 4 - Alignment A	2,350			\$ 75,200
				Segment 4 - Alignment B	605			\$ 19,360
				Segment 5 - North	5,095			\$ 163,040
				Segment 5 - South	750			24,000
				Segment 6	7,185			\$ 229,920
				Segment 7	300			\$ 9,600
				Segment 8	-			-
				Segment 9	-			-
Total				19,345				\$ 619,040
Connector Trails								
Wistar Rd		05-031-059	Bristol Township School District	50	20	1,000	\$ 1.60	\$ 1,600
Wistar Rd		05-031-058	Christ United Methodist Church	305	20	6,100	\$ 1.60	\$ 9,760
Wistar Rd		05-031-057		25	20	500	\$ 1.60	\$ 800
Wistar Rd		05-035-006		140	20	2,800	\$ 1.60	\$ 4,480
Wistar Rd		05-035-007		90	20	1,800	\$ 1.60	\$ 2,880
Mill Creek Parkway		05-042-116		1,110	20	22,200	\$ 1.60	\$ 35,520
New Falls Rd to Mill Creek Parkway				1,150	20	23,000	\$ 1.60	\$ 36,800

APPENDIX E
Silver Lake Nature Center
Bird List





	SPRING	SUMMER	FALL	WINTER	NESTS?
Nuthatches					
<input type="checkbox"/> Red-breasted Nuthatch		O		O	
<input type="checkbox"/> White-breasted Nuthatch	C	U	C	C	B
Creepers					
<input type="checkbox"/> Brown Creeper	U	R	U	U	
Wrens					
<input type="checkbox"/> Carolina Wrens	C	C	C	U	B
<input type="checkbox"/> House Wrens	C	C	C		B
<input type="checkbox"/> Winter Wrens				O	
<input type="checkbox"/> Marsh Wrens		R			
Kinglet					
<input type="checkbox"/> Golden-crowned Kinglet	U	U	O		
<input type="checkbox"/> Ruby-crowned Kinglet	C	C	O		
Gnatcatcher					
<input type="checkbox"/> Blue-gray Gnatcatcher	U	O	O		B
Thrushes					
<input type="checkbox"/> Veery	U				
<input type="checkbox"/> Gray-cheeked Thrush	R		R		
<input type="checkbox"/> Swainson's Thrush	U		U		
<input type="checkbox"/> Hermit Thrush	C		C	O	
<input type="checkbox"/> Wood Thrush	C	C	C		B
<input type="checkbox"/> American Robins	A	A	A	A	B
Thrushes-Mimic					
<input type="checkbox"/> Gray Catbird	C	C	C		B
<input type="checkbox"/> Northern Mockingbird	C	C	C	U	B
<input type="checkbox"/> Brown Thrasher	U	U	U		B
Starlings					
<input type="checkbox"/> European Starling	A	A	A	A	B
Waxwing					
<input type="checkbox"/> Cedar Waxwing	U	U	U	O	B
Warblers					
<input type="checkbox"/> Blue-winged Warbler	U		O		
<input type="checkbox"/> Northern Parula	C		C		
<input type="checkbox"/> Yellow Warbler	C	C	C		B

Continue →



	SPRING	SUMMER	FALL	WINTER	NESTS?
<input type="checkbox"/> Chestnut-sided Warbler	U		U		
<input type="checkbox"/> Magnolia Warbler	C		U		
<input type="checkbox"/> Cape May Warbler	U		U	R	
<input type="checkbox"/> Black-throated Blue Warbler	U		U		
<input type="checkbox"/> Yellow-rumped Warbler	C		C	U	
<input type="checkbox"/> Black-throated Green Warbler	C		C		
<input type="checkbox"/> Blackburnian Warbler	O				
<input type="checkbox"/> Yellow-throated Warbler	U		U		
<input type="checkbox"/> Pine Warbler	U		U		
<input type="checkbox"/> Palm Warbler	C	U	R		
<input type="checkbox"/> Blackpoll Warbler	U		U		
<input type="checkbox"/> Black and White Warbler	C	U	C		
<input type="checkbox"/> American Redstart	C		C		
<input type="checkbox"/> Prothonotary Warbler	R				
<input type="checkbox"/> Ovenbird	C		C		
<input type="checkbox"/> Common Yellow throat	C	C	C		B
<input type="checkbox"/> Northern Waterthrush	U		O		
<input type="checkbox"/> Wilson's Warbler	R		R		
<input type="checkbox"/> Canada Warbler	U		U		
Tanagers					
<input type="checkbox"/> Scarlet Tanager	U	U	U		B
Blackbirds/Orioles					
<input type="checkbox"/> Eastern Towhee	C		C		B
<input type="checkbox"/> American Tree Sparrow	U		O	U	
<input type="checkbox"/> Chipping Sparrow	C	C	C		B
<input type="checkbox"/> Field Sparrow	U	U	U		B
<input type="checkbox"/> Fox Sparrow	U		U	O	
<input type="checkbox"/> Song Sparrow	C	C	C		B
<input type="checkbox"/> Lincoln's Sparrow	U		O		
<input type="checkbox"/> Swamp Sparrow	U	R	U	O	B
<input type="checkbox"/> White-throated Sparrow	C		C	C	
<input type="checkbox"/> White-crowned Sparrow	O		O		
<input type="checkbox"/> Dark-eyed Junco	C			C	
<input type="checkbox"/> Snow Bunting				O	O
<input type="checkbox"/> Northern Cardinal	C	C	C	C	B

Continue →



	SPRING	SUMMER	FALL	WINTER	NESTS?
<input type="checkbox"/> Rose-breasted Grosbeak	C	U	C		B
<input type="checkbox"/> Indigo Bunting	U		U		B
<input type="checkbox"/> Red-winged Blackbird	C	C	C	U	B
<input type="checkbox"/> Rusty Blackbird	O		O	R	
<input type="checkbox"/> Common Grackle	A	C	A	O	B
<input type="checkbox"/> Brown-headed Cowbird	C	C	C	O	B
<input type="checkbox"/> Orchard Oriole	O	O	R		
<input type="checkbox"/> Baltimore Oriole	C	C	C		B
Finches-Weaver					
<input type="checkbox"/> House Sparrow	A	A	A	A	B
<input type="checkbox"/> American Goldfinch	C	C	C	U	B
<input type="checkbox"/> House Finch	A	A	A	A	B



Silver Lake Nature Center
1306 Bath Road, Bristol Pa 19007
(215)785-1177
Fax: (215)785-3228
www.silverlakenaturecenter.org
Email: silverlakenaturecenter@co.bucks.pa.us

Bucks County Commissioners
Charles H. Martz, Chairman
Janet F. Cowley, Esq., Vice-Chairman
Diane M. Ellis-Masaglia, LCSW



SLNC is a facility of Bucks County Department of Parks and Recreation, which does not discriminate on the basis of disability in its programs, activities, and facilities. School programs receive additional support from the nonprofit Friends of Silver Lake Nature Center.



Silver Lake Nature Center

Discovering...  Birds



Ruby-throated Hummingbird



A Natural Treasure

www.silverlakenaturecenter.org
(215)785-1177



Ducks & Miscellaneous Swimming Birds

	SPRING	SUMMER	FALL	WINTER	NESTS?
Geese					
<input type="checkbox"/> White-Fronted Goose				R	
<input type="checkbox"/> Canada Goose	A	C	A	A	B
Swans					
<input type="checkbox"/> Mute Swan	O	O	O	O	
Ducks-Marsh					
<input type="checkbox"/> Wood Duck	C	C	C	O	B
<input type="checkbox"/> American Black Ducks	R		R		
<input type="checkbox"/> Mallard	A	A	A	A	B
<input type="checkbox"/> Blue-winged Teal	R		R		
<input type="checkbox"/> Green-winged Teal	U	U	U		
Ducks-Diving					
<input type="checkbox"/> Ring-necked Duck	U		U	O	
<input type="checkbox"/> Bufflehead	U		U	R	
Mergansers					
<input type="checkbox"/> Common Merganser	R	C			
<input type="checkbox"/> Hooded Merganser	R	C			
Stiff-tails					
<input type="checkbox"/> Ruddy Duck				O	
Loons					
<input type="checkbox"/> Common Loon				O	
<input type="checkbox"/> Pied-billed Grebes					
Cormorants					
<input type="checkbox"/> Double-crested Cormorant	C	C	C		
Hérons/Bitterns					
<input type="checkbox"/> Great Blue Heron	C	C	C	U	
<input type="checkbox"/> Great Egret	U	U			
<input type="checkbox"/> Green Heron	C	C	C		B
<input type="checkbox"/> Black-Crowned Night	U	C	U		
Vultures					
<input type="checkbox"/> Black Vulture	U	O	U	R	
<input type="checkbox"/> Turkey Vulture	C	C	C	C	
Ospreys					
<input type="checkbox"/> Osprey		U	O	U	
Hawks/Eagles					
<input type="checkbox"/> Bald Eagle	O	O	O	R	

Continue →



Birds of Prey

<input type="checkbox"/> Northern Harrier	U	R	U	O	
<input type="checkbox"/> Sharp-Shinned Hawk	U	R	O	U	
<input type="checkbox"/> Cooper's Hawk	C	C	C		B
<input type="checkbox"/> Broad-Winged Hawk	O	O			
<input type="checkbox"/> Red-shouldered Hawk	O	R	O	O	RB
<input type="checkbox"/> Red-tailed Hawk	C	C	C	C	B
Falcons					
<input type="checkbox"/> Merlin	O	R	O	R	
<input type="checkbox"/> Peregrine Falcon	R	R	R	R	
Rails					
<input type="checkbox"/> American Coot	C	R	C	O	
Sandpipers					
<input type="checkbox"/> Spotted Sandpipers	U	U	U		
<input type="checkbox"/> American Woodcock	U				
Gulls					
<input type="checkbox"/> Laughing Gull	O	O	O	R	
<input type="checkbox"/> Ring-Billed Gull	C	C	C	C	
<input type="checkbox"/> Herring Gull	U	R	U	U	
<input type="checkbox"/> Lesser Black-backed Gull	O			O	
<input type="checkbox"/> Great Black-backed Gull	O	R	O	U	
Pigeons/Doves					
<input type="checkbox"/> Rock Pigeon	C	C	C	C	B
<input type="checkbox"/> Mourning Dove	A	A	A	A	B
Cuckoos					
<input type="checkbox"/> Yellow-billed Cuckoo	U	U	U		B
<input type="checkbox"/> Black-billed Cuckoo	O	O	O		
Owls					
<input type="checkbox"/> Eastern Screech Owl	O	O	O	O	B
<input type="checkbox"/> Great Horned Owl	C	C	C	C	B
Goatsuckers					
<input type="checkbox"/> Common Nighthawk	O	O	O		
Swifts					
<input type="checkbox"/> Chimney Swift	C	C	C		
Hummingbirds					
<input type="checkbox"/> Ruby-throated Hummingbird	O	C	C		B

Smaller Wading Birds

Seabirds & Gulls

Birds of Prey

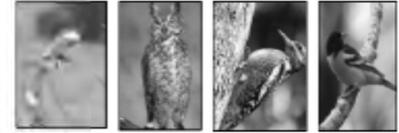
Continue →



Nonpasserine Land Birds

Kingfishers					
<input type="checkbox"/> Belted Kingfisher	C	U	C	O	RB
Woodpeckers					
<input type="checkbox"/> Red bellied Woodpecker	C	C	C	C	B
<input type="checkbox"/> Yellow bellied Sapsucker	O	O	O		
<input type="checkbox"/> Downy Woodpecker	C	C	C	C	B
<input type="checkbox"/> Hairy Woodpecker	U	U	U	U	B
<input type="checkbox"/> Northern Flicker	C	C	C	U	B
Flycatchers					
<input type="checkbox"/> Eastern Wood Pewee	U	U	U		
<input type="checkbox"/> Willow Flycatcher	C	C	U		B
<input type="checkbox"/> Eastern Phoebe	C	C	U		RB
<input type="checkbox"/> Great Crested Flycatcher	C	C	U	R	B
<input type="checkbox"/> Eastern Kingbird	C	C	U		B
Vireos					
<input type="checkbox"/> White-eyed Vireo	A		A		
<input type="checkbox"/> Yellow-throated Vireo	O	R	O		
<input type="checkbox"/> Blue-headed Vireo	O		O		
<input type="checkbox"/> Warbling Vireo	C	C	U		B
<input type="checkbox"/> Red-eyed Vireo	C	C	C		B
Jays & Crows					
<input type="checkbox"/> Blue Jay	A	A	A	C	B
<input type="checkbox"/> American Crow	A	A	A	A	B
<input type="checkbox"/> Fish Crow	A	A	A	A	RB
Swallows					
<input type="checkbox"/> Purple Martin	O	O	O		
<input type="checkbox"/> Tree Swallow	C	C	C		B
<input type="checkbox"/> Rough-Winged Swallow	U	U	U		
<input type="checkbox"/> Bank Swallow	U	U	O		
<input type="checkbox"/> Barn Swallow	C	C	C		B
Titmice					
<input type="checkbox"/> Carolina Chickadee	C	C	C	C	B
<input type="checkbox"/> Tufted Titmouse	C	C	C	C	B

Turn Over Page →



LEGEND TO BIRD LIST

SEASONS

Spring - March, April, May

Summer - June, July, August

Fall - September, October, November

Winter - December, January, February

ABUNDANCE

A- Abundant

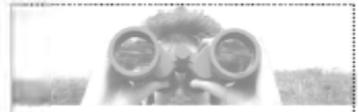
B- Breeding confirmed

C-Common

U-Uncommon

O- Occasional, lucky to see

R- Rare, occurs annually in small numbers



Record your sightings, please.

Date _____ Time in Field _____

Weather Conditions _____

Observers _____

Additional Species _____

Remarks _____

Total Number of Species _____

Optional Information

Name _____

Email Address _____

Return form to: 1306 Bath Rd., Bristol, PA 19007

Original copy can be found here:

http://www.silverlakenaturecenter.org/images/pdfs/bird_list.pdf