FINDING OF NO SIGNIFICANT IMPACT
TOOKANY CREEK FLOOD RISK MANAGEMENT PROJECT
CHELTENHAM TOWNSHIP
MONTGOMERY COUNTY, PENNSYLVANIA
SECTION 205 OF THE 1948 FLOOD CONTROL ACT

OVERVIEW

The United States Army Corps of Engineers (Corps), Philadelphia District has evaluated the construction of various numbers of dry detention basins for the community of Cheltenham Township in Montgomery County, Pennsylvania.

PURPOSE AND SPECIFICATIONS

The authority for this project is Section 205 of the 1948 Flood Control Act (33 U.S.C. 701r), as amended. The purpose of the Section 205 authority is to provide authority to the Corps to plan and construct small flood damage reduction projects that have not already been specifically authorized by Congress. Cheltenham Township is a suburb of Philadelphia and is largely "built-out" or at maximum density according to existing zoning and subdivision ordinances. Although the Township had various periods of settlement from early colonial times to the present, the major development and growth occurred after World War II. With this development came a major change in the hydrological cycle and function, and an increase in impervious surfaces. The impact of this imbalance is apparent in most reaches of the watershed in the form of flooding, severe erosion and sedimentation, slumping banks and poor water quality. In addition, the aging municipal infrastructure and related facilities compound the problems (DCNR 2003). After numerous flood events, the Township approached the Corps for assistance in addressing these issues for the public.

COORDINATION

The project was developed in partnership with the Corps and Cheltenham Township. The draft Environmental Assessment (EA) for the project was forwarded to the U.S. Environmental Protection Agency (EPA), Region III, the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), Pennsylvania Department of Environmental Protection (PADEP), Pennsylvania State Historic Preservation Officer (SHPO), Pennsylvania Game Commission (PGC), Pennsylvania Fish and Boat Commission (PFBC), and all other known interested parties.

In addition, a public notice discussing this project was emailed to members of the public who have signed up to receive copies of Philadelphia District public notices. Currently, there are approximately 350 parties registered on our public notice review email list. Public meetings were conducted in January 2013, February 2014 and May 2015 to provide public outreach regarding the study progress and plan development. Public sentiment is generally in support of the recommended plan; however, some folks are concerned about the footprint(s) of the proposed detention basins.

ENDANGERED SPECIES IMPACT

A Pennsylvania Natural Diversity Inventory (PNDI) search run on the Pennsylvania Natural Heritage Program website indicated that no Federally-listed species are found in the project area and, hence no impacts to Federally listed or proposed species would be anticipated from the proposed project. The search did identify a State Special Concern plant, the field dodder, as possibly being in the project area.

Additional coordination and field site visits will be conducted to determine if this species is found in the project area. In addition, Section 7 consultation with the USFWS, pursuant to the Endangered Species Act of 1973 as amended by P.L. 96-159, will be completed on this project prior to construction.

WATER QUALITY COMPLIANCE

The project is claiming Nationwide Permit #43 (Stormwater Management Facilities) which comes with an automatically issued section 401 Water Quality Certificate from PADEP. In addition, the project will comply with Title 25 Pa. Code Chapter 102, Erosion and Sediment Control and Stormwater Management.

WETLANDS

There will be minor impacts to wetlands as a result of this proposed project. Approximately 0.25 acres of wetlands will be impacted by construction of the proposed West Waverly basin. Mitigation in the form of wetland restoration of approximately 1.0 acre of the West Waverly property will be completed to compensate for this loss.

COASTAL ZONE

Based on the information gathered during the preparation of the EA, the project is not located in the area defined under the Coastal Zone Management Act of 1972. Therefore, the project will not need a Federal consistency determination in regards to the Coastal Zone Management Program of Pennsylvania.

CULTURAL IMPACTS

Based on the results of the Phase IA investigation, additional subsurface archaeological investigations may be required at 8 of the 9 proposed dry detention basins to properly assess their potential to contain undocumented prehistoric or historic archaeological sites. The Corps, in consultation with the SHPO, the Tribes, and other consulting parties will review the results of all investigations and determine any effects to historic properties eligible for or listed on the National Register of Historic Places, and work to avoid, minimize, or mitigate those effects.

Additional architectural assessments may also be required in order to assess the proposed impacts that the recommended plan may have on above ground historic properties. A formal determination of the Area of Potential Effects for historic structures will be coordinated with the SHPO, the Tribes and other consulting parties as part of the Section 106 process.

RECOMMENDATION

Because the EA concludes that the work described does not constitute a major Federal action significantly affecting the human environment, I have determined that an Environmental Impact Statement is not required.

_____ _____

Michael A. Bliss, P.E. Date
Lieutenant Colonel, Corps of Engineers
District Commander

DRAFT

ENVIRONMENTAL ASSESSMENT

TOOKANY CREEK FLOOD RISK MANAGEMENT FEASIBILITY STUDY

CHELTENHAM TOWNSHIP

MONTGOMERY COUNTY, PENNSYLVANIA

SECTION 205 OF THE 1948 FLOOD CONTROL ACT

PREPARED BY:

PHILADELPHIA DISTRICT

U.S. ARMY CORPS OF ENGINEERS

PHILADELPHIA, PENNSYLVANIA 19107

November 2015

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ENVIRONMENTAL ASSESSMENT
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1.0 Project Description

The study area focuses on flood prone areas throughout Cheltenham Township, Montgomery County, PA (Figure 1). Cheltenham is part of the suburban development immediately outside of the City of Philadelphia and is largely at maximum development capacity. Tookany Creek itself is an urbanized tributary of Tacony Creek in the Tacony-Frankford Creek watershed and ultimately part of the Delaware River drainage system. In Cheltenham Township, Tookany Creek is 98% open channel flowing through residential and parklands for more than 95% of its length. Tookany Creek runs through the township and is part of the Tookany/Tacony-Frankford Watershed (TTFW) (Figure 2).

The Tookany Creek watershed is part of the larger TTFW. The TTFW drains approximately 36 square miles from two counties (Philadelphia and Montgomery) and six municipalities (Cheltenham, Springfield, Abington, Jenkintown, Rockledge, and Philadelphia). The stream is termed "Tookany Creek" above the Cheltenham Township/Philadelphia County boundary, "Tacony Creek" above Castor Avenue, and "Frankford Creek" below Castor Avenue until it empties into the Delaware River near the Betsy Ross Bridge. Major stream systems bordering the TTFW include the Pennypack Creek to the east, Delaware River to the south, Wissahickon Creek to the west, and Schuylkill River to the southwest.

Tookany Creek drains the majority of Cheltenham Township (a small portion of western Cheltenham Township drains to the Wissahickon Creek watershed). Since Cheltenham Township is the non-Federal sponsor, the project team focused its analysis on maximizing flood risk management activities within the Cheltenham Township boundary. Therefore, the area of interest (AOI) for this study was delimited above the Cheltenham Township/Philadelphia County boundary near Adams Avenue. The drainage area of Tookany Creek at Adams Avenue is approximately 15.6 square miles.

2.0 Study Authority

The authority for this project is Section 205 of the 1948 Flood Control Act (33 U.S.C. 701r), as amended. The purpose of the Section 205 authority is to provide authority to the Corps to plan and construct small flood risk management projects that have not already been specifically authorized by Congress. A project is accepted for construction only after detailed investigation clearly shows it is engineeringly feasible, environmentally acceptable, and economically justifiable.

3.0 Purpose and Need for Action

As a result of serious flooding in 1955 and in 1967, the Township of Cheltenham undertook a large number of actions within the stream corridor along Tookany Creek and its tributaries to improve flooding problems. These actions included:

- Stream alignment on Tookany Creek upstream of Church Road and Springhouse Lane
- Construction of concrete, stone, masonry, and concrete block channel sections on Tookany Creek upstream of Church Road and Ashmead Road
- Levee construction along Tookany Creek from Rices Mill Road to Brookdale Avenue
- Dredging of Tookany Creek

Despite these earlier actions, flooding and flood-related damages continue to create problems in the study area. Heavy short duration rainfall events, particularly summer thunderstorms, cause most of the flooding problems by inundating low lying areas. This type of flash flooding is characterized by floodwaters that rise and fall very quickly and usually have high flow velocities.

Although the Township had various periods of settlement from early colonial times to the present, the major development and growth occurred after World War II. With this development came a major change in the hydrological cycle and function, and an increase in impervious surfaces. The impact of this imbalance is apparent in most reaches of the watershed in the form of flooding, severe erosion and sedimentation, slumping banks and poor water quality. In addition, the aging municipal infrastructure and related facilities compound the problems (DCNR 2003). After numerous recent flood events, the Township approached the Corps for assistance in addressing these issues for the public.

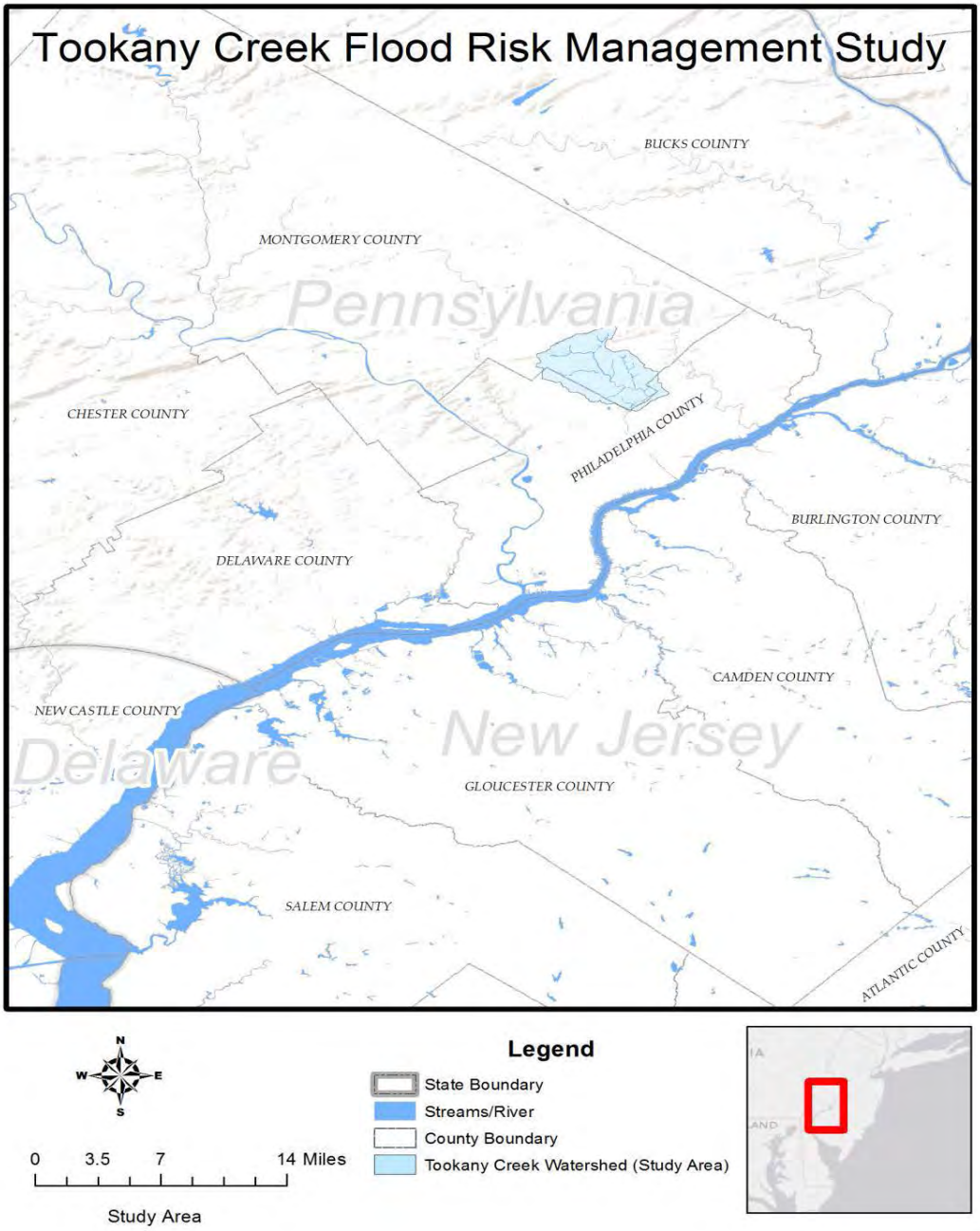

Figure 1. The study area (shaded in blue) in Cheltenham Township located outside of Philadelphia, PA.

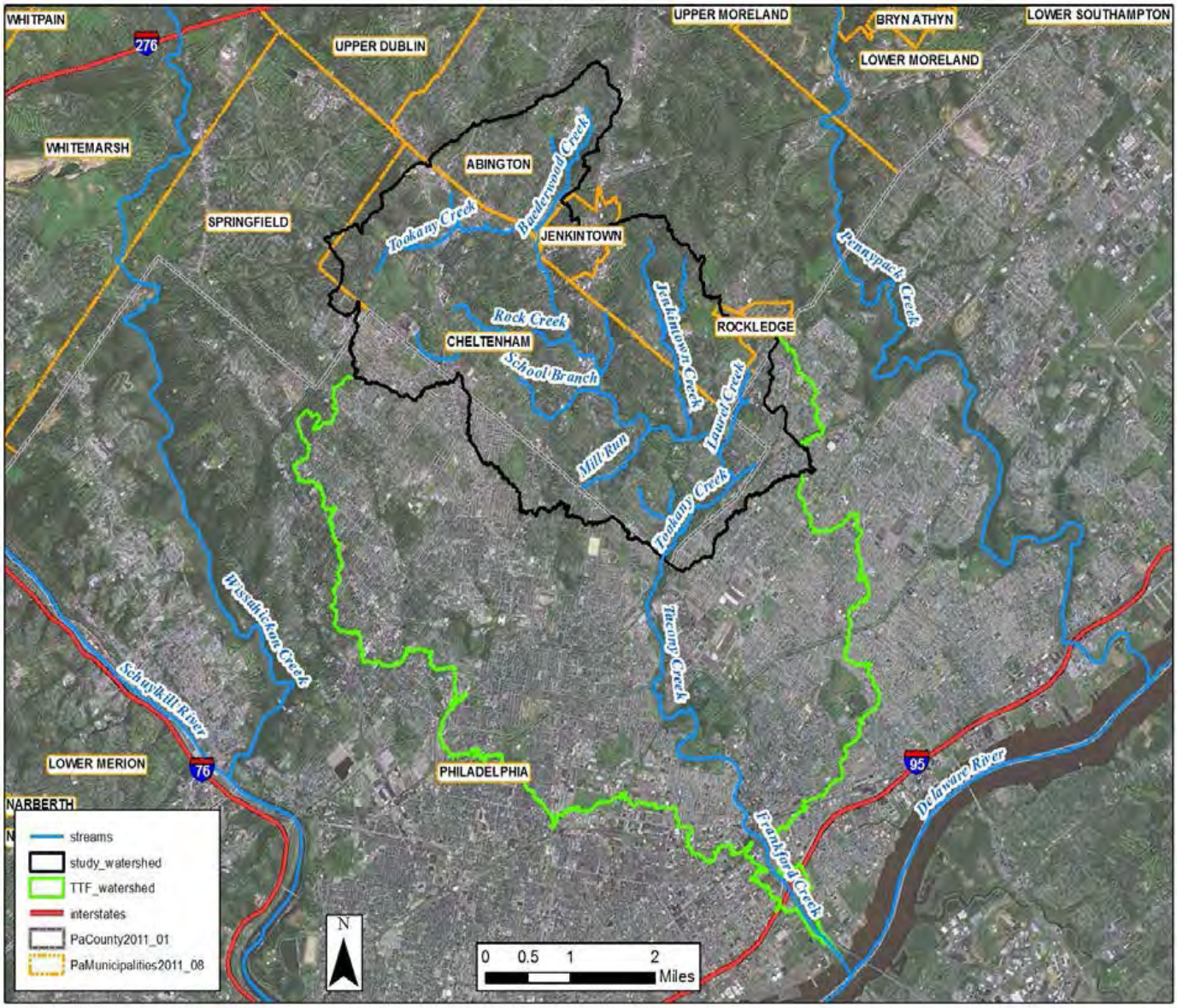

Figure 2: The Tookany/Tacony-Frankford Watershed (highlighted in green).

4.0 Alternative Analysis

The objective of the plan formulation for this study was to define a technically feasible, economically justified and environmentally acceptable solution to the flooding problems in the Tookany Creek watershed in Cheltenham Township. The formulation process involved establishing plan formulation rationale, identification and screening of alternatives, and assessment and evaluation of plans responsive to identified problems and needs. The primary planning objective was to reduce flood hazards, including risks to life safety and damages to private and public infrastructure related to Tookany Creek in Cheltenham Township, PA.

The study had the following constraints:
• Avoid inducing flood damages.
• Avoid and minimize adverse impacts to in-stream or adjacent native habitat.
• Avoid degradation to water quality.

The study had the following considerations:
• There is no known HTRW in the proposed project area; however, HTRW testing will be conducted during the project design phase.
• Impacts to cultural resources and historic structures, sites and features will be minimized
• Upstream impacts and actions from neighboring communities will be incorporated into the planning process.
• Extensive changes to local land use designations and zoning will be limited.

There was an evaluation of measures and alternative plans considered against technical, economic, and environmental criteria. Measures are defined as features or activities that can be implemented to address one or more planning objective. Measures can either be structural or nonstructural. Features are "structural" measures that require construction or assembly on-site, while activities are defined as "nonstructural" actions. Measures are the building blocks of which alternative plans are made.

During the formulation process, structural and nonstructural measures were further subdivided into three categories in order to highlight the hydrologic and hydraulic impacts of the measures:
• Carrying Capacity Modification (CCM) Measures – Improves the creek's conveyance capacity through channel/floodplain modifications without reducing peak volume of water.
o Inlet Modifications
o Bridge Modifications
o Channel Modifications (Levees and Floodwalls)
o Reconnection of Floodplains and Riparian Buffer

• Flow Adjustment (FA) Measures – Reduces water surface elevations through reductions in the peak volume of water.
o Aboveground Storage Areas
o Underground Storage Areas
o Stormwater Controls

o Porous Pavement
o Residential Rain Gardens
o Rain Barrels
o Bio-swales

• Property Protection (PP) Measures – Protects property by modifications to the structure or management practices by reducing the impacts of flood water.
o Flood Proofing
- Floodplain Evacuation/Acquisition
- Elevation
o Floodplain Management
o Flood Warning

All CCM and FA measures were structural, while all PP measures were nonstructural. The four primary criteria used to screen the measures included completeness, effectiveness, efficiency and acceptability, as described below.

Completeness – Completeness is defined as the extent to which an alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of all planned effects. The measures' completeness was evaluated based on the following criteria:
o Minimizes Risk to the Community
o Minimizes Impacts of Flooding
o Incorporates Future Local Actions
o Eliminates Potential for Residual Risk

Effectiveness – Effectiveness is defined as the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities, as established in the planning objectives. The measures' effectiveness was evaluated based on the following criteria:
o Reduces flooding in the project area for various flood frequencies
o Does not induce unmitigated flooding upstream or downstream of the project
o Does not require human intervention outside of normal operation and maintenance

Efficiency – Efficiency is the extent to which an alternative plan is the most cost effective means of alleviating the specified problems and realizing the specified opportunities as established in the planning objectives, consistent with protecting the nation's environment. The measures' efficiency was evaluated based on the following criteria:
o Potential damages avoided exceed implementation cost
o Provides benefits to the general public
o Directly reduces community's financial response to flooding
o Improves conditions at multiple areas

Acceptability – Acceptability is the workability and viability of the alternative plan with respect to acceptance by state and local entities and the public and compatibility with existing laws, regulations, and public policies. The measures' acceptability was evaluated based on the following criteria:
o No adverse environmental impacts, or if necessary, minimal impacts
o Likely to be permitted based on existing laws
o Acceptable to community officials
o Meets USACE definition for FRM (versus stormwater management)
o Enhances community recreational opportunities
o Limited time until benefits realized

The initial screening process for the project included the evaluation of structural and non-structural solutions to the identified problem. In addition, in February 2013, the project team sponsored a Plan Formulation Workshop involving a total of 30 participants representing 13 different agencies and organizations and serving multiple disciplines and programs. During the workshop, participants were assigned to "Breakout Groups" in order to brainstorm specific FRM problem areas and propose potential measures and alternatives to address these problems. Attendees spent approximately 30 minutes brainstorming various structural and non-structural FRM measures and subsequently evaluated the measures based on the Principles and Guidelines' (P&G) and the four evaluation criteria (completeness, effectiveness, efficiency and acceptability).

Based on initial measure screening, the following measures were not carried forward for detailed analysis:
• Inlet Modifications (CCM) – This measure was not carried forward based on a lack of acceptability because inlet modifications are considered to be stormwater management for local stormwater systems, which does not meet the USACE definition for FRM.
• Reconnection of Floodplains & Riparian Buffer (CCM) – This measure was eliminated based on its limited effectiveness. Given the highly urbanized/developed nature of the watershed, there was very little land available to implement such a measure for effective FRM.
• Floodplain Management (PP) – Floodplain management seeks to regulate floodplain uses to minimize current and future damages by controlling construction activities and land use. Based on the highly urbanized nature of the floodplain, it would not be an effective measure due to the limited opportunity for floodplain management to effectively address the existing flood inundation problems.
• Flood Warning (PP) – The fundamental objective of a flood warning and preparedness program is to alert residents and thereby save lives and reduce property damages by allowing the removal of items from the floodplain. In this case, drainage area characteristics result in a rapid rise of Tookany Creek waters and thereby there would be little time for homeowners to take effective protective action.
• Underground Storage Areas (FA) – Underground storage was not carried forward based on a lack of efficiency or cost effectiveness. Based on the anticipated construction costs for underground storage areas, it was determined that the potential implementation cost would potentially exceed the value of damages avoided.
• Stormwater Controls (FA) – This measure was not carried forward based on a lack of acceptability because it is considered an administrative and maintenance program that would fall outside of the USACE definition for FRM.

• Porous Pavement, Residential Rain Gardens, Rain Barrels & Bio-swales (FA) – While these are great measures to increase infiltration, improve water quality and capture the "first flush" from frequent storm events, they lack the completeness and effectiveness necessary to provide a large volume or peak flow rate reduction. These particular measures do not typically store large volumes of runoff for less frequently-occurring events.

The measures carried forward for more detailed analysis are listed below:
Structural Measures
• Bridge Modifications – CCM
• Channel Modifications – CCM
• Aboveground Storage Areas – FA

Non-structural measures
• No Action
• Flood Proofing (Floodplain Evacuation/Acquisition and Elevation) - PP

4.1 Structural Measures

Bridge Modifications (CCM): Multiple existing bridge and culverts span Tookany Creek throughout Cheltenham Township. The vast majority of these crossings affect the movement of water by constricting flows at the crossing, resulting in elevated water surface elevations (WSELs) upstream of the bridge that can negatively impact infrastructure, residences and various properties. Bridge modifications to alleviate the constricted flows were evaluated and compared against the without project conditions.

Bridge modifications consist of raising, removing, or replacing existing bridges in order to alleviate backwater effects. Three bridges/culverts were removed from the model geometry and compared against the without project conditions to determine their potential consequences. These included the Easton Road culvert, the SEPTA 11.22 culvert, and the Rock Creek culvert at Widener Road.

While alleviating the hydraulic constrictions via bridge modifications could potentially lead to a significant reduction in the upstream water surface elevation, it doesn't reduce the downstream flooding due to prevailing subcritical flow conditions. In fact, it may actually increase downstream flow rates and water surface elevations. In addition, bridge modifications may not only be expensive, but also have acceptability issues related to project approvals from adjacent landowners and transportation authorities. Therefore, bridge modification was not carried forward for further analysis.

Channel Modifications (CCM):
• New Levee/Floodwall: Levees and floodwalls are types of flood protection barriers. A levee is typically a compacted earthen structure; a floodwall is an engineered structure usually built of concrete, masonry, or a combination of both. Land requirements necessary to construct floodwalls or levees around each structure, or multiple structures, are greater than what is available. Additionally, the need for human intervention to close any openings such as at a driveway makes this alternative less desirable. Further, one of the planning constraints in this study is to avoid and minimize adverse impacts to in-stream or adjacent native habitat;

however, levees create adverse environmental impacts by disconnecting the stream from the adjacent floodplain.

Additional consideration for levee construction was given in terms of evaluating potential new levee construction based on parametric cost estimates contained in the North Atlantic Coast Comprehensive Study (NACCS). The NACCS estimated a total first construction cost of $8,333,329 per mile of levee construction with an annual cost of approximately $77 per linear foot. This assumes levees of 6 to 16 feet high, which is consistent with the existing levee along Brookdale Avenue. The mainstem of Tookany Creek within the study area is in excess of 6 miles in length (12 miles assuming levee construction on both sides of the creek). Assuming 1% ACE protection, the potential annual benefit is $1,600,120. To obtain unity or greater, the recommended plan would need to include approximately 3.9 miles or less of levee construction. Considering the existing conditions within the community, levee construction was considered not cost effective as more than 3.9 miles of levee would be required to provide protection for the community.

This measure has been screened out based on efficiency (not cost effective) and lack of public acceptability.

• Raise Levee(s): As part of the alternative evaluations, consideration is often given to the applicability of increasing the height of existing leeves and floodwalls as this typically has the least impact on existing real estate and minimal adverse environmental impact. Unfortunately, raising a levee could also require raising several downstream bridges adding greatly to the complexity of the design and construction of the project, and significantly increase the cost. Another consideration is that this would simply move the flooding downstream causing damage in areas that currently do not experience problems. In addition, as the height of a levee or floodwall increases, so does the depth of water that can build up behind it. Greater depths result in greater water pressures, so taller levees and floodwalls must be designed and constructed to withstand the increased pressures. Meeting this need for additional strength greatly increases the cost of the levee or floodwall.

Furthermore, the project team evaluated a third-party design for a raised levee alternative along Brookdale Ave and determined this alternative was not effective at reducing flood damages within the community. As way of background, there is one existing levee in this study area. The approximately 1,000-ft long levee protects a single neighborhood within the community and only represents less than 20% of the structures subject to flooding from the 1% chance annual flood (see photo on cover page). Existing condition modeling estimates the levee currently provides protection between a 50 and 100-year level of protection. During peak flood periods, the levee is flanked and the structures the levee is attempting to protect become flooded. As an example, according to the Pennsylvania Department of Environmental Protection, within a two hour period following Tropical Storm Allison in 2001, approximately 63 acre-feet of water ponded on the Brookdale Ave side of the levee. Therefore, the project team screened out this alternative prior to completing an economic analysis due to its lack of effectiveness demonstrated through engineering analysis. The analysis of the third-party design was completed at the request of the non-Federal sponsor and the results were shared with community officials.

Aboveground Storage Areas (FA): The storage areas considered during the plan formulation process included surface water detention and retention basins. Each type of basin is intended to allow large surface

water flows to enter, while limiting and controlling the rate of release to downstream receiving waters. Essentially, the basins function to temporarily hold back the peak flow during storm events and slowly release the ponded water to the downstream receiving waters.

The primary difference between detention and retention basins is that retention basins have a permanent pool of water, while detention basins only contain standing water during flood events. For the purposes of this study, retention basins were eliminated from further consideration based on the following:
• A permanent pool of water reduces the flood storage capacity of the basin (effectiveness)
• There are potential public safety issues with a permanent pool of water (acceptability)
• There are potential vector issues associated with standing water in a permanent pool of water (acceptability)

Detention basins are areas installed on or adjacent to tributaries of rivers, streams, lakes or bays to provide FRM and in some cases protect against downstream erosion by storing water for a limited period of time. These basins are often called "dry ponds," "holding ponds" or "dry detention basins" since no permanent pool of water exists. During site visits and subsequent review of aerial imagery, thirteen (13) potential detention basins were initially identified. The 13 basins were divided into four major groups based on their location within the watershed:
• Upper Tookany Creek Basins – Doe Lane, West Waverly Road, Church Road, Limekiln Pike and Grove Park
• Middle Tookany Creek Basins – George Perley Bird Sanctuary and Highland/Mt. Carmel
• Baederwood Creek Basins – Baeder Road, Highland East and Highland West
• Rock Creek Basins – Washington Lane, Greenwood and Limekiln/Ogontz

The detention basin groups were screened by the project team to determine what basins or combination of basins would provide the greatest FRM benefits. Initially, the basins in the Middle Tookany Group were screened out based on limited effectiveness, efficiency and acceptability. Specifically, hydrologic results from the model indicated that the George Perley Bird Sanctuary basin location had a relatively small storage capacity versus the upstream drainage area. This basin would have minimal effectiveness because it would likely fill up prior to the arrival of the peak flow; therefore, the peak flow would simply pass over/through the storage area with little or no attenuation. At the Highland-Mt. Carmel basin location, basin construction may necessitate the removal of a large portion of the adjacent park and the SPS parking lot. According to Cheltenham Township officials and residents, these construction impacts are not acceptable at this time. In addition, to provide sufficient storage relative to the upstream drainage area, substantially tall and long floodwalls would need to be placed along numerous bordering properties to provide sufficient storage. Not only would this concept have public acceptability challenges, but also such floodwalls would be costly and present potential safety hazards.

Along Rock Creek, the Limekiln-Ogontz and Greenwood storage areas were screened out as well. The Limekiln-Ogontz storage area may not be publicly acceptable because there is a potential development project occurring within the proposed footprint of this basin. Also, there is a Philadelphia Water Department (PWD) Combined Sewer Outfall (CSO) that daylights adjacent to the proposed Limekiln-Ogontz storage area, which would present potential environmental and construction issues. The Greenwood

storage area would not be efficient or effective because it not only has a small footprint, but also it receives water from a very small drainage area.

After initially screening out the Middle Tookany Creek basins and two of the three detention basins along Rock Creek, the remaining 9 basins were carried forward for more detailed analysis. The Upper Tookany System, the Baederwood Creek System and the Rock Creek System (Washington Lane only) were each evaluated as individual systems by routing water through the basins and examining the flow reduction at their outlet and further downstream. In addition, the basin systems were evaluated in series through various basin system combinations, as discussed further below.

4.2 Non-structural

Flood proofing: Flood proofing measures consist of structural changes and adjustments incorporated into new construction or adopted to existing structures to reduce flood damages. Flood proofing techniques are aimed at reducing damage by several methods: control infiltration of floodwater by raising structures above flood levels (**Elevation**), constructing individual levees around structures, and/or by providing permanent or temporary watertight covers for all openings. Due to the frame construction of many flood prone dwellings in the study area, they are not capable of sustaining the increased hydrostatic pressures when floodwater is prevented from entering the structure.

The Corps quantified the potential benefits and costs associated with elevating the 174 structures within the 1%ACE. Applying a parametric cost for structure elevation/flood-proofing over a 25-year period of analysis (with a 3.125% interest rate), a total cost of $2,084,858 was computed for this measure. HEC-FDA version 1.4 was used to calculate project benefits ($1,600,120) for elevating/flood-proofing the 174 structures. Based on these calculations, the BCR for this alternative is 0.77 with -$484,738 in Annual Net Benefits. Additionally, there are a number of other factors that make this measure impractical and unacceptable:

- Utility lines would have to be removed and their supporting systems relocated in some other part of the structure at a higher elevation
- Utility lines would have to be rerouted and reconnected to relocated support systems
- Basement area would need to be backfilled to create a crawl space
- The structure itself would require raising in placing and the exposed concrete masonry unit walls would need to be reinforced internally with steel or a new reinforced cast-in-place concrete foundation wall
- To raise the structure in place, roof framing that connects the house to the garage would be demolished.

  Also, estimated detour and vehicle damage costs would not be substantially reduced by flood proofing techniques.

Permanent Evacuation of the Floodplain: Evacuation of the floodplain permanently solves the problem of future flood damages. This type of project involves the acquisition of the land and structure and the subsequent demolition of the structure. The land is then restricted against future development preventing any future flood damage. The community can retain the property for public use, such as a park, or as an environmental sanctuary, such as a wetland. These projects rely on annual estimated flood damages exceeding the market value for an equivalent home not located in the floodplain.

The industrial structure at 1 North Avenue is owned by Mack Electric Devices, a certified service-disabled veteran owned small business. This structure was identified for a potential non-structural solution. Flood-plain evacuation analysis, commonly referred to as "buy-out" analysis, was conducted in accordance with CECW-PD, and dated 22 January, 2001. The structure was analyzed to understand the benefits of removing the structure from the floodplain relative to the costs incurred to do so.

As discussed in the Economics Appendix, The floodplain evacuation analysis for 1 North Avenue yields a benefit-to-cost ratio of 0.34. The net benefits are calculated as the difference between the benefits and the flood-free land cost. Table 1 displays the pertinent data under scrutiny. Because the benefits do not exceed the costs, it is not recommended to consider the property for flood-plain evacuation.

Table 1: Floodplain Evacuation - Summary of Benefits and Costs

Benefits	$85,000
Flood-Free Land Cost	$253,000
Net Benefits	-$168,000
BCR	**0.34**

After completing the initial measures screening process as described above, the Corps continued to formulate alternative plans with different combinations of dry detention basin measures. Based on the measure combinations, 4 different action alternatives and 1 no-action alternative were compared and evaluated to determine the recommended plan. The following alternatives were considered for the project:

- Alternative 1: No Action Plan
- Alternative 2: The Upper Tookany Creek Plan
- Alternative 3: The Baederwood Creek Plan
- Alternative 4: The Comprehensive Plan
- Alternative 5: The Rock Creek Plan

For each of the action alternatives, the proposed dry detention basin locations are low-lying, open-space areas that would require minimal excavation and construction costs to store water. Reduced excavation will not only improve the project economics, but also help to minimize environmental and cultural impacts. Instead of large-scale excavation, an embankment will be constructed on the downstream end of the dry detention basin to capture and control flows. Such a structure will include interlocked gabion baskets and earthen material that allow flows up to a non-damaging level to pass unimpeded. As the inflow rate increases, flow through the gabion basket conduit structure will be "choked" and a pool will start to form behind the embankment. If inflows are really high, the structure can be safely overtopped without failing by "keying" it into a foundation, such as solid rock. Once the downstream flows have returned to a low level and inflows have dropped, the stored water will be slowly released through the conduit and the area will

return to pre-storm conditions. An overview of all nine areas being considered for dry detention basins can be seen in Figure 3.

- Alternative 1: No-action

The "no action" alternative would not address the continuing flood risk management problems in Cheltenham Township and; therefore the Corps does not consider this as a viable alternative. As per National Environmental Policy Act guidelines, the Corps will keep the "no action" alternative as part of the plan formulation process.

- Alternative 2: The Upper Tookany Creek Plan

Five potential storage basins were evaluated at different scales/combinations: Doe Lane, West Waverly Road, Church Road (Arcadia University), Limekiln Pike and Grove Park. One combination which included all five basins functioning as a system had a positive benefit /cost ratio and positive net benefits (Figure 4).

- Alternative 3: The Baederwood Creek Plan

Three potential storage basins were evaluated at different scales/combinations: Highland West, Highland East and Baeder Road. Each storage area in this group is entirely located within Abington Township. The first combination included all three basins functioning as a system (Figure 5). The different combinations yielded a positive benefit / cost ratio and positive net benefits.

- Alternative 4: The Comprehensive Plan

Nine potential storage areas were evaluated at different scales/combinations: Doe Lane, West Waverly Road, Church Road (Arcadia University), Limekiln Pike, Grove Park, Highland West, Highland East, Baeder Road and Washington Lane. This combination includes all nine basins functioning as a system. (Figure 3). It had a positive benefit / cost ratio and positive net benefits (Figure 5).

- Alternative 5: The Rock Creek Plan

Alternative 5 consists of one dry detention basin along Rock Creek (a tributary to Tookany Creek): Washington Lane (Figure 6). This plan did yield a positive benefit / cost ratio and positive net benefits; however, Alternative 4 had higher net benefits.

In addition, if federal and non-federal funds are available, the proposed dry detention basins may also include rain gardens within their footprint to provide ancillary ecosystem restoration benefits in addition to their flood risk management (FRM) function. A rain garden is an excavated shallow surface depression planted with specially selected native vegetation to treat and capture runoff. Rain gardens can improve FRM through water quantity reduction (via evapo-transpiration and/or ground infiltration), while providing ancillary water quality benefits. Rain gardens also provide ecosystem restoration benefits by mimicking native ecosystems through species diversity, density and distribution of vegetation, and the use of native species, resulting in a system that is resistant to insects, disease, pollution and climatic stresses. It is important to note that rain gardens are not to be confused with constructed wetlands or wet ponds which permanently pond water. Rain gardens are best suited for areas with at least moderate infiltration rates (more than 0.1 inches per hour).

To further illustrate the alternatives considered for the project, a summary of the three most viable (positive net benefits) alternatives can be found in Table 1. In addition, the anticipated benefits and potential issues for each alternative are also highlighted in this table.

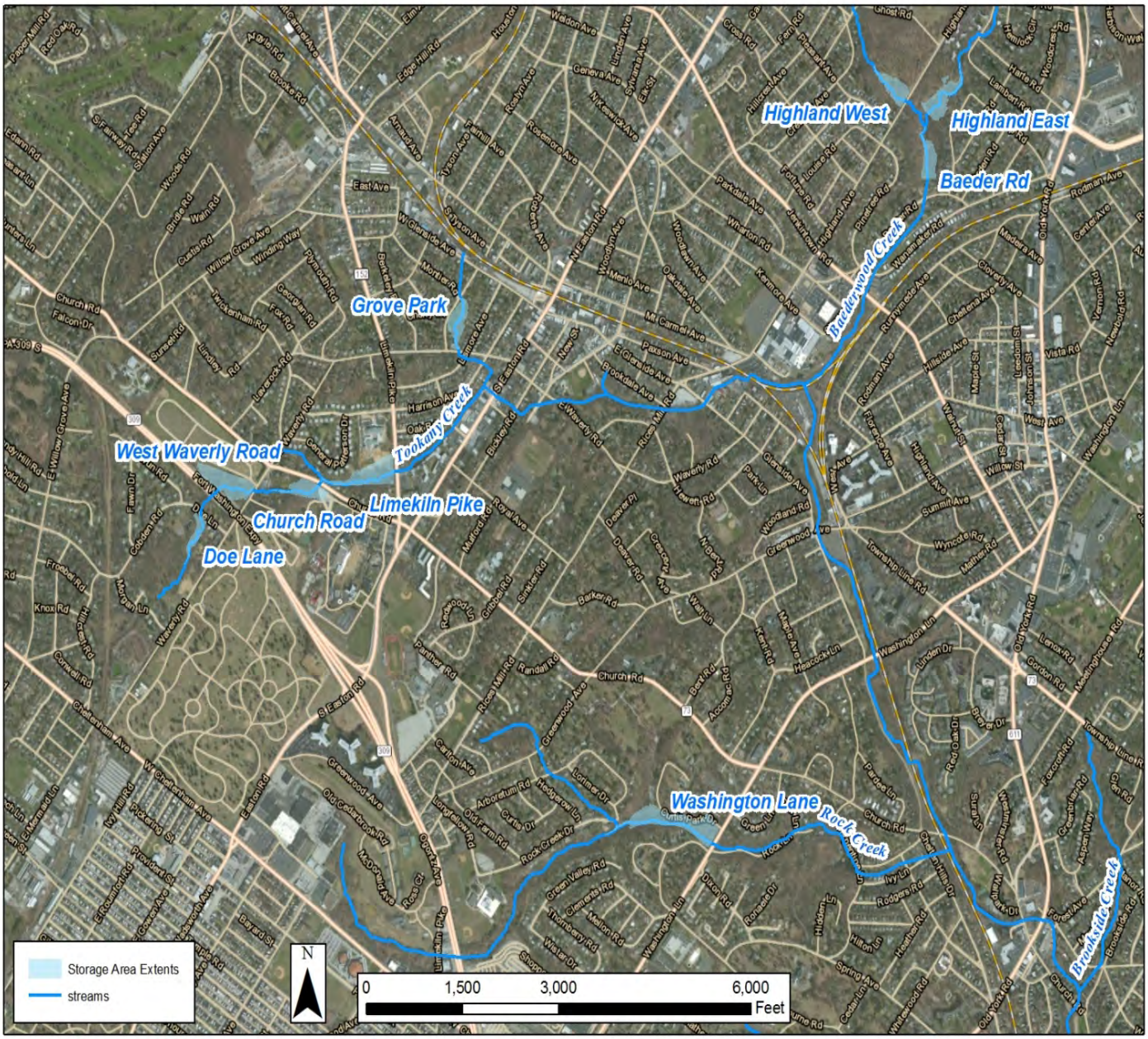

Figure 3. Overview of all nine areas being considered for dry detention basins.

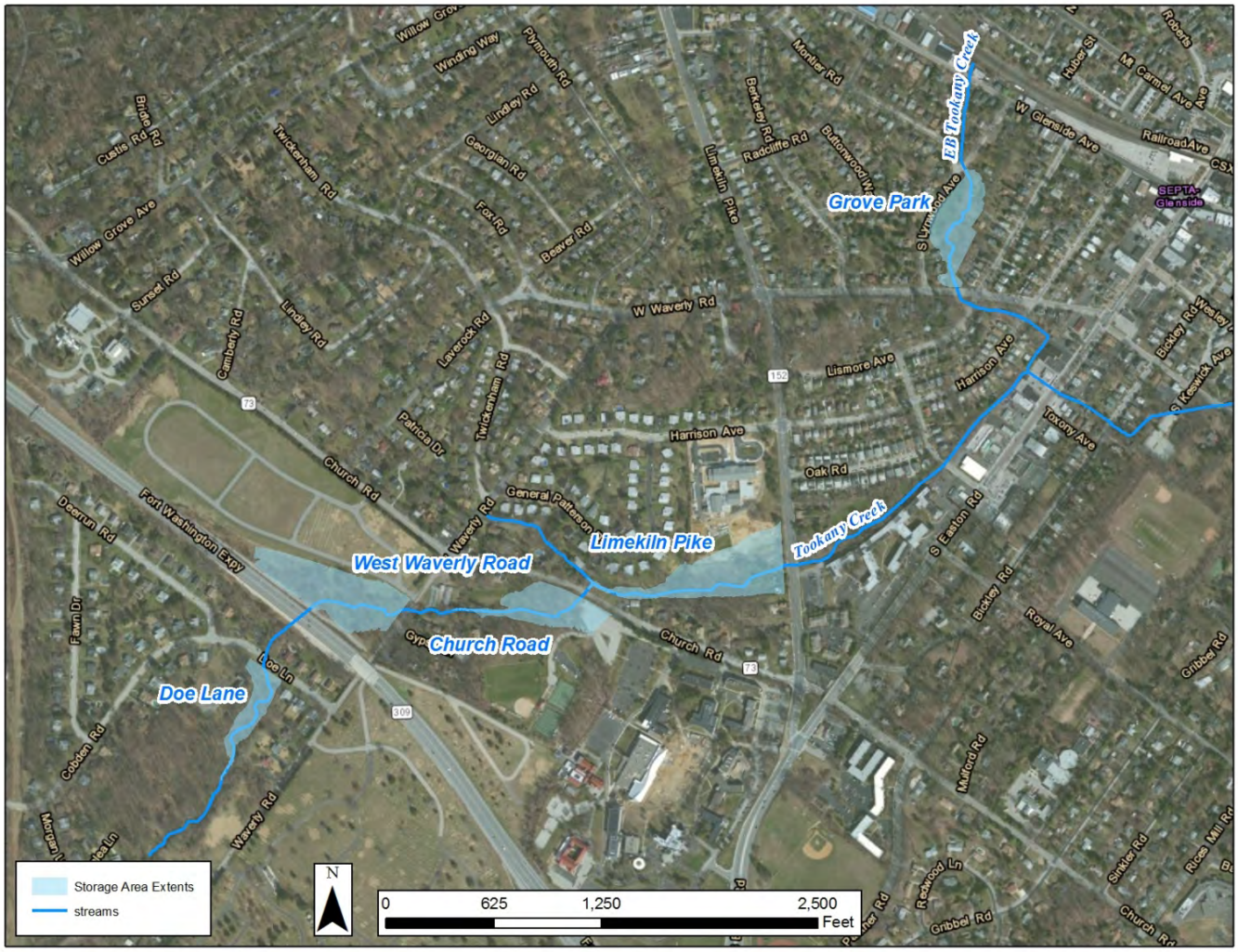

Figure 4. A close up of five of the areas being considered for dry detention basins.

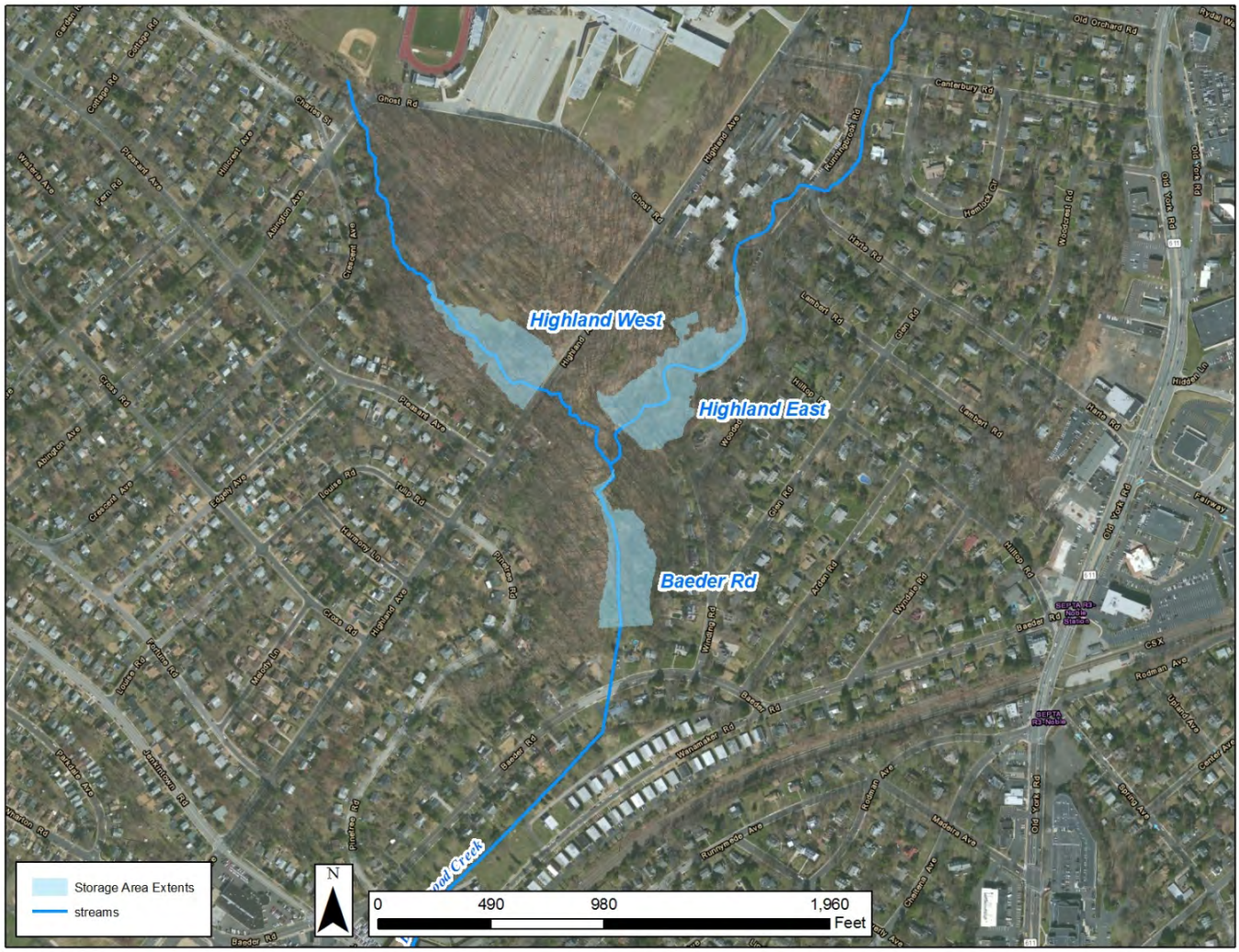

Figure 5. A close up of three of the areas being considered for dry detention basins.

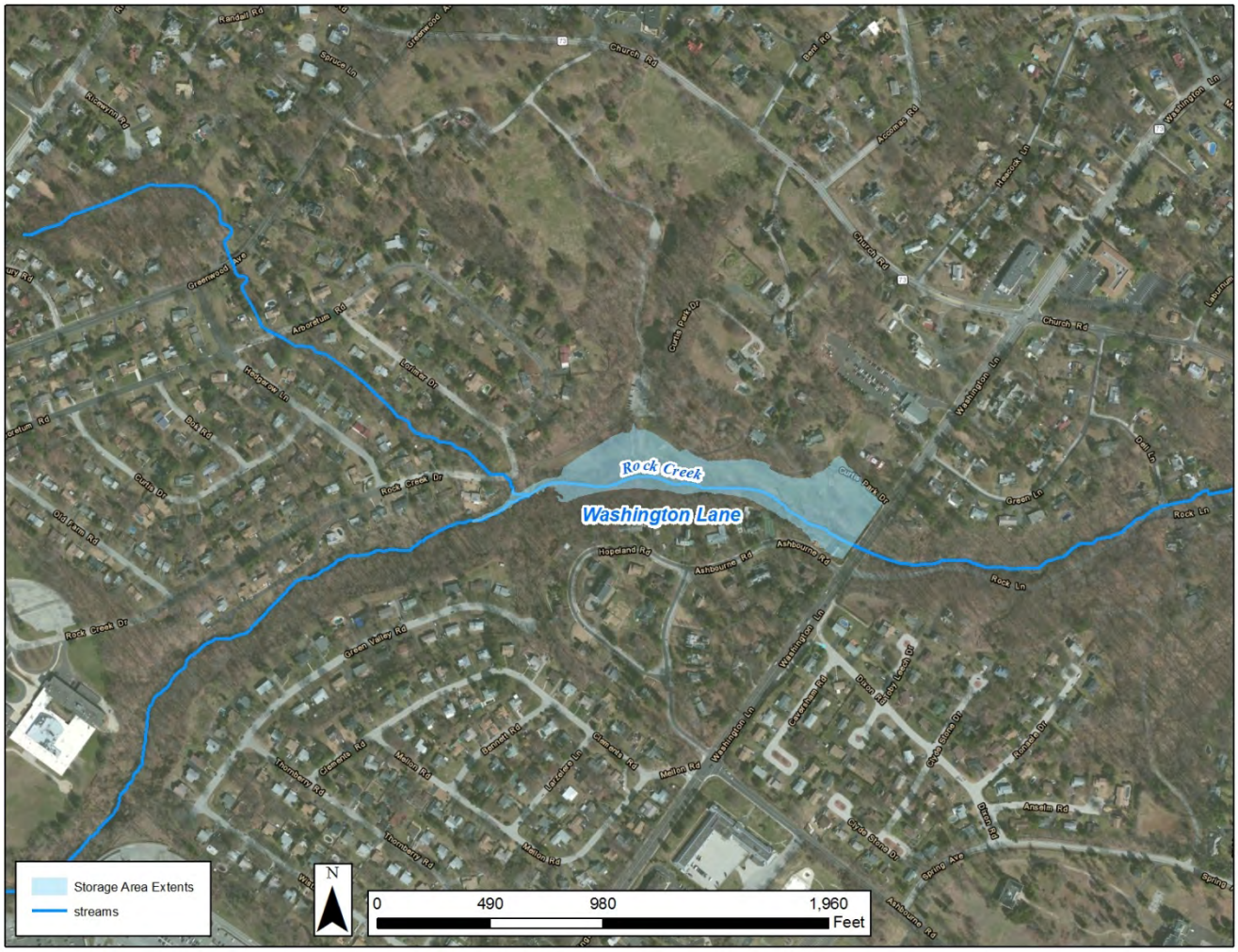

Figure 6. A close up of the Washington Lane area being considered for a dry detention basin.

Table 2. Summary for Alternatives with a Benefit to Cost Ratio Greater than 1.0.						
	Alternative 1	**Alternative 2a**	**Alternative 3a**	**Alternative 3b**	**Alternative 4**	**Alternative 5**
	No Action	The Upper Tookany Creek Plan (D1)	The Baederwood Creek Plan (D9)	The Baederwood Creek Plan (D12)	The Comprehensive Plan	The Rock Creek Plan
Benefits	● None	• Provides a BCR greater than 1.0 and positive net benefits • BCR = 1.41/net benefits = $30,000 • Will provide reduced storm damages for the local community for multiple percent annual chance exceedance	• Provides a BCR greater than 1.0 and positive net benefits • BCR = 1.41/net benefits = $30,000 • Will provide reduced storm damages for the local community for multiple percent annual chance exceedance	• Provides a BCR greater than 1.0 and positive net benefits • BCR = 2.69/net benefits = $44,000 • Will provide reduced storm damages for the local community for multiple percent annual chance exceedance	• Provides a BCR greater than 1.0 and provides the highest net benefits. • BCR=3.02/ net benefits = $725,000 • Will provide reduced storm damages for the local community for multiple percent annual chance exceedance	• Provides a BCR greater than 1.0 and positive net benefits. • BCR=2.25 / net benefits = $110,000 • Will provide reduced storm damages for the local community for multiple percent annual chance exceedance

		(ACE) storm events,	(ACE) storm events,	(ACE) storm events,	(ACE) storm events,	(ACE) storm events,
Potential Issues	• Will not prevent damages associated with frequent storm events.	• Real estate acquisition. • Potential historic/cultural resources issues associated with proposed basin areas.	• Real estate acquisition. • Potential historic/cultural resources issues associated with proposed basin areas.	• Real estate acquisition. • Potential historic/cultural resources issues associated with proposed basin areas.	• Real estate acquisition. • Potential historic/cultural resources issues associated with proposed basin areas.	• Real estate acquisition. • Potential historic/cultural resources issues associated with proposed basin areas.
Maintenance Costs (estimate)	No cost	Medium	Medium	Medium	High	Medium
Wetland Impacts (acres)	0	0.25	0	0	0.25	0

Construction Cost (estimate)	No cost	$5.4	$1.786M	$626,000	$9.2 M	$900,000
Conclusion	Not recommended	Not Recommended	Not Recommended	Not Recommended	Recommended	Not Recommended

4.3 Selected Plan

Alternative #4 (the Comprehensive Plan) is the tentatively selected plan. This alternative was selected for various reasons, including economics, real estate, and environmental. Specifically, this alternative provides the greatest net benefits for the community and has very minor environmental impacts. See below for more details:

Preliminary Design Assumptions

1.) Dry detention basins will be constructed using gabion baskets (backside – downstream facing) and earthen embankments (frontside – upstream facing) (Figures 7 and 8). Additional conceptual designs for the 9 basins can be found in Appendix A.

2.) All excavated material will stay onsite and be used in construction of the embankments.

3.) An Environmental Data Resources (EDR) data search identified no known sources of HTRW for the proposed basin locations. Future testing will be conducted during the geotechnical subsurface investigation during the design phase.

4.) Additional clean material will be needed to be brought in for specific basins.

5.) Embankments will be planted with native grasses and shrubs for wildlife habitat and aesthetics. Some examples of native plants that will be considered for the embankment will be grasses {big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*), *and* Indiangrass *(Sorghastrum nutans);* and shrubs {Black chokeberry (*Photinia melanocarpa*), *New Jersey tea* (*Ceanothus americanus*), and Southern arrowwood *(Viburnum dentatum*)}.

6.) Dry detention basins will hold water for approximately 24 hrs (1% storm or 100 year storm) before draining and the basin area returning to the normal creek width.

7.) Dry detention basins may also include rain gardens planted with native species within their footprint to provide ancillary ecosystem restoration benefits, as well as to improve the aesthetics of the basins to the local community. This additional work will be dependent on Federal and non-federal funding availability for the project.

8.) Box culverts used for each basin structure will be set at a low enough elevation that they will not impede fish and other aquatic species movement within the creek . In addition, ”bottomless or natural bottom” culverts may be used within the detention structures. The applicability of “bottomless” culverts to the project will be determined in the next phase of the project design {Preconstruction Engineering and Design (PED)}.

9.) All basins will have an appropriately sized low flow channel that mimics the natural stream channel as much as possible.

10.) As necessary, real estate easements will be acquired for all basins.

11.) The size of the basin will be site specific and each basin will be different in size.

Figure 7. Conceptual design for the proposed West Waverly basin.

Figure 8. Conceptual design for the proposed Grove Park basin.

5.0 Existing Environment

The watershed is severely urbanized and offers limited open space and ecologically valuable habitat for fish and wildlife. Most of the project area has been built out and impacts from this urban development have severely impacted the streams and associated processes (sediment transport, etc.) of these aquatic systems.

The PWD conducted a comprehensive, multi-year assessment of the Tookany/Tacony-Frankford Watershed. Results of the watershed-wide assessment suggests that sometimes during dry weather periods, bacterial contamination of the Tookany/Tacony-Frankford's waters prevents the achievement of water quality standards that would support swimming or other forms of primary contact recreation in the creek. Stream aesthetics, accessibility, and safety are compromised due a number of factors, including litter and illegal dumping, trash from stormwater discharges, channelization of portions of the stream, and bank deterioration along stream corridors. The existing aquatic and riparian habitats have been degraded by urban runoff, limiting the diversity of fish and other aquatic life and preventing the development of healthy living resource conditions necessary to support recreational activities such as fishing. Wet weather water quality is limited by bacteria discharged from combined and separate storm sewers. High rates of urban runoff cause flooding during larger storms, and flood flows that erode the stream banks and bottoms and have subsequently exposed and compromised utility infrastructure (PWD 2005).

5.1 Air and Water Quality

Air Quality

Ambient air quality is monitored by PADEP and is compared to the National Ambient Air Quality Standards (NAAQS) throughout the state, pursuant to the Clean Air Act of 1970. Six principal "criteria" pollutants are part of oxides of nitrogen (NO_x), particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb). Stationary sources include power plants that burn fossil fuels, factories, boilers, furnaces, manufacturing plants, gasoline dispensing facilities, and other industrial facilities. Mobile sources include vehicles such as cars, trucks, boats, and aircraft.

The Tookany Creek Flood Risk Management Project is located within Montgomery County, which is included in the Philadelphia-Wilmington-Atlantic City Nonattainment Area, PA-NJ-MD-DE (Philadelphia-Wilmington-Atlantic City Area) moderate ozone nonattainment for the 1997 8-hour ozone (oxides of nitrogen [NOx] and hydrocarbons [HC]) NAAQS. In addition, in April 2005, EPA designated the Philadelphia-Wilmington Area, PA-NJ-DE (Philadelphia-Wilmington Area) as a nonattainment area for the 1997 $PM_{2.5}$ NAAQS; and this area was subsequently designated in December 2009 as a nonattainment area for the 2006 24-hour $PM_{2.5}$ NAAQS.

Water Quality

The Tookany/Tacony-Frankford Watershed is approximately 32 linear miles and drains approximately 33 square miles, encompasses areas of Philadelphia and Montgomery Counties, with all or parts of five

municipalities, including Abington, Cheltenham, Jenkintown, Rockledge, and Springfield (PWD Website 2013).

The primary water quality concerns were identified as elevated concentrations of some metals and Total Suspended Solids (TSS), particularly during wet weather events, high fecal coliform counts, particularly in wet weather, and low dissolved oxygen (DO) in downstream areas of the Tookany/Tacony–Frankford creek. The primary sources of contaminants are wet weather flows from separate and combined sewers, and some sewage flows during dry weather due to the connection of waste lines to a separate storm sewer, or to leaking combined sewer lines.

Stormwater running off of impervious areas can carry pollutants to the creek through the storm sewers and, during overflow events, through the combined sewer. Stormwater-borne pollutants can include litter, nutrients, metals, fecal coliform from pet wastes, pesticides used on lawns and sediment. Non-point source pollution poses a threat to the water quality in the Tookany/Tacony–Frankford watershed because of the volume of stormwater runoff and the concentrations of pollutants found in the stormwater (PWD 2005).

Additional water quality issues stated in PWD's Tookany/Tacony-Frankford Integrated Watershed Management Plan (2005) included:

- Water quality concerns including high fecal coliform during dry weather
- Potential dry weather sewage flows in separate sewered areas
- Trash-filled, unsightly streams that discourage residential use
- Degraded aquatic and riparian habitats
- Loss of wetlands
- Channelized stream sections
- Limited diversity of fish and other aquatic life
- Periodic, localized occurrences of low dissolved oxygen in downstream areas
- Wide diurnal swings in dissolved oxygen

There were two PWD sampling locations near the project area (TF975 and TF1120) and these are part of their annual monitoring program for water quality.

Site TF975

This site experienced water quality criteria exceedances frequently in both dry and wet weather. Indicators of dry weather sewage inputs (*e.g.*, fecal coliform bacteria concentration, *E.coli*) were highest among sites upstream of combined sewer outfalls. However, site TF975 is located within a small park in Cheltenham Township, so dog feces must be considered a potential source of indicator bacteria (PWD 2005).

Site TF1120
Site TF1120 is located just downstream of a straightened and recently channelized portion of Tookany Creek that runs parallel to the Southeastern Pennsylvania Transportation Authority (SEPTA) Railroad tracks. Gabion baskets were installed in 2004 to reinforce the railroad bed. Cheltenham Township also replaced many water mains in the vicinity of this site. Continuous water quality data do not indicate Dissolved Oxygen (DO) stress at this site and there were few violations of WQ criteria at this site overall.

5.2 Wetlands

According to the USFWS' National Wetlands Inventory (NWI), there is one wetland (West Waverly Road site) found within the project area. Field visits also confirmed the presence of the wetland at this location. The NWI maps categorize the wetland as PSS1/EM5C or a palustrine scrub-shrub / common reed (*Phragmites australis)* dominated emergent wetland of approximately 4 acres. The field visit also confirmed this categorical information, as well as documenting the large presence of another invasive species, Japanese knotweed *(Fallopia japonica)*. No other wetlands were identified in the project area.

5.3 Aquatic Resources

Poor instream habitat has been identified as both a problem itself, as well as the cause of biological impairment found throughout the watershed. Stream channels in the Tookany/Tacony-Frankford Watershed exhibit many effects of urbanization, including overwidening, erosion, loss of sinuosity, loss of the floodplain, loss of stream connection, channel modification, and loss/degradation of aquatic habitat. Biological monitoring indicates that the whole Tookany/Tacony-Frankford Watershed suffers from impaired aquatic habitat and does not meet its designated use as a warm water fishery. As a result, the whole length of the nontidal Tookany/Tacony-Frankford Creek and its tributaries were listed in PA DEP's 303d list of impaired waters in 1999. This impairment is due to severe water flow fluctuations, habitat alteration, point and non-point source pollution from urban development, hydromodification, and combined sewer overflows. The biological community of the Tookany/Tacony-Frankford Watershed is heavily impacted by its urban surroundings (PWD 2005).

Fish

During the 2004 Tookany /Tacony-Frankford Watershed fish assessment, PWD collected over 9000 individuals representing 17 species in 7 families. Blacknose dace (*Rhinichthys atratulus)* and mummichog (*Fundulus heteroclitus),* two taxa extremely tolerant of poor stream conditions, were most abundant and comprised over half (56%) of all fish collected. Other common species included white sucker (*Catostomus commersoni*), satinfin shiner (*Cyprinella analostana*), banded killifish (*Fundulus diaphanus*), and swallowtail shiner (*Notropis procne*). Five species made up greater than 80% of the total fish biomass, with redbreast sunfish (*Lepomis auritus*) and American eel (*Anguilla rostrata*) contributing 42% of the biomass. Though community composition varied between sites, the fish assemblage in Tookany/Tacony-Frankford Watershed was highly skewed towards a pollution tolerant, generalist feeding community (PWD 2005). There were two PWD sampling locations near the project area (TF975 and TF1120). See Figure 9 for the locations.

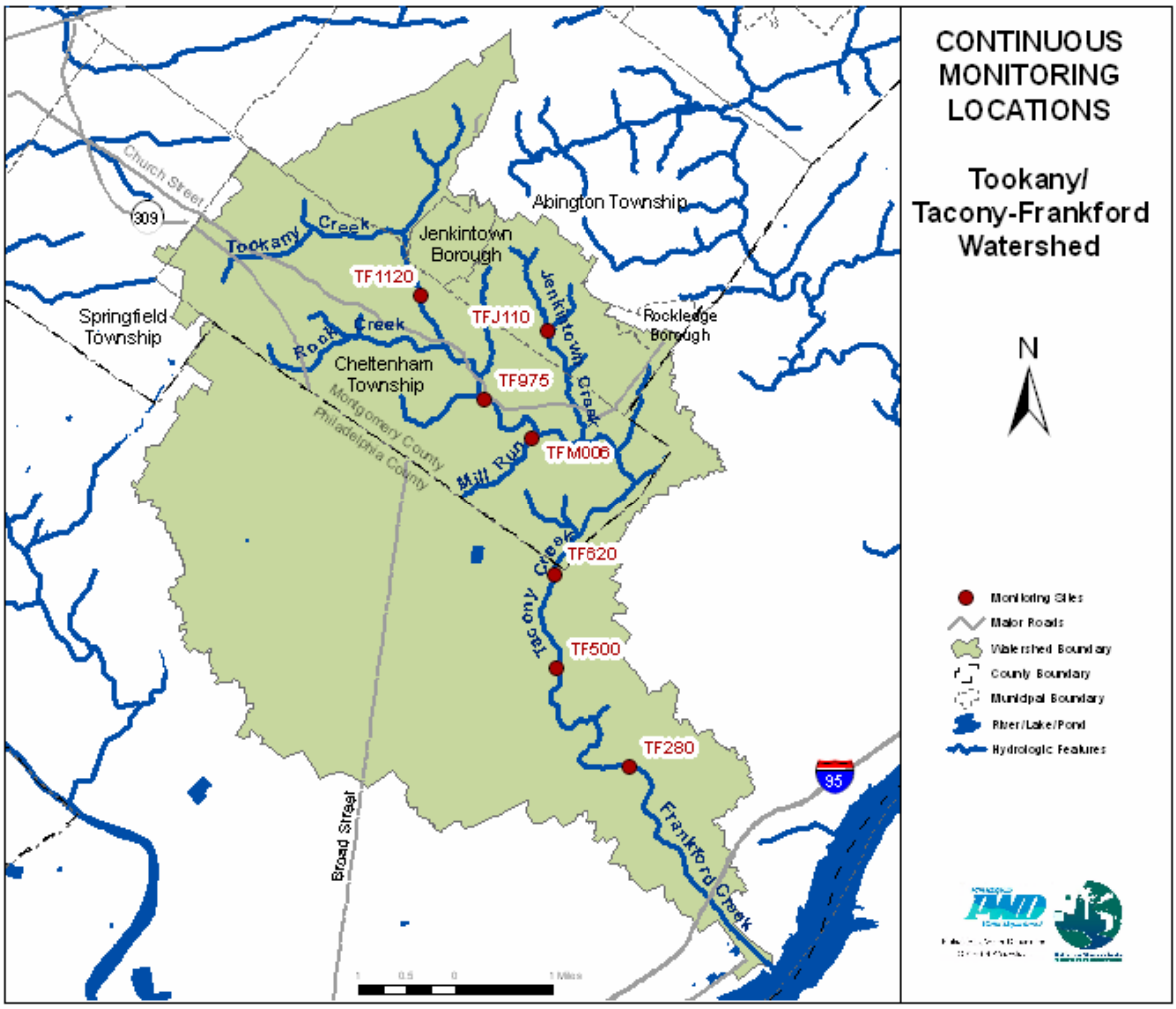

Figure 9. Continuous Water Quality Monitoring Sites in Tookany/Tacony-Frankford Watershed, 2004 (PWD 2005).

Site TF975

This site contained the greatest number of fish, density, and catch per unit effort in Tookany/Tacony-Frankford Watershed. However, greater than 95% of all fish collected were blacknose dace (79%) and white sucker (16%), species highly tolerant of poor water quality and degraded habitat. These two species also accounted for 79% of fish biomass (11 kg) collected at site TF975. Of 10 species collected, there were no intolerant species, no benthic insectivores, three water column species, and five cyprinid

species. Trophic structure of the fish assemblage at this site was dominated by generalist feeders (98%), with very few insectivores and top carnivores. Likewise, pollution tolerant taxa made up 98% of the fish assemblage. The large percentage of white sucker (16%) may be indicative of degradation as this species typically shows increased distribution or abundance despite historical disturbances and they shift from incidental to dominant in disturbed sites. This site had the second highest percentage (8.8%) of fishes with disease, tumors, fin damage, or other anomalies, which are symptomatic of an impacted assemblage downstream of point source pollution or in areas where toxic chemicals are concentrated (PWD 2005).

Site TF1120

The fish assemblage at TF1120 contained only five species, which was the lowest number for this watershed and all other of Philadelphia's watersheds surveyed by PWD. Blacknose dace constituted 86% of all fish collected at this location. This site was devoid of intolerant taxa and benthic insectivorous species, and only contained one water column species. With 99% generalist feeders, this was the most highly skewed trophic structure in all of Philadelphia's watersheds surveyed by PWD. This site contained only pollution tolerant species and had the highest percentage (9%) of individuals with disease, tumors, fin damage, or other anomalies in this watershed. Low species richness and trophic composition metrics combined with poor abundance and condition metrics reflect severely degraded stream quality at this location. In addition to channelization and peak flow modification, four dams separate site TF 1120 from site TF975, probably limiting upstream migration of fish species, other than minnows that are known to have an affinity for smaller streams (*i.e.*, blacknose dace, creek chubs) (PWD 2005).

Benthic Macroinvertebrates

Benthic macroinvertebrate monitoring occurred at 12 sites in Tookany/Tacony-Frankford Watershed during 2004 and benthic impairment in Tookany/Tacony-Frankford Watershed was omnipresent; with the exception of Jenkintown Creek, all stream segments were designated “severely impaired” (PWD 2005).

Benthic macroinvertebrates rely heavily on stream riffles for at least part of their life cycle. Living in a stream riffle requires various adaptations, and most macroinvertebrates are not prepared for the extreme hydrologic fluctuations that can occur in a channelized creek such as those in the Tookany/Tacony-Frankford watershed. Increased stream velocities and sediment loads from eroding stream banks are disrupting the benthic environment by scouring the stream bottom of appropriately sized substrates. The cobble substrate has limited interstitial space, often filled by finer materials, for benthic macroinvertebrates to thrive. In addition, storm events lead to decreased species richness and evenness, which in turn changes the dynamics of feeding groups within the communities. Specialized feeders are greatly diminished, and generalists such as gatherer/collectors dominate the feeding community (PWD 2005). There were three PWD benthic sampling locations (TF975, TF1120, and TFR064) near the project area (see Figure 10).

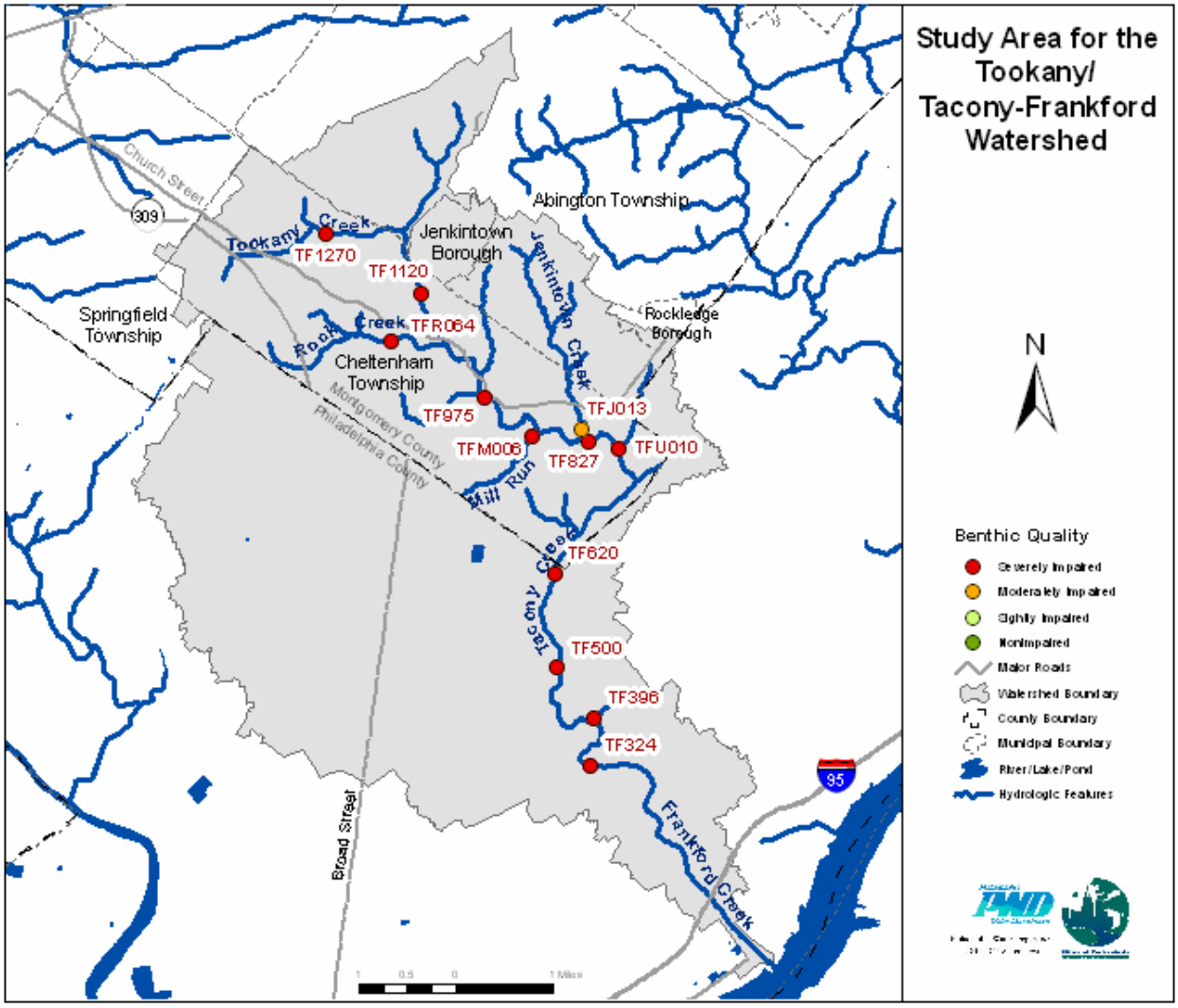

Figure 10. Tookany/Tacony-Frankford Watershed Benthic Indicator Status Locations (PWD 2005).

Site TFR064

The total metric score at TFR064 was (0) out of 30. The site was designated "severely impaired" when compared to a reference site. Resembling the rest of the watershed, TFR064 had an elevated Hilsenhoff Biotic Index (HBI) (5.93) and low taxa richness (n=9). Midge larvae composed 89% of the sub-sampled sorted for identification. Generalist feeders (97%) and moderately tolerant individuals (95%) dominated the assemblage (PWD 2005).

Site TF975
The assessment site at TF975 received a total metric score of zero (0) out of 30. The site was designated "severely impaired". Impairment was based primarily on low taxa richness (n=8) and an elevated HBI (5.94). Similar to other assessment sites, generalist feeders (98%) and moderately tolerant individuals (98%) dominated the assemblage (PWD 2005).

Site TF1120
The macroinvertebrate assemblage at TF1120 scored zero (0) out of 30. The site was deemed "severely impaired" when compared to a reference site. TF1120 had an elevated HBI score (6.04) and very low taxa richness (n=5). TF1120 was the only site surveyed where net-spinning caddisflies (Hydropsychidae) were not identified. Chironomids (96%) dominated the assemblage. When this site was sampled in 2000, filterer collectors were much more abundant, trophic and overall community composition was more even compared to results from the 2004 study (PWD 2005).

5.4 Wildlife Resources

With very limited open space and riparian areas still intact in the watershed, there is limited habitat for wildlife resources. The white-tailed deer, chipmunk, woodchuck (groundhog), opossum, skunk, red fox, eastern cottontail, raccoon, big brown bat, little brown bat, muskrat, eastern mole, rat, field mouse, and the gray squirrel are common mammalian species that occur throughout the Tookany/Tacony/Frankford Watershed. These species are also known throughout the rest of the State. The watershed generally lacks species diversity as a direct result of the elimination of habitat. Few animals, other than those listed above, are able to co-exist with the level of human activity within most of the watershed.

The watershed study completed by PWD in 2005 evaluated the riparian habitat areas at various locations in the watershed. PWD surveyed habitat at 12 sites throughout the Tookany/Tacony-Frankford Watershed. Monitoring locations along the mainstem of Tookany Creek (Montgomery County) received uniform scores of "Non-Supporting", indicating a region of severe habitat degradation. In general, upstream reaches in Tookany Creek lacked habitat heterogeneity, possessed poor riparian zones, and experienced high levels of channelization. Moreover, poor bank stability and exaggerated levels of sediment deposition also contributed to the poor aquatic habitat in the upper portions of the watershed. Rock Creek and Jenkintown Creek sites, the two surveyed upstream tributaries, both were rated as partially supporting, indicating slightly better habitat conditions relative to the mainstem (Figure 11) (PWD 2005). Two sites (TF975 and TF1120) sampled from that study were near the project area (Figure 11).

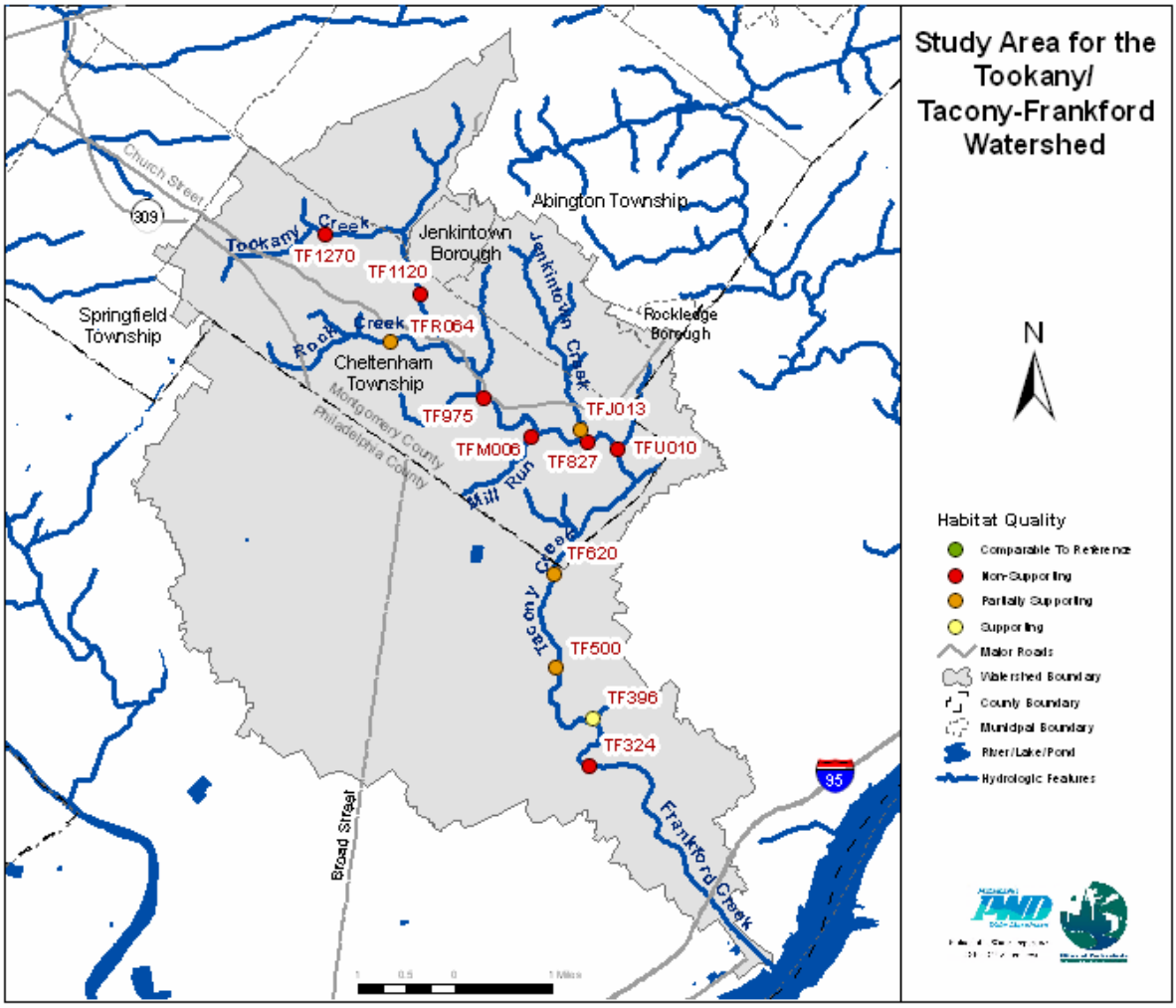

Figure 11. Tookany/Tacony-Frankford Watershed Habitat Quality Indicator Status (PWD 2005).

Site TF975

Numerous infrastructure impacts are present in the vicinity of this site. Bridge culverts and a dam located at High School Road promote instability and the semi-natural revetments installed along the right bank to curb erosion are beginning to deteriorate. Dams located downstream of the site (n=3) may partially explain the decreased fish species evenness relative to downstream sites. Upstream of High School Road, the stream has been extensively channelized, particularly along the left bank (20% of the left bank of Tookany Creek is channelized between site TF1120 and TF975). Many stormwater outfalls (n=20) discharge to the stream between site TF1120 and site TF975, the greatest relative impact of stormwater outfall density outside the City of Philadelphia's Combined sewer system. Like other sites, habitat attributes associated with streambanks and riparian zone management scored poorly, despite the fact that these sites are located within parkland (PWD 2005).

Site TF975 received a mean habitat score of 116.5 and was deemed "non-supporting". The substrate of the stream reach was well distributed, but the morphology type of the stream was dominated by run (50%). Most condition categories were scored as "marginal". A dam is present upstream of the assessment site, and the stream is channelized downstream of the assessment location. The riparian zone at the site is highly reduced. The surrounding land use is residential with maintained lawns dominating the riparian vegetation (PWD 2005).

Site TF1120

Signs of hydrologic instability were very evident at this site. Bedrock outcrops have been scoured of smaller substrates and the inside meander bar was observed to increase in size dramatically since 2000. Near the lower end of the fish assessment site, the stream is channelized along the right bank where the creek adjoins Chelten Hills Drive (PWD 2005).

The mean habitat score at TF1120 was 123.0, which was a 58.02% comparison to the reference condition at FC1310 ("non-supporting" designation). Most habitat attributes were scored as "marginal". The substrate of the site was well distributed with a large portion of bedrock (15%) and a sizeable portion of sand (30%). A large bedrock outcropping comprised a substantial portion of the left bank of the assessment site. The riparian vegetative zone width of the right bank scored low because of an electrical/railroad access road and vehicle roadway (PWD 2005).

5.5 Threatened and Endangered Species

A Pennsylvania Natural Diversity Inventory (PNDI) search run on the Pennsylvania Natural Heritage Program website resulted in one species of potential concern listed for the Pennsylvania Department of Conservation and Natural Resources. The species was field dodder (*Cuscuta pentagona*), a State Special Concern plant, which is found in old fields and prairies, sandstone ledges and coastal plain marshes (PNDI 2013). Blooming occurs from July through October. Additional coordination and field site visits will have to be conducted to determine if this species is found in the project area.

Additionally, the PNDI search indicted that no Federally-listed species are found in the project area and that no impacts to Federally-listed or proposed species would be anticipated with the proposed project.

5.6 Cultural Resources

A Phase IA cultural resources investigation was completed for the proposed project. The investigation consisted of : 1) background research using available archival, library and online sources on topics pertinent to the study, including regional environment, history, architecture and archaeology; 2) a field inspection of 11 potential dry detention basin locations to evaluate prior ground disturbances and

topographic characteristics that have influenced archaeological sensitivity at each basin; 3) a field inspection to identify historic architecture resources located proximal to each proposed basin; and 4) recommendations regarding further cultural resources investigations.
The Area of Potential Effect (APE) for archaeology is defined as the estimated boundaries of construction of 11 basins (includes the 9 basins in the recommended plan). The Phases IA investigation evaluated the archaeological sensitivity of the project APE and reviewed archaeological site files and survey reports maintained by the Pennsylvania Bureau for Historic Preservation (BHP) within a one mile radius of each basin locale.

For historic architecture resources, the Phase IA investigation collected information from a Study Area defined as the proposed basin locations plus a radius of 500 feet to account for potential visual effects. Once the selected alternative is further defined, the APE for historic structures will be defined.
The site file review indicates that one previous archaeological survey has been conducted within one mile of the project APE. That survey, undertaken to evaluate resources for the State Route 309 Improvement Project, identified no archaeological sites within the Tookany Creek APE.
The archaeological field inspection indicates that 9 of the 11 dry detention basin areas (Highland East, Highland West, Grove Park, Limekiln Pike, Church Road, West Waverly Road, Doe Lane, Greenwood, and Washington Lane) contain adjacent landforms that are considered to exhibit high archeological sensitivity for the presence of previously undocumented cultural resources. In addition, an extant concrete structural feature and slate steps were identified at Limekiln/Ogontz. The only proposed dry detention basin that did not have high archaeological or historic sensitivity was the Baeder Road dry detention basin.

A review of historic architecture files at the BHP identified twelve previously documented properties within the Historic Architecture Study Area. Field work confirmed the existence of eleven of these resources; one was demolished between 2008 and 2010. Two of these properties have been listed in the National Register of Historic Places (NRHP). In addition, field work identified two properties that may constitute a single potentially NRHP-eligible resource.

Table 3. Results of Phase 1A Cultural Resources Investigation.

Key	Town	Address	Name	APE Section	SHPO Opinion
102377	Cheltenham	141 South Lynnwood Ave.	Shady Nook Farm	Grove Park	Insufficient Information to Evaluate

155857	Cheltenham	400 Harrison Ave.	Glenside Elementary School	Limekiln-Church-West Waverly-Doe	Not Eligible
112549	Cheltenham	2543 W. Church Road	Mason Property	Limekiln-Church-West Waverly-Doe	Insufficient Information to Evaluate
112546	Cheltenham	2549 W. Church Road	None	Limekiln-Church-West Waverly-Doe	Insufficient Information to Evaluate
112543	Cheltenham	2551 W. Church Road	None	Limekiln-Church-West Waverly-Doe	Insufficient Information to Evaluate
112573	Cheltenham	1017 Greenwood Ave.	Charles Hewett Elvetham Estate	Greenwood	Insufficient Information to Evaluate
155627	Cheltenham	1300 Spruce Lane	William & Ruth Leshner House	Greenwood	Not Eligible
103293	Cheltenham	1250 W. Church Road	Curtis Hall	Washington Lane	Listed on NRHP
112600	Cheltenham	1421 Hopeland Road	Ogontz Farm	Washington Lane	Insufficient Information to Evaluate
112597	Cheltenham	1468 Ashbourne Road	None	Washington Lane	Insufficient Information to Evaluate
112594	Cheltenham	1150 Church Road	Milmoral	Washington Lane	Listed on NRHP

112637	Cheltenham	7907 Toby Leech Drive	Ronaele Manor Outbuilding	Washington Lane	Insufficient Information to Evaluate

5.7 Hazardous, Toxic, Radioactive Waste (HTRW)

Based on the best available information at this time, it does not appear that there are any HTRW concerns for the project; however, additional investigations on this issue will occur during the D&I phase of the project.

6.0 Environmental Impacts

6.1 Air and Water Quality

Air Quality

As stated previously, Philadelphia County, Pennsylvania within which the Federal Action will take place is located in the Philadelphia-Wilmington-Atlantic City Area moderate 8-hour ozone nonattainment area and the $PM_{2.5}$ Philadelphia-Wilmington Area.

Construction of the flood risk management project would cause temporary reduction of local ambient air quality due to fugitive dust and emissions generated by construction equipment. These temporary reductions in air quality would not have a significant impact on the long term air quality of the surrounding area.

The 1990 Clean Air Act Amendments include the provision of Federal Conformity, which is a regulation that ensures that Federal Actions conform to a nonattainment area's State Implementation Plan (SIP) thus not adversely impacting the area's progress toward attaining the National Ambient Air Quality Standards (NAAQS). In the case of the Tookany Creek Flood Damage Reduction Project, the Federal Action is the construction of 9 dry detention basins in the Tookany Creek Watershed. The U.S. Army Corps of Engineers, Philadelphia District would be responsible for construction.

There are two types of Federal Conformity: Transportation Conformity and General Conformity (GC). Transportation Conformity does not apply to this project because the project is not funded by the Federal Highway Administration and it does not impact the on-road transportation system. GC however is applicable. Therefore, the total direct and indirect emissions associated with the Tookany Creek project must be compared to the GC trigger levels presented below.

General Conformity: Trigger Levels

Pollutant	(tons per year)
NOx	100
VOC	50

$PM_{2.5}$	100

To conduct a general conformity review and emission inventory for the Tookany Creek Flood Damage Reduction Project, a list of equipment necessary for construction was identified. Table 1 (Appendix C) lists these pieces of equipment along with the number of engines, engine size (hp), and duration of operation. A Load Factor (LF) was also selected for each engine, which represents the average percentage of rated horsepower used during a source's operational profile.

Table 1 (see Appendix C) shows the estimated hp-hr required for each equipment/engine category. Hp-hr was calculated using the following equation:

hp-hr = # of engines*hp*LF*hrs/day*days of operation

The second calculation is to derive the total amount of emissions generated from each equipment/engine category by multiplying the power demand (hp-hr) by an emission factor (g/hp-hr). The following equations were used:

emissions (g) = power demand (hp-hr) * emission factor (g/hp-hr)

emissions (tons) = emissions (g) * (1 ton/907200 g)

Tables 2, 3, and 4 (see Appendix C) present the emission factors and emission estimates for NOx, VOC, and $PM_{2.5}$ respectively. The tables present the emissions from each individual equipment/engine category and the combined total.

The total estimated emissions that would result from construction of the Tookany Creek Flood Damage Reduction Project is 3.89 tons of NOx, 1.67 tons of VOC, and 0.34 tons of $PM_{2.5}$ (Table 5 – Appendix C). Construction of the project will be completed in approximately 1 year. These emissions are well below the General Conformity trigger levels of 100 tons of NOx and $PM_{2.5;}$ and 50 tons of VOC per year. General Conformity under the Clean Air Act, Section 176 has been evaluated for the project according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project because the total direct and indirect emissions from the project are below the conformity threshold values established at 40 CFR 93.153 (b) for ozone (NOx and VOC) in a Moderate Nonattainment Area (100 tons and 50 tons of each pollutant per year) and 100 tons for $PM_{2.5}$. The project is not considered regionally significant under 40 CFR 93.153 (i).

Water Quality

Implementation of this project will have temporary impacts to water quality during construction. All necessary best management practices will be used during construction and the proposed project is not anticipated to have any long-term adverse impacts on water quality in the Tookany Creek watershed.

If funding is available, and rain gardens can be incorporated into the final designs for the dry detention basins, then improved water quality could result from those additions. Many of the proposed detention

basins are unvegetated and / or just have manicured lawn grass, so plantings of native shrubs and trees would help increase uptake of nutrients in the riparian area and possible improve water quality in those areas.

The Corps has determined that this project meets the terms and conditions (< ½ acre of wetland impact) of Nationwide Permit (NWP) #43 (Stormwater Management Facilities) for the construction of this project. NWP#43 is defined as discharges of dredged or fill material into non-tidal waters of the United States for the construction of stormwater management facilities, including stormwater detention basins and retention basins and other stormwater management facilities; the construction of water control structures, outfall structures and emergency spillways; and the construction of low impact development integrated management features such as bioretention facilities (e.g., rain gardens), vegetated filter strips, grassed swales, and infiltration trenches. This NWP also authorizes, to the extent that a section 404 permit is required, discharges of dredged or fill material into non-tidal waters of the United States for the maintenance of stormwater management facilities.

With the approval of the NWP#43 permit in Pennsylvania, the Section 401 State Water Quality Certificate is automatically issued for the project. In addition, any future maintenance requirements of the project undertaken by the non-federal sponsor, Cheltenham Township, will be covered by Nationwide Permit #3 (Maintenance). Furthermore, a Section 404(b)(1) analysis of the Clean Water Act, as amended (Public Law 92-500), was completed for this project based and included in this document.

6.2 Wetlands

Wetlands are found on site of the proposed West Waverly Road Basin. The NWI maps estimate a 4 acre wetland in this area. An official wetland delineation of the site will be completed in the next phase of the project to determine the exact size of the wetland area. The proposed detention structure will impact approximately 0.25 acres of scrub/shrub wetland habitat. It is anticipated that the proposed mitigation for this impact will include an invasive species management plan for the site to control common reed and Japanese knotweed followed by planting of native wetland species {e.g., winterberry (*Ilex verticillata*)} in approximately 1.0 acre of the site to restore the area. During the next phase of the study (PED), a wetland delineation will be completed for all the proposed basin sites and a more detailed mitigation plan will follow.

6.3 Fisheries Resources

There is no Essential Fish Habitat under the 1996 Magnuson-Stevens Act found in the project area. There will be temporary minor impacts to resident fish populations in Tookany Creek during the construction of this project. All best management practices will be used (i.e., silt fences) to minimize disturbance to the stream and fishery resources.

6.4 Wildlife Resources

No long-term impacts to the wildlife resources in the Tookany Creek watershed are anticipated as a result of this project. There will be noise and general disturbances in the stream area as a result of

construction activities, but these will be temporary in nature and should not have a long term negative effect on wildlife in the area. If the funding is available, rain gardens will be planted in the basin areas using native plants to enhance the area for wildlife resources. If this happens, the project will provide a long-term positive impact to the wildlife in the Tookany Creek watershed with an improved riparian corridor.

6.5 Threatened and Endangered Species

A web-based PNDI search identified the potential of field dodder (*Cuscuta pentagona*), a State Special Concern plant, which is found in old fields and prairies, sandstone ledges and coastal plain marshes to be found in the project area. Field surveys during the next phase of the project will confirm or refute this finding. We do not anticipate an impact on these species as a result of the project; however, additional coordination will occur with PADEP to insure this is the case prior to project construction.

Additionally, the PNDI search indicted that no Federally-listed species are found in the project area and that no impacts to Federally-listed or proposed species would be anticipated with the proposed project.

6.6 Cultural Resources

The selected alternative, Alternative 4 includes nine of the eleven dry detention basin sites reviewed by TetraTech during the Phase IA investigation (Tetra Tech 2014). The results of the investigation are provided for each of the nine dry detention basins within Alternative 4, the selected alternative for this project .

Highland East Dry detention basin

The Highland East Dry detention basin is characterized by a meandering channel bordered by uplands to the east and west. The stream bed is extremely stony, with platy micaceous schist manifested as slabs, cobbles and gravel. The channel appears to have repeatedly migrated between its current position and the T1 terrace to the west. The terrace exhibits little soil development and abundant rock. High archaeological sensitivity is limited to a small segment of the eastern bank uplands. A review of historic maps reveals no buildings or structures depicted within the Highland East Dry detention basin APE.

Baeder Road Dry detention basin

The Baeder Road Dry detention basin is situated downstream of the Highland East and Highland West Basins. It exhibits a meandering stream bed with extremely abundant micaceous schist as slabs, cobbles and gravel. The east and west banks are low-lying, have little soil development and probably supported the migrating stream at various times past. The Baeder Road Dry detention basin is considered to have low archaeological sensitivity. A review of historic maps reveals no buildings or structures within the Baeder Road Dry detention basin APE.

Highland West Dry detention basin

The stream course within the Highland West Dry detention basin is fairly straight and stony, with low-lying terraces on both banks. Bedrock outcrops are found along the eastern third of the stream. The north bank is landscaped as parkland. An earthen flood dry detention basin has been dug out along a portion of the north bank to a depth below grade of between 0.5 and 1 meter. Segments of both banks exhibit high archaeological sensitivity. A review of historic maps reveals no buildings or structures within the Highland West Dry detention basin APE.

Grove Park Dry detention basin
The stream course within the Grove Park Dry detention basin flows through generally level terrain and is entrained less than one meter below surrounding grade. The western bank and portions of the eastern bank are landscaped as parkland. A drainage outfall was noted emptying into the western stream bank. Segments of both banks exhibit high archaeological sensitivity. A review of historic maps reveals no buildings or structures within the Grove Park Dry detention basin APE.

Limekiln Pike Dry detention basin
The stream within the Limekiln Pike Dry detention basin has a straight course, contains moderate amounts of micaceous schist in the form of slabs, cobbles and gravel and is incised into its banks to a depth of between 0.5 and 1 meter. Portions of both banks have been landscaped as rear yards with the north bank sloping upward to meet the Glenside School's playgrounds. A drainage outfall was observed emptying into the north bank approximately 50 meters west of Limekiln Pike. Aside from the outfall line and minimal landscaping the Limekiln Pike Dry detention basin exhibits high archaeological sensitivity through its full length. A review of historic maps reveals no buildings or structures within the Limekiln Pike Dry detention basin APE.

Church Road Dry detention basin
The western margin of the stream within the Church Road Dry detention basin is incised between 3 meters to 4 meters into the bank. The western end of the north bank supports the remains of an abandoned greenhouse and a landscaped soccer field. The western end of the south bank slopes gradually upward from the stream reaching about a 10 percent incline. The eastern two-thirds of the proposed basin is part of a landscaped park. In this section, the stream is incised into the banks approximately 0.5 to 1 meter. The eastern margin of the north bank slopes upward from the stream approximately 5 percent to 6 percent. Much of the dry detention basin exhibits high archaeological sensitivity. A review of historic maps reveals no buildings or structures with the Church Road Dry detention basin APE.

West Waverly Road Dry detention basin
The stream course within the West Waverly Road Dry detention basin exhibits a moderate degree of meander within its low-lying banks. The north bank is nearly level and meets the landscaped grounds of Holy Sepulcher Cemetery. The southern margins of the proposed dry detention basin have been impacted by the elevated berm of PA Route 309 with patches of common reed indicating areas of poor to very poor drainage. Other portions of the south bank exhibit limited soil development and abundant

quantities of cobbles and gravel. It appears that the stream has migrated back and forth across the southern margin of the proposed basin. Portions of the north bank exhibit high archaeological sensitivity. A review of historic maps reveals no buildings or structures with the West Waverly Road Dry detention basin APE.

Doe Lane Dry detention basin
The stream within the Doe Lane Dry detention basin is entrained within a narrow U-shaped valley within which it exhibits a moderate degree of meander. Low-lying portions of the streambank exhibit vehicle ruts and tree throws. The northern section of the west bank is a landscaped yard. This area is generally low archaeological sensitivity; however, a portion of the landscaped yard exhibits high sensitivity. A review of historic maps reveals no buildings or structures within the Doe Lane Dry detention basin APE.

Washington Lane Dry detention basin
The streambed within the Washington Lane Dry detention basin contains abundant micaceous schist in the form of slabs, cobbles and gravel. The south bank rises steeply and supports large bedrock outcroppings. The entire north bank is low-lying terrace and mostly landscaped lawns of Curtic Park. The western margin of the proposed basin exhibits a somewhat meandering streambed with little soil development and abundant rock. The south bank contains low archaeological sensitivity, while much of the north bank is highly sensitive. The 1871 county atlas depicts a building along the south bank of Rock Creek situated west of Washington Lane that is attributed to Jay Cooke. Cooke was a wealthy financier in the mid-nineteenth century whose Cheltenham Township estate lay on both sides of Washington Lane.

Based on the results of the Phase IA investigation, additional subsurface archaeological investigations may be required at 8 of the 9 proposed dry detention basins for Alternative 4 to properly assess their potential to contain undocumented prehistoric or historic archaeological sites. The USACE, in consultation with the Pennsylvania State Historic Preservation Officer (SHPO), the Tribes, and other consulting parties will review the results of all investigations and determine any effects to historic properties eligible for or listed on the NRHP, and work to avoid, minimize, or mitigate those effects.

Additional architectural assessments may be required in order to assess the proposed impacts that Alternative 4 may have on above ground historic properties. A formal determination of the APE for historic structures will be coordinated with the SHPO, the Tribes and other consulting parties as part of the Section 106 process.

6.7 HTRW

Based on the best available information at this time in the Planning process, it does not appear that there are any HTRW concerns for the project; however, additional investigations on this issue will occur during the D&I phase of the project.

7.0 Environmental Justice

In February, 1994 President Clinton signed Executive Order 12898, entitled "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." This EO directs Federal agencies "to make achieving environmental justice part of its mission by identifying and addressing, as appropriate disproportionately high and adverse human health or environmental effects of programs, policies, and activities on minority populations and low income populations in the United States…." The purpose of this order is to avoid the disproportionate placement of adverse environmental economic, social, or health impacts from Federal actions and policies on minority and low-income populations. In order to prevent the potential for discrimination and disproportionately high and adverse effects on specific populations, a process must identify minority and low-income populations that might be affected by the implementation of a proposed action or alternatives.

As defined by the "Environmental Justice Guidance Under NEPA" (CEQ, 1997), "minority populations" includes persons who identify themselves as Asian or Pacific Islander, Native American or Alaskan Native, black (not of Hispanic origin), or Hispanic. Race refers to Census respondents' self-identification of racial background. Hispanic origin refers to ethnicity and language, not race, and may include persons whose heritage is Puerto Rican, Cuban, Mexican, Central or South American.

A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population. Low-income populations are identified using the Census Bureau's statistical poverty threshold, which is based on income and family size. The Census Bureau defines a "poverty area" as a census tract with 20 percent or more of its residents below the poverty threshold and an "extreme poverty area" as one with 40 percent or more below the poverty level.

Based on census data (US Census 2010), the project area is the most densely populated township in Montgomery County. The median income for a household in the township was $61,713, and the median income for a family was $76,792. Males had a median income of $50,564 versus $36,439 for females. The per capita income for the township was $31,424. About 3.0% of families and 5.1% of the population were below the poverty line, including 6.5% of those under age 18 and 3.2% of those age 65 or over. Based on this census data, the project area would not be considered one of poverty and would not have a detrimental effect on any low-income or minority population (Wikepdia 2015).

8.0 Relationship of Selected Plan to Applicable Environmental Statutes

Compliance with environmental quality protection statutes and other environmental review requirements is ongoing. Table 3 provides a listing of compliance with environmental statutes.

Table 4. Compliance with Appropriate Environmental Quality Protection Statutes and other Environmental Review Requirements.

STATUTE	COMPLIANCE STATUS
Clean Water Act	Partial*
Endangered Species Act	Partial*
Fish and Wildlife Coordination Act	Partial*
National Historic Preservation Act	Partial*
National Environmental Policy Act	Partial*
Clean Air Act	Partial*

NOTE:

Full Compliance: Having met all requirements of the statute, E.O., or other environmental requirements for the current stage of planning.

Partial Compliance: Some requirements of the statute, E.O., or other policy and related regulations remain to be met.

*All applicable laws and regulations will be fully complied with upon completion of the environmental review, obtaining state water quality certification, coastal zone consistency determination, and concurrence with our determination on cultural resources. Full compliance will be obtained prior to project construction.

Noncompliance: None of the requirements of the statute, E.O., or other policy and related regulations remain to be met.

9.0 Section 404(b)(1) Analysis

A review of the impacts associated with discharges to waters of the United States for the Tookany Creek Flood Damage Reduction Project located in Cheltenham Township, PA is required by Section 404(b)(1) of the Clean Water Act, as amended (Public Law 92-500).

I. PROJECT DESCRIPTION

A. Location. The project area is located in the Tookany/Tacony-Frankford Creek Watershed in Cheltenham Township, Montgomery County, PA.

B. General Description. The Tookany Creek Flood Risk Management Project is located within the Cheltenham Township, Montgomery County, PA.

C. Purpose. This project had investigated the best alternative to provide flood risk management along in the Tookany/Tacony-Frankford Watershed. The most effective method of achieving this goal is with the construction of the nine basin tentatively selected plan.

The watershed has issues in the form of flooding, severe erosion and sedimentation, slumping banks and poor water quality. In addition, the aging municipal infrastructure and related facilities compound the problems (DCNR 2003). After numerous flood events, the Township approached the Corps for assistance in addressing these issues for the public.

D. General Description of Dredged or Fill Material.

1. General Characteristics of Material: rock/fill
2. Quantity of Discharge: Creation of an earthen/gabion berm at West Waverly with approximately 1000 cubic yards of rock and fill.
3. Source of Material: re-use of material found on site and additional rock fill brought from outside the project area.

E. Description of Discharge Sites.

1. Location: Tookany Creek floodplain
2. Size (acres): The estimated limit of disturbance is 0.25 acres and the actual amount of fill to be used will be approximately 1000 cubic yards.
3. Type of Sites: Floodplain/Riparian Corridor
4. Type of Habitat: Floodplain/Riparian Corridor
5. Timing and Duration of Discharge: Intermittent over a 1-year construction period.

F. Description of Discharge Method. Creation of earthen/gabion embankment in Tookany Creek floodplain.

II. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations.

1. Substrate Elevation and Slope: varies

2. Sediment Type: varies.

3. Fill Material Movement: Project will be constructed "in the dry" with a cofferdam.

4. Physical Effects on Benthos: Temporary and permanent effects on benthos. Existing benthos will be buried under the newly constructed embankment and the surrounding area will be disturbed during construction.. The surrounding area should recover in a relatively short time period (< 1 year.).

5. Actions taken to Minimize Impacts: Best management practices will be used during construction to minimize any disturbance to the adjoining stream banks and floodplain. Disturbed stream banks and floodplain will be seeded and mulched soon after construction to stabilize and restore the area.

B. Water Circulation, Fluctuation and Salinity Determinations.

1. Water:

a. Salinity – No effect

b. Water Chemistry – Temporary, major effect during construction.

c. Clarity – Temporary, major effect during construction.

d. Color - No effect

e. Odor – No effect.

f. Taste - No effect.

g. Dissolved Gas Levels – Temporary, major effect during construction.

h. Nutrients – Temporary, major effect during construction.

I. Eutrophication - No effect.

j. Temperature- Temporary, major effect during construction.

2. Current Patterns and Circulation:

a. Current Patterns and Flow – Temporary, major effect on flow and patterns with the use of a cofferdam and during construction. The surrounding area in the vicinity of the project area should recover in a relatively short time period (< 1-year) .

b. Velocity - Temporary, major effect on flow and patterns with the use of a cofferdam and during construction. The surrounding area in the vicinity of the project area should recover in a relatively short time period (< 1-year) .

c. Stratification - No effect.

3. Normal Water Level Fluctuations – Temporary, major effect on flow and patterns with the use of a cofferdam and during construction. The surrounding area in the vicinity of the project area should recover in a relatively short time period (< 1-year) .

4. Salinity Gradients – no effect.

5. Actions That Will Be Taken To Minimize Impacts: Best management practices will be used during construction to minimize any disturbance to the adjoining stream banks and floodplain. Disturbed stream banks and floodplain will be seeded and mulched soon after construction to stabilize and restore the area.

C. Suspended Particulate/Turbidity Determinations.

1. Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Fill Site: Temporary, major effect with the use of a cofferdam and during construction.

2. Effects on Chemical and Physical Properties of the Water Column:

a. Light Penetration: Temporary, major effect.

b. Dissolved Oxygen: Temporary, major effect.

c. Toxic Metals and Organics: No effect.

d. Pathogens: No effect.

e. Aesthetics: Temporary, major effects limited to the construction period. Will permanently change the landscape and viewshed of all areas where the 9 basins are proposed. Gabions may be considered not aesthetically pleasing by some members of the public.

f. Temperature: Temporary, major effects limited to the construction period. Cofferdam and diversion water system will warm up water during this period.

3. Effects on Biota:

a. Primary Production, Photosynthesis: Temporary, major effect during construction.

b. Suspension/Filter Feeders: Temporary, major effect during construction.

c. Sight feeders: Temporary, major effect during construction.

4. Actions Taken to Minimize Impacts: Best management practices will be used during construction to minimize any disturbance to the adjoining stream banks and floodplain. Disturbed stream banks and floodplain will be seeded and mulched soon after construction to stabilize and restore the area.

D. Contaminant Determinations.

All excavated material will remain on site. No contaminant testing was done on any of the proposed basin locations.

E. Aquatic Ecosystem and Organism Determinations.

1. Effects on Plankton: No effect.

2. Effects on Benthos: Temporary, major effect on benthos. Existing benthos will be buried under the newly constructed embankment The surrounding area should recover in a relatively short time period (< 1-year.).

3. Effects on Nekton: No effect

4. Effects on Aquatic Food Web: Temporary, major effect on benthos. Existing benthos will be buried under the newly constructed embankment The surrounding area should recover in a relatively short time period (< 1-year.).

5. Effects on Special Aquatic Sites:

(a) Sanctuaries and Refuges: None

(b) Wetlands: permanent loss of approx. 0.25 acres (exact figure will be determined in the next phase with a detailed wetland delineation).

(c) Tidal flats: None.

(d) Vegetated Shallows: None.

6. Threatened and Endangered Species: No effect.

7. Other Wildlife: Temporary, minor effect.

8. Actions to Minimize Impacts: Best management practices will be used during construction to minimize any disturbance to the adjoining stream banks and floodplain. Disturbed stream banks and floodplain will be seeded and mulched soon after construction to stabilize and restore the area.

F. Proposed Disposal Site Determinations (N/A – no dredging will be conducted)

1. Mixing Zone Determinations:

   a. Depth of water:

   b. Current velocity:

   c. Degree of turbulence:

   d. Stratification:

   e. Discharge vessel speed and direction:

   f. Rate of discharge:

   g. Dredged material characteristics:

2. Determination of Compliance with Applicable Water Quality Standards:

   The project is claiming Nationwide Permit #43 which comes with an automatically issued section 401 Water Quality Certificate from PADEP.

3. Potential Effects on Human Use Characteristics:

   a. Municipal and Private Water Supply: No anticipated effect.

   b. Recreational and Commercial Fisheries: Temporary, minor effect during construction.

   c. Water Related Recreation: Temporary, minor effect.

   d. Aesthetics: Temporary and Permanent, major effect.

e. Parks, National and Historical Monuments, National Seashore, Wilderness Areas, Research Sites, and Similar Preserves: No effect.

G. Determination of Cumulative Effects on the Aquatic Ecosystem.

No significant adverse effects are anticipated.

H. Determination of Secondary Effects on the Aquatic Ecosystem.

No significant secondary effects are anticipated.

III. FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

A. Adaptation of the Section 404(b)(1) Guidelines to this evaluation - No significant adaptation of the guidelines were made relative to this evaluation.

B. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem - The selected plan was determined from a detailed evaluation of alternatives to have the best chance for success with non significant impacts to the aquatic ecosystem.

C. Compliance With Applicable State Water Quality Standards - The selected plan is not expected to violate any applicable state water quality standards in Pennsylvania.

D. Compliance With Applicable Toxic Effluent Standards or Prohibition Under Section 307 of the Clean Water Act - The proposed discharge is not anticipated to violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

E. Compliance With Endangered Species Act of 1973 -The selected plan will comply with the Endangered Species Act of 1973. Informal Section 7 consultation with the U.S. Fish and Wildlife Service will be completed for this project prior to construction.

F. Compliance With Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972 - No Marine Sanctuaries, as designated in the Marine Protection, Research, and Sanctuaries Act of 1972, are located within the project area.

G. Evaluation of Extent of Degradation of Waters of the United States - The selected plan will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, and recreational and commercial fishing, plankton, fish and shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and wildlife will not be adversely affected. Significant adverse impacts on aquatic ecosystem

diversity, productivity and stability, and recreation, aesthetics and economic values will not occur as a result of the project.

H. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem - Appropriate steps (as described above) will be taken to minimize potential adverse impacts of discharging material in the aquatic ecosystem.

10.0 References

Pennsylvania Department of Conservation and Natural Resources (DCNR). 2003. "Tookany Creek Watershed Management Plan."

Pennsylvania Natural Diversity Inventory (PNDI). 2013. Endangered and Threatened Species Search. (http://www.gis.dcnr.state.pa.us/hgis-er/Login.aspx).

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TetraTech, Inc. 2014. Phase IA Cultural Resources Investigation, Tookany Creek, Cheltenham and Abington Township, Montgomery County, Pennsylvania. Prepared for USACE, Philadelphia District.

United States Fish and Wildlife Service. 2013. "National Wetlands Inventory." (http://www.fws.gov/wetlands/Data/Mapper.html).

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11.0 Clean Air Act Statement of Conformity

CLEAN AIR ACT STATEMENT OF CONFORMITY

TOOKANY CREEK FLOOD RISK MANAGEMENT PROJECT

CHELTENHAM TOWNSHIP

MONTGOMERY COUNTY, PENNSYLVANIA

I have determined that the selected plan conforms to the applicable State Implementation Plan (SIP). The Environmental Protection Agency had no adverse comments under their Clean Air Act authority. Comments from the State air quality management district were received during coordination of the draft environmental assessment and addressed in the final environmental assessment. The selected plan would comply with Section 176 (c)(1) of the Clean Air Act Amendments of 1990.

_____ _____

Date

Michael A. Bliss, P.E.
Lieutenant Colonel, Corps of Engineers
District Commander

Appendix A: Conceptual Designs

BAEDER ROAD DETENTION BASIN

CHURCH ROAD DETENTION BASIN

DOE LANE DETENTION BASIN

HIGHLAND EAST DETENTION BASIN

HIGHLAND WEST DETENTION BASIN

LIMEKILN PIKE DETENTION BASIN

WASHINGTON LANE EMBANKMENT WITH FEMA FLOODPLAIN

Appendix B: Clean Air Act Assessment

General Conformity Review and Emission Inventory for Cobbs Creek Watershed Improvement Project
Table 1. Project Emission Sources and Estimated Power

hp-hr = # of engines*hp*LF*hrs of operation

Load Factor (LF) represents the average percentage of rated horsepower used during a source's operational profile

Equipment/Engine Category	# of engines	hp	LF	hrs of operation	hp-hr
COMPACTOR, ROLLER, VIBRATORY, 26.5" W, 0.8 Ton	1	8	0.59	3	14
CRANE, HYDRAULIC, TRUCK MOUNTED, 25 Ton	1	130	0.43	1,898	106098
CRANE, HYDRAULIC, TRUCK MOUNTED, 90 Ton Main	1	158	0.43	33	2235
CRANE, HYDRAULIC, TRUCK MOUNTED, 90 Ton Carrier	1	375	0.43	33	5305
GRADER, MOTOR, ARTICULATED, 135 HP, 12' Blade Width	1	135	0.59	143	11406
HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB, 1.50 CY BUCKET	1	176	0.59	132	13748
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB, 2.00 CY BUCKET	1	238	0.59	132	18578
LANDSCAPING EQUIPMENT, HYDROSEEDER, 3,000 GAL, TRUCK MOUNTED Main	1	115	0.43	23	1157
LANDSCAPING EQUIPMENT, HYDROSEEDER, 3,000 GAL, TRUCK MOUNTED Carrier	1	310	0.43	23	3119
ROLLER, VIBRATORY, TOWED, SINGLE DRUM, SHEEPSFOOT, 25.5 TON, 72" WIDE	1	50	0.59	154	4528
TRACTOR, CRAWLER (DOZER), 181-250 HP POWERSHIFT, LGP, W/UNIVERSAL BLADE	1	240	0.59	1,182	167357
TRACTOR, CRAWLER (DOZER), 251-300 HP, POWERSHIFT, W/UNIVERSAL BLADE	1	310	0.59	361	66082
TRUCK, HIGHWAY, CONVENTIONAL, 8,800 LB GVW, 4X4, 2 AXLE, 3/4 TON - PICKUP	1	130	0.59	166	12702
TRUCK, HIGHWAY, 25,000 LB GVW, 4X2, 2 AXLE	1	210	0.59	172	21274

TRUCK, HIGHWAY, 45,000 LB GVW, 6X4, 3 AXLE	1	230	0.59	111	15103
TRUCK, HIGHWAY, 45,000 LB GVW, 6X4, 3 AXLE	1	230	0.59	121	16352
TRUCK, HIGHWAY, 50,000 LB GVW, 6X4, 3 AXLE	1	310	0.59	96	17558
35,000 LBS GVW, 2 AXLE, 4X2	1	265	0.59	108	16886
DUMP TRUCK, HIGHWAY, 16 - 20 CY DUMP BODY, 75,000 LBS GVW, 2 AXLE, 6X4	1	400	0.59	210	49607

Load Factors taken from Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling
Report No. NR-005d, revised July 2010, EPA-420-R-10-016. Environmental Protection Agency, Office of Transportation and Air Quality

Table 2. Emission Estimates (NOx)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)
Emissions (tons) = Emissions (g) * (1 ton/907200 g)
NOx Emissions Factor for Off-Road Construction Equipment is 6.9 g/hp-hr*

Equipment/Engine Category	hp-hr	EF (g/hp-hr)	Emissions (tons)
COMPACTOR, ROLLER, VIBRATORY, 26.5" W, 0.8 Ton	14	6.90	0.00
CRANE, HYDRAULIC, TRUCK MOUNTED, 25 Ton	106098	6.90	0.81
CRANE, HYDRAULIC, TRUCK MOUNTED, 90 Ton Main	2235	6.90	0.02
CRANE, HYDRAULIC, TRUCK MOUNTED, 90 Ton Carrier	5305	6.90	0.04
GRADER, MOTOR, ARTICULATED, 135 HP, 12' Blade Width	11406	6.90	0.09
HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB, 1.50 CY BUCKET	13748	6.90	0.10
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB, 2.00 CY BUCKET	18578	6.90	0.14
LANDSCAPING EQUIPMENT, HYDROSEEDER, 3,000 GAL, TRUCK MOUNTED Main	1157	6.90	0.01
LANDSCAPING EQUIPMENT, HYDROSEEDER, 3,000 GAL, TRUCK MOUNTED Carrier	3119	6.90	0.02
ROLLER, VIBRATORY, TOWED, SINGLE DRUM, SHEEPSFOOT, 25.5 TON, 72" WIDE	4528	6.90	0.03
TRACTOR, CRAWLER (DOZER), 181-250 HP POWERSHIFT, LGP, W/UNIVERSAL BLADE	167357	6.90	1.27
TRACTOR, CRAWLER (DOZER), 251-300 HP, POWERSHIFT, W/UNIVERSAL BLADE	66082	6.90	0.50
TRUCK, HIGHWAY, CONVENTIONAL, 8,800 LB			

GVW, 4X4, 2 AXLE, 3/4 TON - PICKUP	12702	6.90	0.10
TRUCK, HIGHWAY, 25,000 LB GVW, 4X2, 2 AXLE	21274	6.90	0.16
TRUCK, HIGHWAY, 45,000 LB GVW, 6X4, 3 AXLE	15103	6.90	0.11
TRUCK, HIGHWAY, 45,000 LB GVW, 6X4, 3 AXLE	16352	6.90	0.12
TRUCK, HIGHWAY, 50,000 LB GVW, 6X4, 3 AXLE	17558	6.90	0.13

Total NOx Project Emissions (tons) = 3.30

*Emission Factor taken from Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition Report No. NR-009d, Revised July 2010, Assessment and Standards Division EPA, Office of Transportation and Air Quality

Table 3. Emission Estimates (VOC)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)
Emissions (tons) = Emissions (g) * (1 ton/907200 g)
VOC Emissions Factor for Off-Road Construction Equipment is 1.0 g/hp-hr

Equipment/Engine Category	hp-hr	EF (g/hp-hr)	Emissions (tons)
COMPACTOR, ROLLER, VIBRATORY, 26.5" W, 0.8 Ton	14	1.00	0.00
CRANE, HYDRAULIC, TRUCK MOUNTED, 25 Ton	106098	1.00	0.12
CRANE, HYDRAULIC, TRUCK MOUNTED, 90 Ton Main	2235	1.00	0.00
CRANE, HYDRAULIC, TRUCK MOUNTED, 90 Ton Carrier	5305	1.00	0.01
GRADER, MOTOR, ARTICULATED, 135 HP, 12' Blade Width	11406	1.00	0.01
HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB, 1.50 CY BUCKET	13748	1.00	0.02
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB, 2.00 CY BUCKET	18578	1.00	0.02
LANDSCAPING EQUIPMENT, HYDROSEEDER, 3,000 GAL, TRUCK MOUNTED Main	1157	1.00	0.00
LANDSCAPING EQUIPMENT, HYDROSEEDER, 3,000 GAL, TRUCK MOUNTED Carrier	3119	1.00	0.00
ROLLER, VIBRATORY, TOWED, SINGLE DRUM, SHEEPSFOOT, 25.5 TON, 72" WIDE	4528	1.00	0.00
TRACTOR, CRAWLER (DOZER), 181-250 HP POWERSHIFT, LGP, W/UNIVERSAL BLADE	167357	1.00	0.18
TRACTOR, CRAWLER (DOZER), 251-300 HP, POWERSHIFT, W/UNIVERSAL BLADE	66082	1.00	0.07
TRUCK, HIGHWAY, CONVENTIONAL, 8,800 LB GVW, 4X4, 2 AXLE, 3/4 TON - PICKUP	12702	1.00	0.01

TRUCK, HIGHWAY, 25,000 LB GVW, 4X2, 2 AXLE	21274	1.00	0.02
TRUCK, HIGHWAY, 45,000 LB GVW, 6X4, 3 AXLE	15103	6.90	0.11
TRUCK, HIGHWAY, 45,000 LB GVW, 6X4, 3 AXLE	16352	6.90	0.12
TRUCK, HIGHWAY, 50,000 LB GVW, 6X4, 3 AXLE	17558	6.90	0.13

Total VOC Project Emissions (tons) = 0.48

*Emission Factor taken from Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition Report No. NR-009d, Revised July 2010, Assessment and Standards Division EPA, Office of Transportation and Air Quality

Table 4. Emission Estimates (PM)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)
Emissions (tons) = Emissions (g) * (1 ton/907200 g)
PM Emissions Factor for Off-Road Construction Equipment is 0.4 g/hp-hr*

Equipment/Engine Category	hp-hr	EF (g/hp-hr)	Emissions (tons)
COMPACTOR, ROLLER, VIBRATORY, 26.5" W, 0.8 Ton	14	0.40	0.00
CRANE, HYDRAULIC, TRUCK MOUNTED, 25 Ton	106098	0.40	0.05
CRANE, HYDRAULIC, TRUCK MOUNTED, 90 Ton Main	2235	0.40	0.00
CRANE, HYDRAULIC, TRUCK MOUNTED, 90 Ton Carrier	5305	0.40	0.00
GRADER, MOTOR, ARTICULATED, 135 HP, 12' Blade Width	11406	0.40	0.01
HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB, 1.50 CY BUCKET	13748	0.40	0.01
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB, 2.00 CY BUCKET	18578	0.40	0.01
LANDSCAPING EQUIPMENT, HYDROSEEDER, 3,000 GAL, TRUCK MOUNTED Main	1157	0.40	0.00
LANDSCAPING EQUIPMENT, HYDROSEEDER, 3,000 GAL, TRUCK MOUNTED Carrier	3119	0.40	0.00
ROLLER, VIBRATORY, TOWED, SINGLE DRUM, SHEEPSFOOT, 25.5 TON, 72" WIDE	4528	0.40	0.00
TRACTOR, CRAWLER (DOZER), 181-250 HP POWERSHIFT, LGP, W/UNIVERSAL BLADE	167357	0.40	0.07
TRACTOR, CRAWLER (DOZER), 251-300 HP, POWERSHIFT, W/UNIVERSAL BLADE	66082	0.40	0.03
TRUCK, HIGHWAY, CONVENTIONAL, 8,800 LB GVW, 4X4, 2 AXLE, 3/4 TON - PICKUP	12702	0.40	0.01

TRUCK, HIGHWAY, 25,000 LB GVW, 4X2, 2 AXLE	21274	6.90	0.16
TRUCK, HIGHWAY, 45,000 LB GVW, 6X4, 3 AXLE	15103	6.90	0.11
TRUCK, HIGHWAY, 45,000 LB GVW, 6X4, 3 AXLE	16352	6.90	0.12
TRUCK, HIGHWAY, 50,000 LB GVW, 6X4, 3 AXLE	17558	6.90	0.13
		Total PM Project Emissions (tons) =	0.34

*Emission Factor taken from Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition Report No. NR-009d, Revised July 2010, Assessment and Standards Division EPA, Office of Transportation and Air Quality

Table 5. Pollutant Emissions from Employee Vehicles

Assumptions:

Average trip distance (1 way) is 25 miles.
Average NOx vehicle emission factor is 1.4 g/mile. Average VOC vehicle emission factor is 2.8 g/mile. Work crew comprised of 47 people (maximum)
Every member of the work crew drives their own vehicle. Project construction period is 12 months.
Project construction occurs 5 days per week. There are 3 holidays in the work period.
There are 4 weather days (no work).

Actual days = 240 days - 64 weekend days off - 6 holidays off - 6

weather days off Actual work days = 164 days

NOx Calculation: 47 workers * 2 trips/work day * 164 work days * 25 miles/trip * 1.4 g of NOx/mile* (1 ton/907200 g)
Total NOx resulting from employee vehicles = 0.59

VOC Calculation: 47 workers * 2 trips/work day * 164 work days * 25 miles/trip * 2.8 g of VOC/mile* (1 ton/907200 g)

Total VOC resulting from employee vehicles = 1.19

Pollutant emissions associated with employee vehicles derived from:
Emission Facts: Average Annual Emissions and Fuel Consumption for Passenger Cars and Light Trucks, EPA420-F-00-013, April 2000.

Total Project NOx Project Emissions (tons) (construction + worker's vehicles) = 3.89
Total Project VOC Project Emissions (tons) (construction + worker's vehicles) = 1.67