Figure 3-17

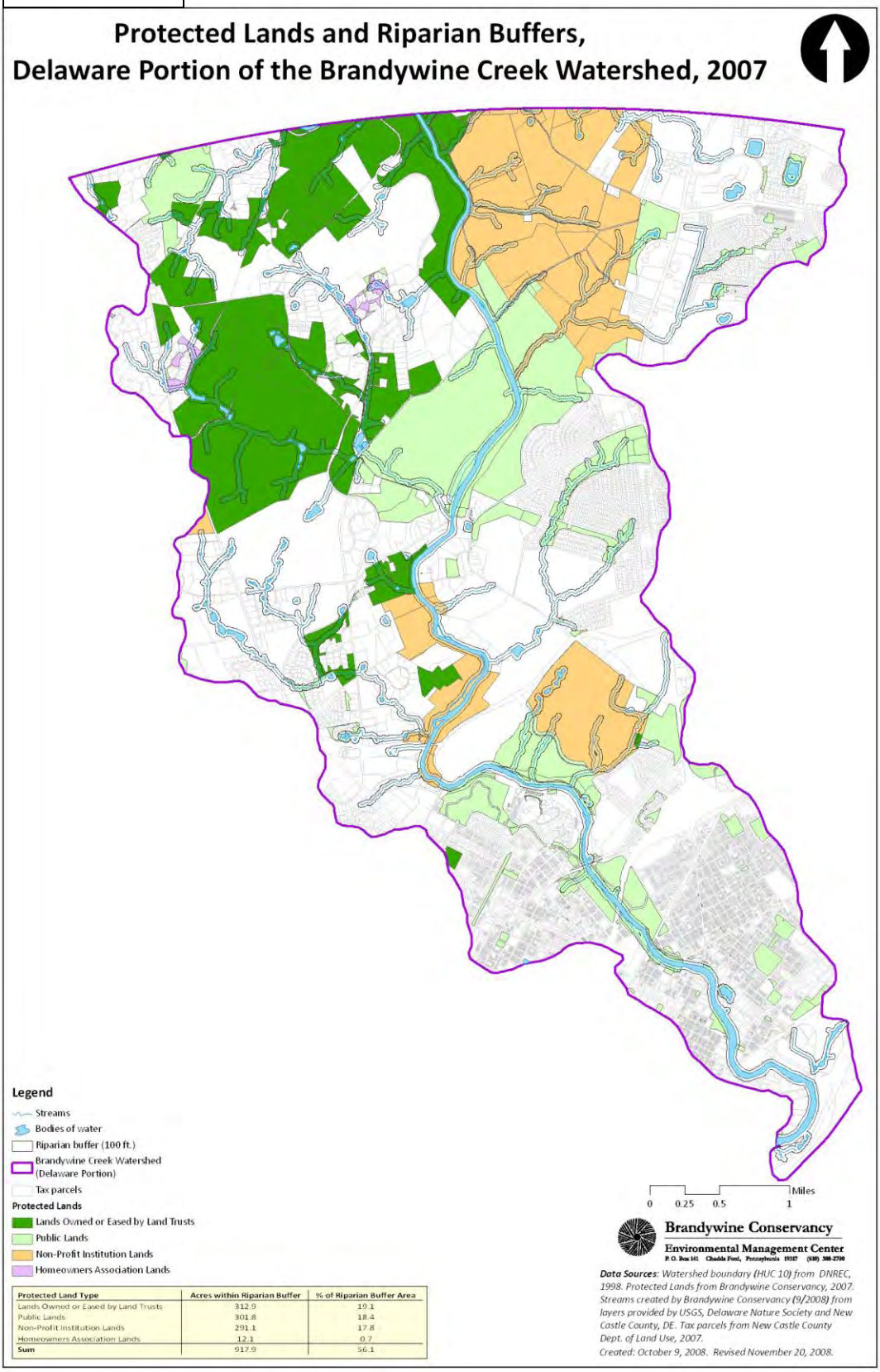
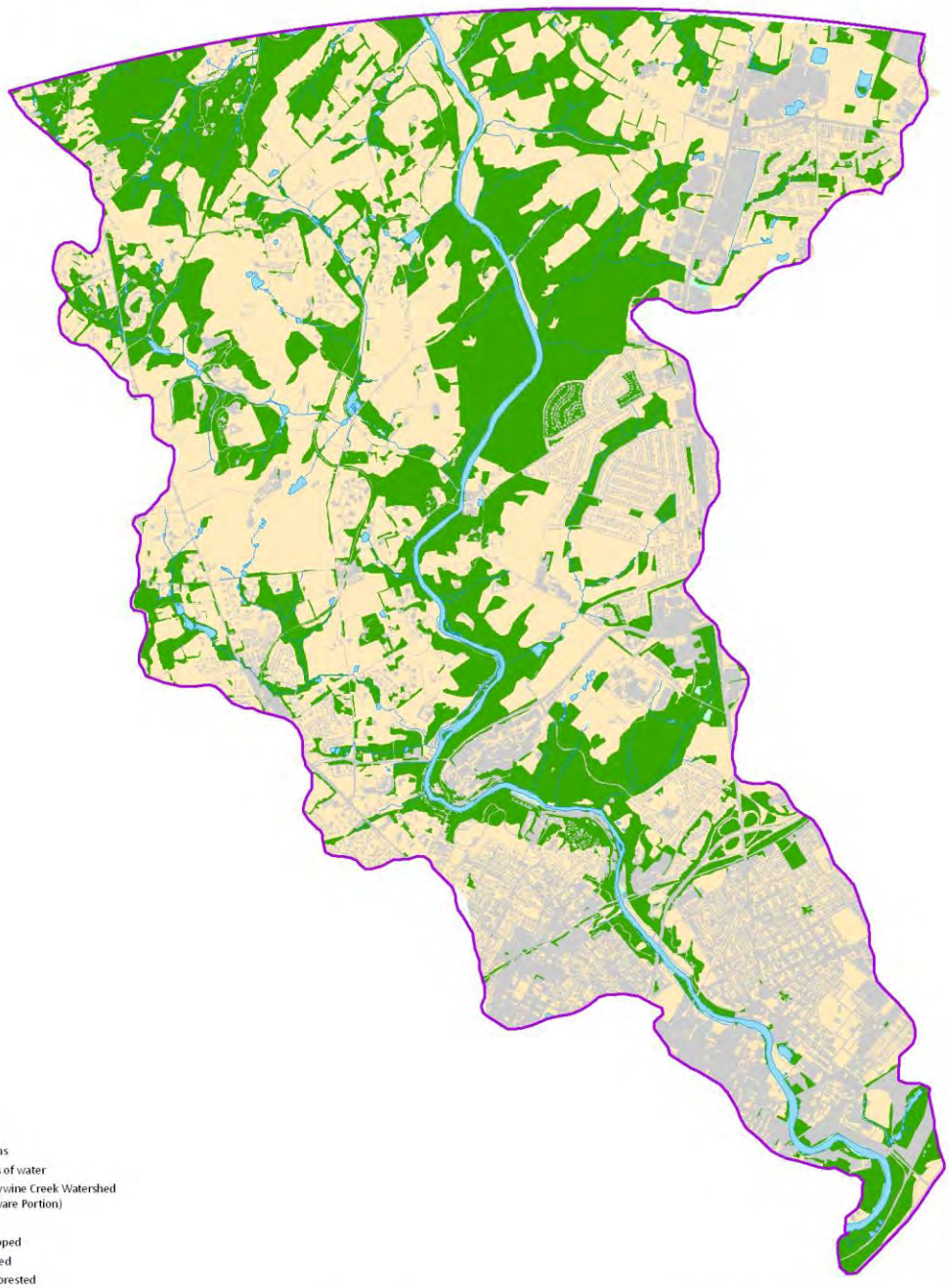

Protected Lands and Riparian Buffers,
Delaware Portion of the Brandywine Creek Watershed, 2007
Legend
Streams
Bodies of water
Riparian buffer (100 ft.)
Brandywine Creek Watershed (Delaware Portion)
Tax parcels
Protected Lands
Lands Owned or Eased by Land Trusts
Public Lands
Non-Profit Institution Lands
Homeowners Association Lands
Protected Land Type | Acres within Riparian Buffer | % of Riparian Buffer Area
Lands Owned or Eased by Land Trusts | 312.9 | 19.1
Public Lands | 301.8 | 18.4
Non-Profit Institution Lands | 291.1 | 17.8
Homeowners Association Lands | 12.1 | 0.7
Sum | 917.9 | 56.1
0 0.25 0.5 1 Miles
Brandywine Conservancy
Environmental Management Center
Data Sources: Watershed boundary (HUC 10) from DNREC, 1998. Protected Lands from Brandywine Conservancy, 2007. Streams created by Brandywine Conservancy (9/2008) from layers provided by USGS, Delaware Nature Society and New Castle County, DE. Tax parcels from New Castle County Dept. of Land Use, 2007.
Created: October 9, 2008. Revised November 20, 2008.

Figure 3-18

Detailed Land Cover, Delaware Portion of the Brandywine Creek Watershed, 2002



Legend

- Streams
- Bodies of water
- Brandywine Creek Watershed (Delaware Portion)

Land Cover

- Developed
- Forested
- Non-Forested
- Water/Wetland

Land Cover Type	Acres	% of Watershed
Developed	2,984.3	20.3
Forested	4,621.7	31.5
Non-Forested	6,678.0	45.5
Water/Wetland	325.1	2.2
Missing data*	70.9	0.5
Sum	14,680.0	100.0

**The land cover layer does not match the Brandywine Creek watershed boundary due to differences in data collection*

0 0.25 0.5 1 Miles

Brandywine Conservancy
Environmental Management Center
P. O. Box 141 Chadds Ford, Pennsylvania 19317 (610) 388-2700

Data Sources: *Watershed boundary (HUC 10) from DNREC,1998. Land Cover derived from data provided by Delaware Natural Heritage Program, 2002. Streams created by Brandywine Conservancy (9/2008) from layers provided by USGS, Delaware Nature Society, and New Castle County, DE.*

Date Created: October 9, 2008. Revised November 24, 2008.

Figure 3-19

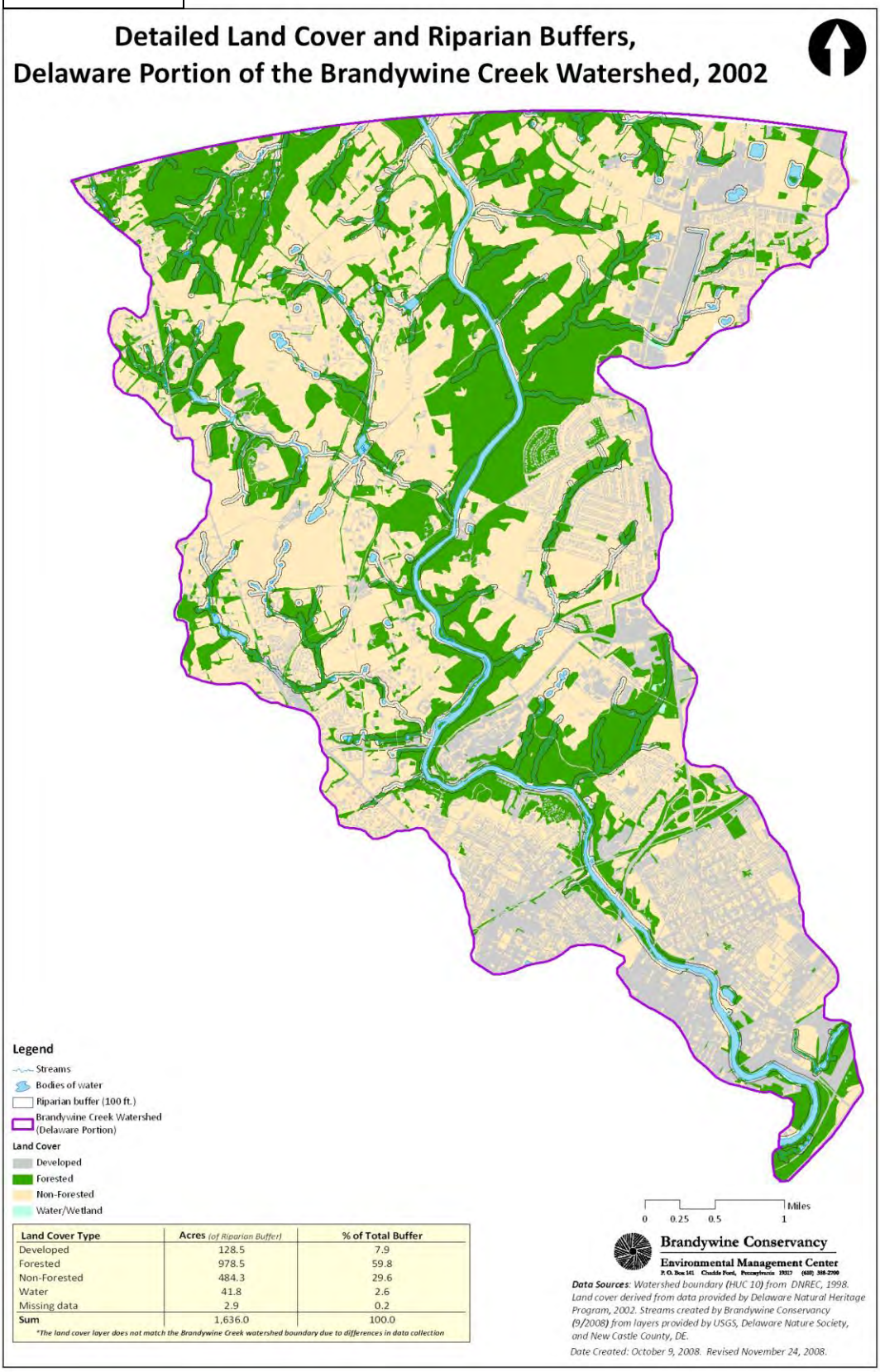
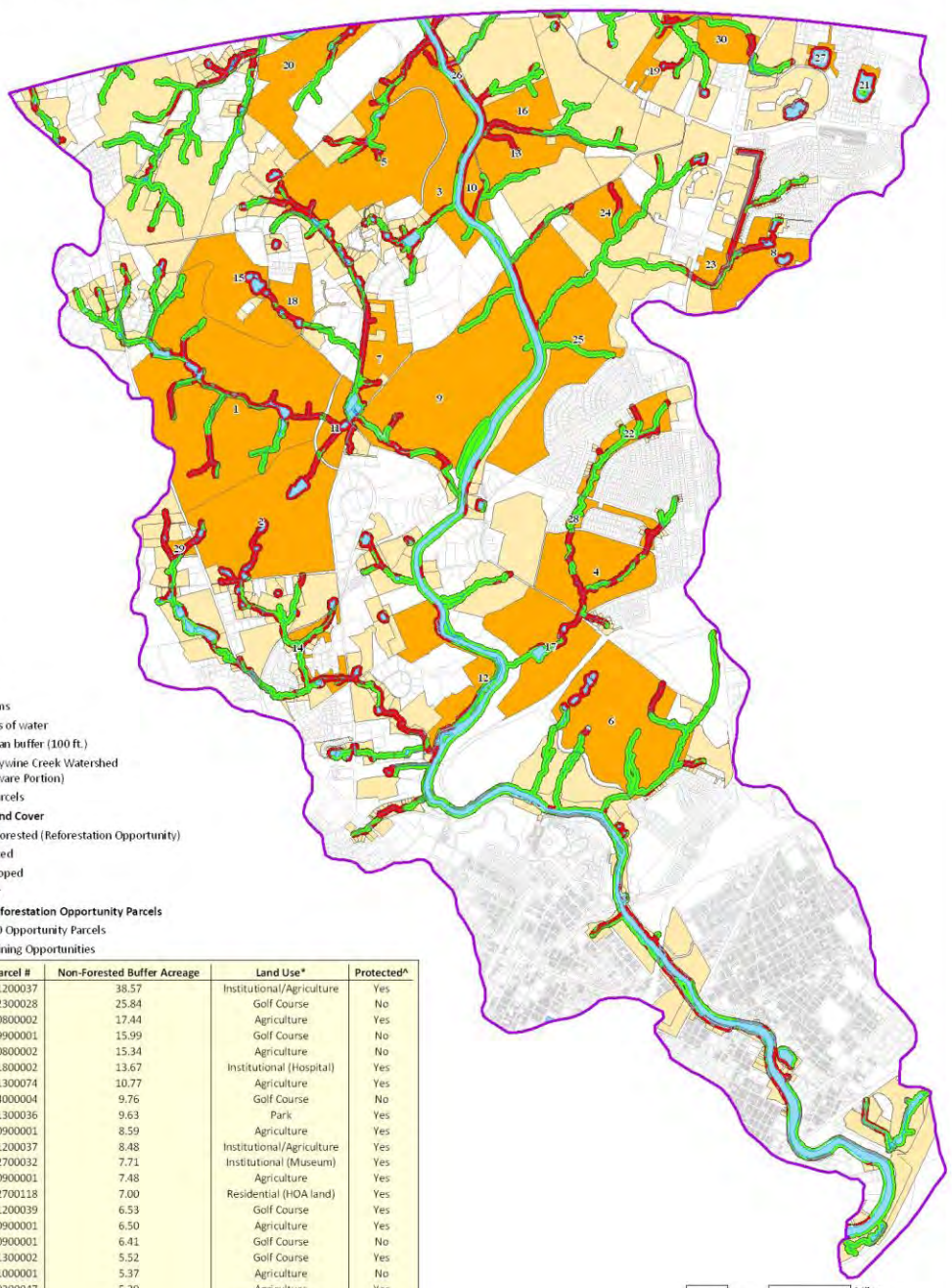

Detailed Land Cover and Riparian Buffers,
Delaware Portion of the Brandywine Creek Watershed, 2002
Legend
Streams
Bodies of water
Riparian buffer (100 ft.)
Brandywine Creek Watershed (Delaware Portion)
Land Cover
Developed
Forested
Non-Forested
Water/Wetland
Land Cover Type | Acres (of Riparian Buffer) | % of Total Buffer
Developed | 128.5 | 7.9
Forested | 978.5 | 59.8
Non-Forested | 484.3 | 29.6
Water | 41.8 | 2.6
Missing data | 2.9 | 0.2
Sum | 1,636.0 | 100.0
*The land cover layer does not match the Brandywine Creek watershed boundary due to differences in data collection
0 0.25 0.5 1 Miles
Brandywine Conservancy
Environmental Management Center
Data Sources: Watershed boundary (HUC 10) from DNREC, 1998. Land cover derived from data provided by Delaware Natural Heritage Program, 2002. Streams created by Brandywine Conservancy (9/2008) from layers provided by USGS, Delaware Nature Society, and New Castle County, DE.
Date Created: October 9, 2008. Revised November 24, 2008.

Figure 3-20

Riparian Reforestation Opportunities, Delaware Portion of the Brandywine Creek Watershed



Rank	Parcel #	Non-Forested Buffer Acreage	Land Use*	Protected^
1	701200037	38.57	Institutional/Agriculture	Yes
2	702300028	25.84	Golf Course	No
3	700800002	17.44	Agriculture	Yes
4	609900001	15.99	Golf Course	No
5	700800002	15.34	Agriculture	No
6	611800002	13.67	Institutional (Hospital)	Yes
7	701300074	10.77	Agriculture	Yes
8	604000004	9.76	Golf Course	No
9	701300036	9.63	Park	Yes
10	600900001	8.59	Agriculture	Yes
11	701200037	8.48	Institutional/Agriculture	Yes
12	702700032	7.71	Institutional (Museum)	Yes
13	600900001	7.48	Agriculture	Yes
14	702700118	7.00	Residential (HOA land)	Yes
15	701200039	6.53	Golf Course	Yes
16	600900001	6.50	Agriculture	Yes
17	610900001	6.41	Golf Course	No
18	701300002	5.52	Golf Course	Yes
19	601000001	5.37	Agriculture	No
20	700200047	5.29	Agriculture	Yes
21	601200231	5.01	Residential (HOA land)	Yes
22	606400033	4.97	Park	Yes
23	602900009	4.91	Institutional (College)	No
24	602800005	4.56	Agriculture	Yes
25	602800002	4.48	Park	Yes
26	600100005	4.43	Park	Yes
27	600400025	4.39	Commercial	No
28	608800018	4.33	Park	Yes
29	702300022	4.11	Residential	No
30	600400002	3.77	Agriculture	No

*Derived from 2007 aerial photography and tax parcel records.
^Refers to ownership, or easements held, by nonprofits, land trusts, public agencies, and HOAs.

The Brandywine Conservancy also conducted an additional GIS screening of potential riparian buffer opportunities in the Brandywine Creek. This prioritization was conducted using the similar methodologies discussed previously in this section. Tables 3- 20 and 21 summarize the potential amounts of riparian buffer opportunities in the watershed. As shown all the sections of the watershed except the main stem portion of the Brandywine in Delaware had over 50% to 60% riparian buffer opportunities. When examined on a percentage basis it appears that the Upper East Branch and Central Brandywine sections have the greatest potential riparian buffer areas and potential riparian buffer opportunities. Figures 3-21 to 25 show the riparian areas in each watershed. The numbered areas in the figures identify the larger potential riparian opportunities.

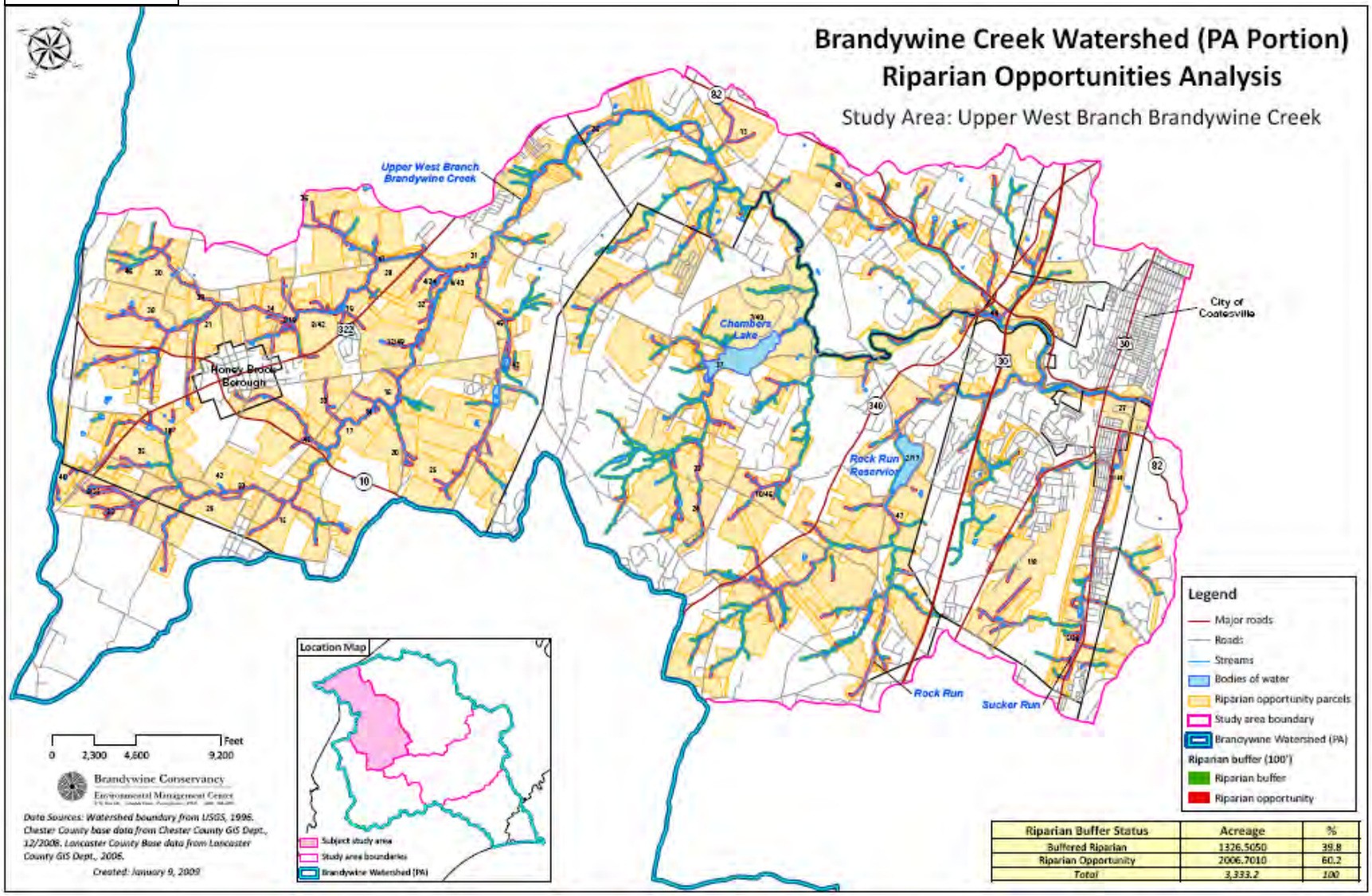
Table 3- 20 – Acres of Potentially Buffered and Non-Buffered Riparian Areas In Sections of The Brandywine Watershed

Section of Watershed	Buffered Riparian (acres)	Riparian Opportunity (acres)	Total (acres)	% opportunity
Upper West Branch	1326.505	2006.701	3333.2	60%
Upper East Branch	2726.2	3177.83	5904	54%
Buck & Doe Run	1419.305	2178.235	3597.5	61%
Central Brandywine Creek	2134.6	3267.8	5402.4	60%
Main stem Brandywine (PA)	1824.9	2046.9	3871.8	53%
Main stem Brandywine (DE)	978.5	484.3	1462.8	33%
Total	10410.01	13161.766	23571.7	56%

Table 3- 21 – Percentage of Potentially Buffered and Non-Buffered Riparian Areas In Sections of The Brandywine Watershed

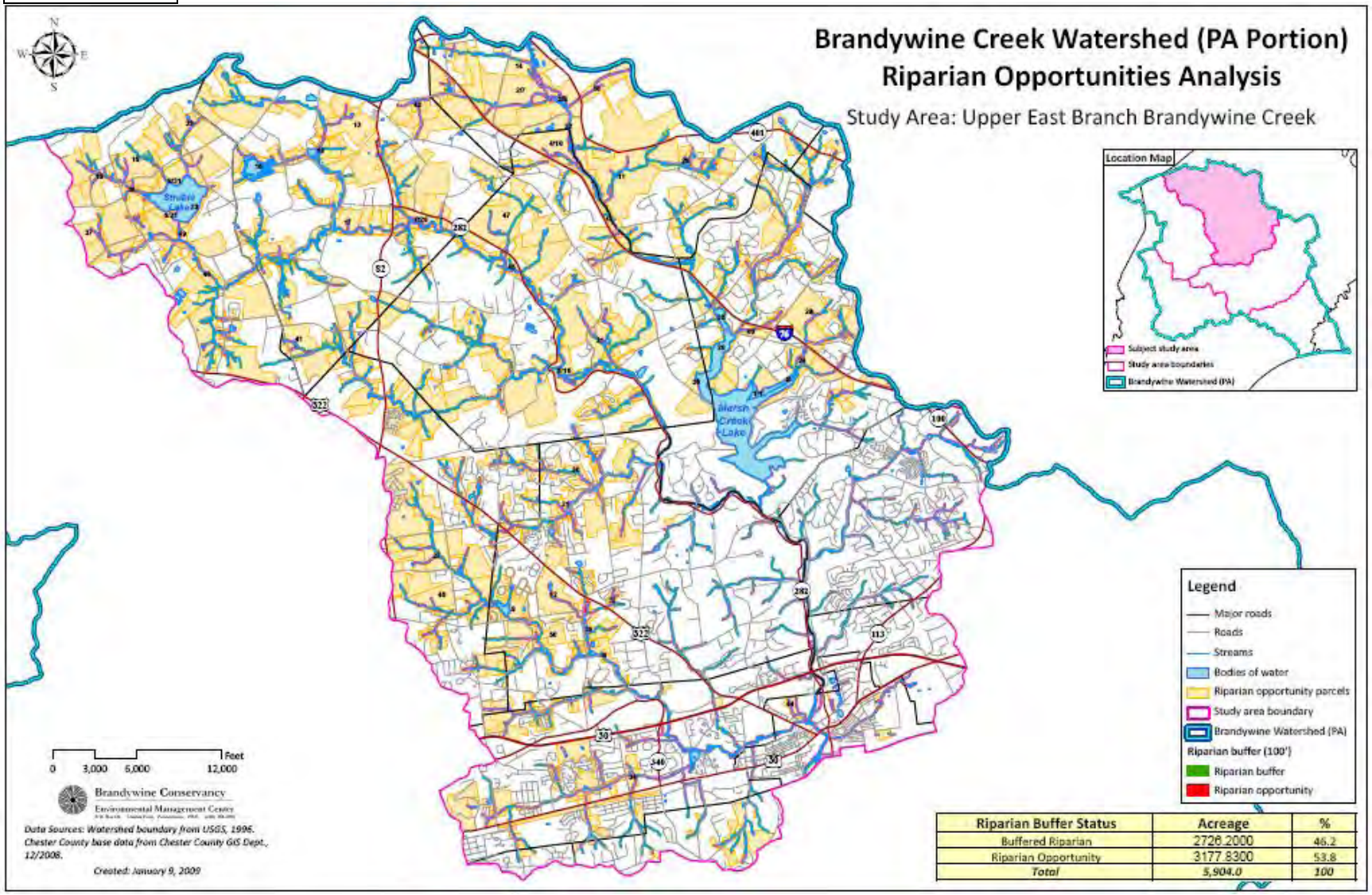
Section of Watershed	Buffered Riparian (acres)	Riparian Opportunity (acres)	Total (acres)
Upper West Branch	13%	15%	14%
Upper East Branch	26%	24%	25%
Buck & Doe Run	14%	17%	15%
Central Brandywine Creek	21%	25%	23%
Main stem Brandywine (PA)	18%	16%	16%
Main stem Brandywine (DE)	9%	4%	6%
Total	100%	100%	100%

Figure 3-21



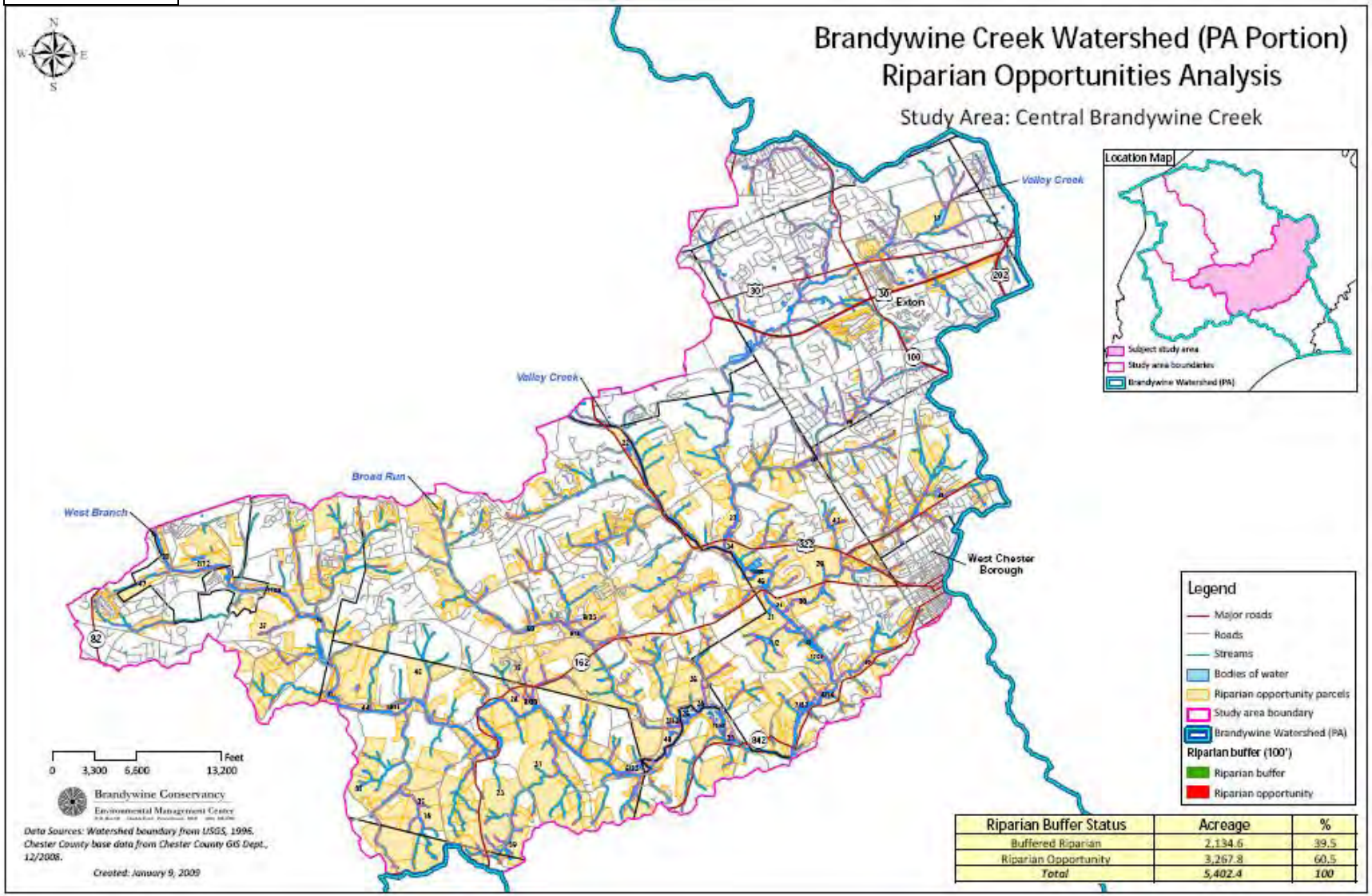
Riparian Buffer Status	Acreage	%
Buffered Riparian	1326.5050	39.8
Riparian Opportunity	2006.7010	60.2
Total	*3,333.2*	*100*

Figure 3-22



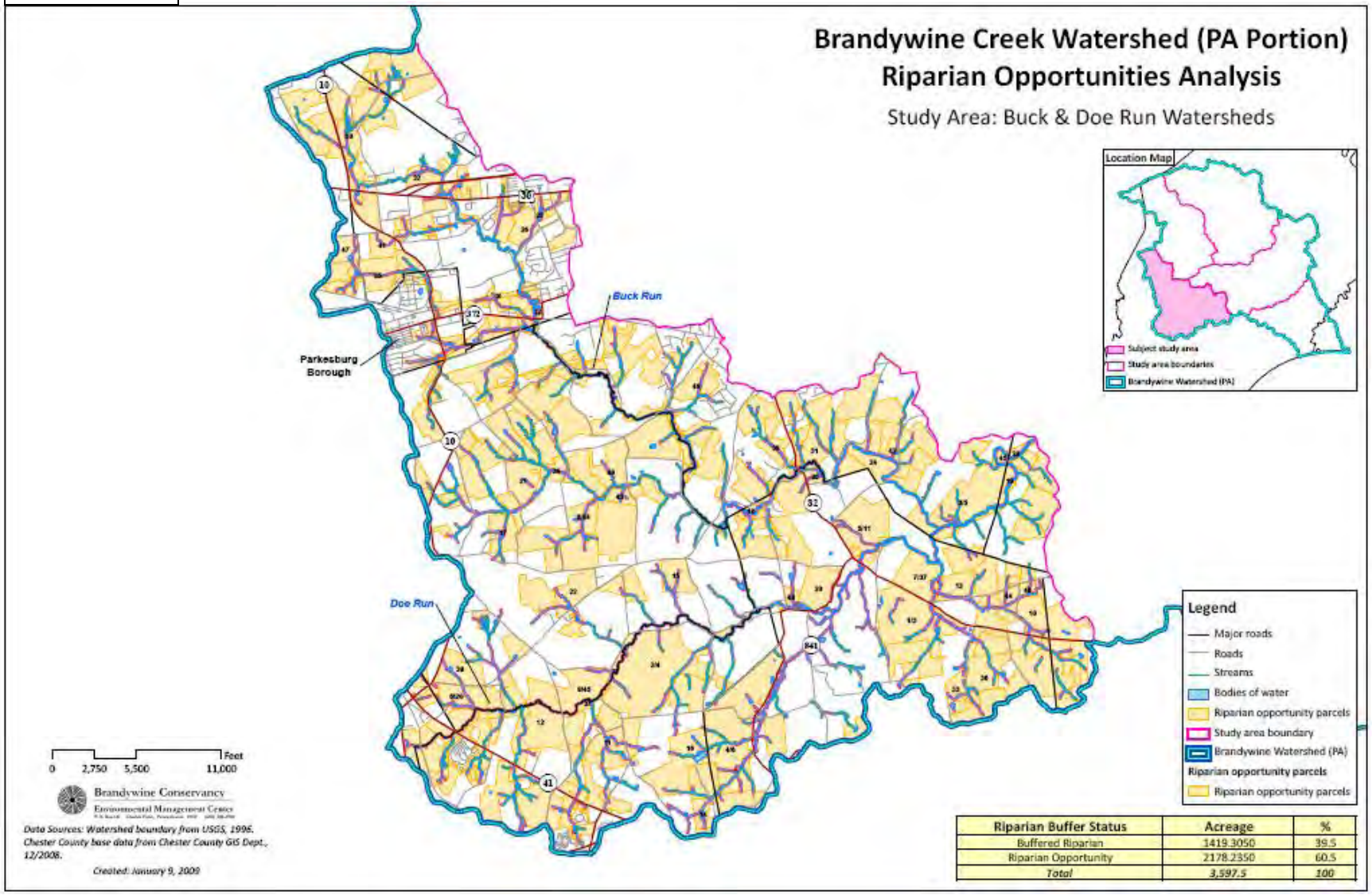
Riparian Buffer Status	Acreage	%
Buffered Riparian	2726.2000	46.2
Riparian Opportunity	3177.8300	53.8
Total	*5,904.0*	*100*

Figure 3-23



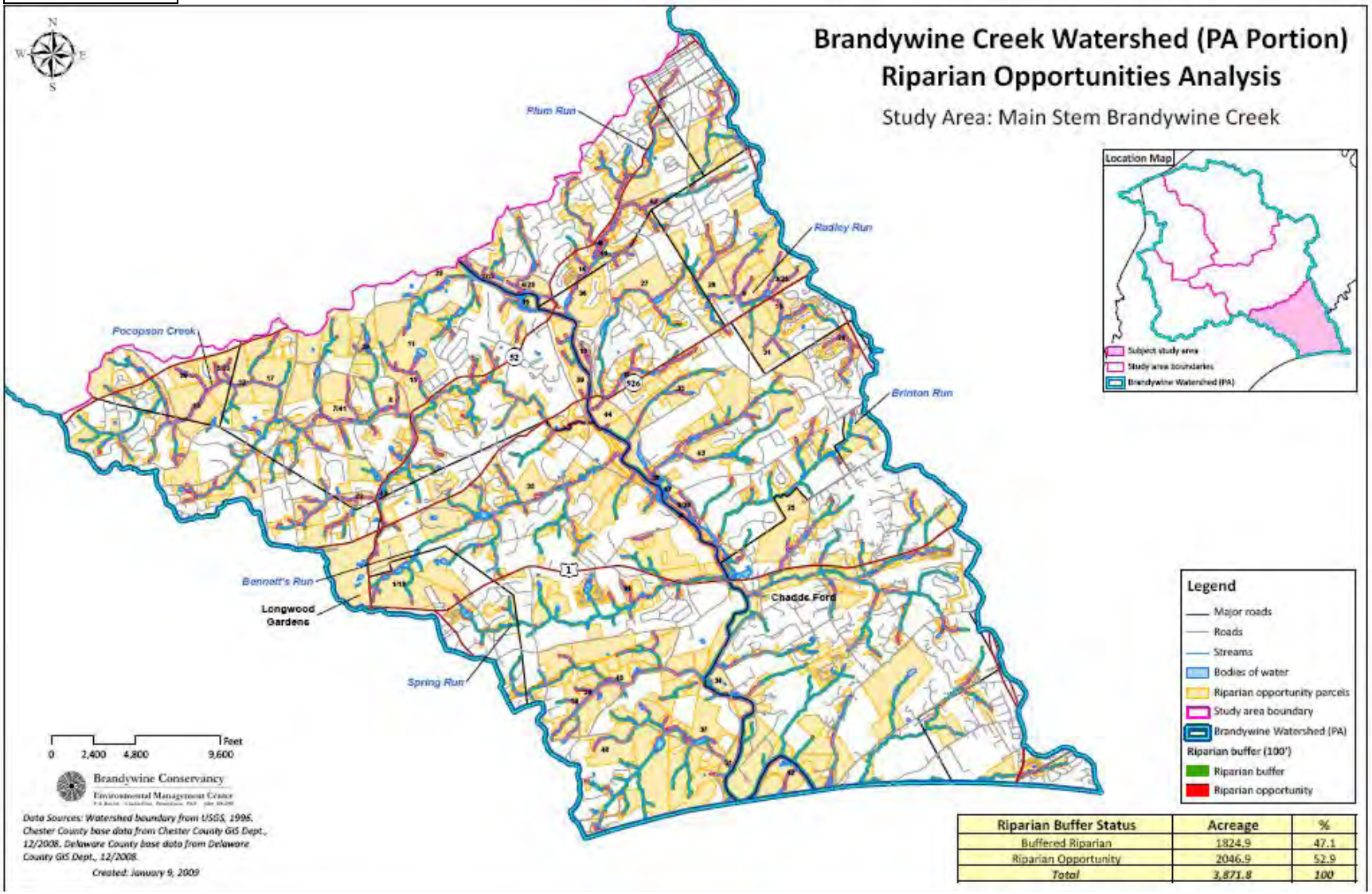
Riparian Buffer Status	Acreage	%
Buffered Riparian	2,134.6	39.5
Riparian Opportunity	3,267.8	60.5
Total	*5,402.4*	*100*

Figure 3-24



Riparian Buffer Status	Acreage	%
Buffered Riparian	1419.3050	39.5
Riparian Opportunity	2178.2350	60.5
Total	*3,597.5*	*100*

Figure 3-25



Riparian Buffer Status	Acreage	%
Buffered Riparian	1824.9	47.1
Riparian Opportunity	2046.9	52.9
Total	*3,871.8*	*100*

3.5. Common Priorities with Stakeholders

In reality, implementation of the preservation and mitigation areas though prioritized for Wilmington's water supply needs may not be the order in which things may be implemented. In fact, the identification of common priority mitigation areas and preservation activities for Wilmington with the other stakeholders will ultimately result in the most quickly implemented, cost effective, sustainable, and successful projects. Therefore, though the previously described priorities are for Wilmington, flexibility of Wilmington's SWP program to adjust to work with stakeholders will be a priority. Nonetheless, there are several common priorities that were identified between the Wilmington SWP Plan and other stakeholders that can serve as a starting point for common partnerships and efforts. Table 3-22 shows common priorities between the Wilmington SWP Plan and other stakeholder priorities.

Table 3-22– Common Priorities of the Wilmington SWP Plan with Other Previous Stakeholder Plans and Priorities

Priority Source / Type	Common Priority	Stakeholder	Other Plans
Agriculture	Honey Brook area & clusters	CCCD, Coatesville PA American	TWIG scope of work, CCC, BAP, Phase II & III reports, DE PCS
Preservation	Upper East Branch	Brandywine conservancy, Aqua PA	UEB DCNR, Watersheds/Landscapes, CCC, BAP, DE PCS
Stormwater Mitigation	Radley Run/Plum Run	BVA	
Stormwater	Ordinances	CCWRA, WRAUD	DE PCS, Phase I, II, III reports, TMDL
Stormwater	Stormwater Utility	NCC, WRAUD	DE PCS
Point Source	Accidents/Spills	Aqua, Downingtown, Coatesville, CCHD	None
Point Source	NPDES Discharges	Aqua, PADEP, BVA	TMDL, BAP,
Stormwater	Sodium/Chloride	DNREC , DELDOT	None
Emerging Contaminants	Trace Organics	USGS	None

3.6. Brandywine Watershed / Christina Basin Clean Water Partnership Stakeholder Efforts & Projects

The Brandywine Creek Watershed is fortunate to have a number of stakeholders that are actively involved in efforts to address the various issues identified in previous sections of this report. These activities are mainly coordinated in a larger effort by the Christina Basin Clean Water Partnership. The Christina Basin Clean Water Partnership is a multi-state stakeholder and regulatory agency endorsed effort to restore the Christina River Basin and its tributaries to unimpaired status. A majority of its work is focused on identifying and implementing approaches to implement the TMDLs in the watershed to achieve meaningful environmental results. Other than the regulatory agencies such as USEPA, DNREC, and PADEP many other stakeholder organizations are involved at various levels in efforts in the Brandywine Creek Watershed. The best example of stakeholder coordination, partnering, and leveraging due to the Christina Basin Clean Water Partnership is the awarding of Watershed Initiative Grant. It was a $1 million dollar grant awarded to the Christina Basin Clean Water Partnership. The three year grant was used to study and test several agricultural and stormwater best management practices to reduce nonpoint source runoff. Some specific projects included restoration of 10,000 feet of agricultural streams and implementation of a SMARTYARD program. It also includes the following on-the-ground projects:

- One stormwater retrofit project at Ashbridge Square in East Caln Township, Pennsylvania
- Survey work for three nutrient-management control systems in Chester County, Pennsylvania
- Treatment of 500 acres of cropland per a nutrient-management plan in Chester County, Pennsylvania
- Stabilization/reforestation of 1,200 linear feet of stream bank on Ludwig Creek, a headwater to Brandywine Creek
- Five water-control structures (two small basins and three crossings) in Chester County, Pennsylvania
- Four nutrient-management plans
- One rain garden along Cool Run, a tributary to the White Clay Creek National Wild and Scenic River in Newark, Delaware
- Stream restoration along 5,000 linear feet of Pike Creek in New Castle County, Delaware, including the creation of three acres of wetlands and five acres of riparian corridor using native plants
- The restoration of 350 linear feet of stream along a tributary to the Red Clay Creek in New Castle County, Delaware

- 25 SMARTYARD projects
- Site selection for seven wetland projects at the University of Delaware's Agriculture Complex

The following describes some of those stakeholders and highlights some of their specific efforts in the Brandywine Creek Watershed.

Brandywine Conservancy (BC) – The Brandywine Conservancy includes the Environmental Management Center with the main goal of protecting the natural and cultural resources of the Brandywine watershed and other selected areas. To date, the Conservancy has been involved in the permanent protection of more than 41,000 acres of land through services to landowners, farmers, municipalities, and developers. This is accomplished through providing conservation services to landowners, farmers, municipalities and developers. Their professional staff also offers technical assistance and expertise for conservation and comprehensive land use planning which includes conservation easements, assistance to local governments and water protection efforts. The Conservancy has provided significant assistance to the City of Wilmington's Source Water Protection Plan regarding items related to natural resource inventories, GIS mapping, and conservation efforts. In 2008, the City of Wilmington initiated a funding agreement with the Brandywine Conservancy that provides a $10,000 matching contribution to headwaters preservation projects.

Brandywine Valley Association (BVA) – The Brandywine Valley Association was the first small watershed association in America. BVA focuses on providing water protection and environmental education. Its current focus is on its red streams to blue program which is aimed at restoring impaired streams in the watershed. Its current restoration efforts are focused in the East Branch at Plum Run and Radley Run. The BVA is also providing assistance to the City of Wilmington in its Source Water Protection Plan by hosting a water supplier issue forum to discuss water supply issues with watershed stakeholders.

Chester County Water Resources Authority (CCWRA) – The mission of Chester County Water Resources Authority is to provide the basic science, analyses and planning necessary to protect public safety, to preserve the integrity of Chester County's natural water resources and watershed systems, and to balance the needs of water users in support of **Landscapes** and planned growth for Chester County.

The CCWRA created and published ***Watersheds***—*An Integrated Water Resources Management Plan for Chester County, Pennsylvania and Its Watersheds* which was adopted as a component of ***Landscapes***, Chester County's comprehensive land use policy plan. To encourage the implementation of ***Watersheds***, CCWRA conducts, coordinates, and facilitates water resources management and planning activities.

The CCWRA with its partners has ongoing programs to:

- Characterize and monitor the County's streams and ground water.
- Provide scientific data, investigations, and projects to address priority concerns.
- Provide reliable water resources information to municipalities, water users, and the public.
- Coordinate with municipalities, water purveyors, government agencies, environmental, watershed and conservancy organizations, and others involved in activities that affect Chester County's water resources and watersheds.
- Operate Struble, Beaver Creek, Barneston, and Hibernia Dams, and Chambers Lake reservoir to protect public safety during floods and droughts.
- Own and maintain nearly 200 acres of adjoining riparian lands and easements and the 80-acre Chambers Lake reservoir. Chambers Lake is a 400 million gallon water supply reservoir that is used to provide water for the Coatesville regional water supply system during droughts.

Chester County Conservation District (CCCD) – the mission of the Chester county conservation district is to provide leadership in addressing natural resource conservation in the sustainable use of those resources by the citizens of Chester County through education and technical assistance. This includes the following programs:

- Erosion and Sediment Control
- National Pollutant Discharge Elimination System (NPDES) Post Construction Stormwater Management
- Agriculture
- Education
- Dirt and Gravel Road Program
- Watershed Coordinator Assistance

University of Delaware, Water Resources Agency (UDWRA) - The UDWRA provides technical assistance for water resources and watershed policy and to governments in Delaware and the Delaware Valley through the University's public service, education, and research role. It's funded by four governments - the State of Delaware, New Castle County, City of Newark, and City of Wilmington along with grants from public and private sources. The staff at the WRA utilizes an interdisciplinary team approach and specializes in technical assistance, research, and information management in the fields of water supply, water quality, and watershed management and planning. The WRA provides Local Government Water Management Assistance, Natural Resources and Infrastructure Inventory, Infrastructure and Land Use Reviews, Public Assistance and Education, and Federal,

Regional and Statewide Grant Administration.

Aqua Pennsylvania (Aqua PA) - A national and regional water supplier, Aqua PA conducts activities to protect its water supply intake on the East Branch of the Brandywine Creek. It conducts monitoring and watershed inspections and participates in stakeholder activities and events.

Pennsylvania American Water Company (PAWC) - PAWC is a national and regional water supplier. It conducts activities that promote water supply protection for its intake at Coatesville on the West Branch of the Brandywine Creek. American Water launched an environmental grant program in 2005 and has since expanded the program into 20 states where the company provides water and wastewater services. Applicants are asked to address a source water protection need in the local community or a project that improves, restores, or protects one or more watersheds. Approximately $21,000 in grants was given in Pennsylvania in 2007 though none were in the Brandywine Creek Watershed.

Delaware Nature Society (DNS) - The DNS efforts focus in the state of Delaware primarily on education, preservation, and conservation. Specifically it offers a variety of outdoor programs in natural settings, preserves rare habitats, and assists in addressing environmental concerns.

Partnership for the Delaware Estuary (PDE) – PDE was established in 1996 to take a leadership role in protecting and enhancing the Delaware Estuary. The mission of the Partnership for the Delaware Estuary, one of 28 National Estuary Programs, is to lead collaborative and creative efforts to protect and enhance the Delaware Estuary and its tributaries for current and future generations.

Some relevant programs include it Corporate Environmental Stewardship Program (CESP) and Schoolyard Habitats programs. The CESP helps corporations discover that ecological enhancement and economic savings are not mutually exclusive. The Schoolyard Habitats Program offers to help schools, institutions, and organizations create and enhance wildlife habitats.

Section 4 – Funding, Public Outreach, & Policy Needs

4.1. Funding Sources in the Brandywine Watershed

A search of Federal Funding Databases identified over 71 different federal funding grant sources for watershed related programs (http://cfpub.epa.gov/fedfund/search1.cfm) that distribute millions per year in federal dollars to address watershed issues. Over 27 different organizations were identified that provide funding or resources to the Brandywine Watershed (See Table 4-1). Most notably in Pennsylvania over $2.6 million dollars in grants were provided between 1999 and 2006 through the PADEP Growing Greener Program (see Appendix B for a detailed listing). Approximately $19 million was provided for conservation and preservation in Chester County from the PADCNR grants programs of the grant funding is derived from programs that are oriented around addressing non-point source pollution and the EPA 319 program. Delaware also receives 319 funding, but the portion of the Brandywine Creek Watershed is Delaware is such a small portion of the state that it can only receive small portions of funding.

It may appear on paper that many of these funding sources are adequate to address the funding needs identified in Wilmington's Source Water Protection Plan. For example, of the 2.5 million in Growing Greener funding only roughly $500,000 was directly related to high priority projects in the SWP Plan (roughly 20%), and even this money was shared amongst the Honey Brook, Buck Run, and Doe Run areas. In addition to the final project funded the true implementation these grant sources are susceptible to significant annual fluctuations and are not consistently dedicated to specific long term projects or areas. Finally, each year significant administrative resources are expended to apply, process, and track these grants to measure effectiveness. These short term results and metrics are necessary, but lead to inefficiencies to address the needs of larger longer term watershed management programs.

If one compares the five year funding needs of the Honey Brook cluster initiative in the Wilmington SWP Plan with combined 5 year funding of past potential watershed funds, it is clear it significantly exceeds the available funding by a factor of five or greater ($500,000 over 5 years vs. $500,000 per year needed for Honey Brook). Comparing preservation, the long term average preservation rate in the watershed is roughly 1,200 acres per year. The focus area preservation rate for the Upper East Branch areas of Perkins Run and Indian Run in the COW SWPP is 1,000 acres alone at $800,000 per year. It is likely that the current preservation and conservation funds will not all be able to be allocated to this priority area, so it is assumed that roughly half of the $800,000 per year needed in the focus area will need to come from new sources.

Another funding source and approach will be necessary given the inconsistencies of funding and the clear gap between the necessary funding for the plan and current potential funding for all priorities. Wilmington may want to consider optional funding through avenues such as voluntary donations on customer's water bills or approaching larger industrial users of Wilmington's water to fund specific initiatives. Other options include access to the State Revolving Fund monies. According to conversations with EPA and DNREC, Wilmington

could use Delaware SRF monies upstream in PA. However, SRF money is a loan and a cost justification of the ultimate long term savings and benefits to water treatment versus the loan costs would need to be conducted.

Overall, Wilmington will need to identify key funding opportunities and new techniques for leveraging stakeholder resources and grant sources in order to achieve the goals of the source water protection plan. In some cases, the goals of its program based on measurable results may be limited by available funding and may need to be revised at a later date. However, current financial limitations should not be the way to set watershed protection goals. The focus should be on demonstrating the need and locating the funding mechanisms.

Given the findings of this analysis the following is recommended for Wilmington to fund its SWP Plan activities:

1. Identify the appropriate current funding sources and stakeholders for a particular element of the plan
2. Determine the limitations to achieving plan goal through current funding sources
3. Identify opportunities to leverage additional existing resources and funds to achieve the plan goal
4. If shortfalls still exist explore non-traditional and new sources of funding to address the gap if desired.
5. If shortfalls exist and cannot be addressed, then goals and targets will need to be adjusted based on financial limitations until new funding sources are created.

Table 4-1 – Potential Funding Organizations in the Brandywine Watershed

Organization Type	State	Organization	Primary Focus/Relationship	Potential Amount or Matching Resources
Public	DE	DNREC 319	non-point source reduction	> $100,000 /yr
Public	DE	DNREC State Revolving Fund	drinking water improvements	> $100,000/yr
Public	PA	PADCNR	Preservation	> $1 million/yr
Public	PA	PA American Water Company	Watershed restoration	$10,000
Public	All	EPA 319	non-point source reduction	$ 200 million nationally in 2008
Public	All	EPA Targeted Watersheds Initiative	non-point source reduction	$1 million to Christina Basin
Public	PA	PADEP - Growing Greener & 319	non-point source reduction	$5.7 Million Statewide (319), $94 million (GG), $2.6 million in Brandywine 1999-2006
Public	All	U.S. Fish & Wildlife NFWF	Habitat restoration/protection	$50,000 - $300,000
Public	All	U.S. Forest Service	Forestry improvements	Various
Public	All	U.S. Army Corps	Restoration	> $1 million/yr
Public	PA	League of Women Voters Water Resource Education Network	Education	$5,000 / yr

Organization Type	State	Organization	Primary Focus/Relationship	Potential Amount or Matching Resources
Public	All	Partnership for the Delaware Estuary	Education	Free stewardship programs
Public	All	USDA/NRCS - EQIP & CRP	Agricultural Preservation/Mitigation	> $200,000 / yr
Public	PA	PA Sea Grant (NOAA)	Planning/Studies	Various
Public	All	Coastal Zone Management (NOAA)	Coastal Protection/Restoration	Up to $100,000 / yr
Public	All	DELDOT & PENNDOT	Highway Mitigation Programs	Various
Public	All	National Science Foundation	Monitoring & Studies	Various
Public	All	U.S. Geological Survey & Dept. of Interior Heritage Corridor	Various	Various
Private	All	William Penn Foundation	Planning/Studies	Various
Private	All	Brandywine Conservancy	Conservation/Preservation	Various
Private	All	Brandywine Valley Association	Education/Restoration	Various
Private	All	Dupont Clear Into the Future	Preservation/Restoration	Up to $300,000/yr

Organization Type	State	Organization	Primary Focus/Relationship	Potential Amount or Matching Resources
Private	All	Golf Courses	Stewardship	Various
Private	DE	Nature Conservancy Delaware	Preservation/Restoration	Various
Private	DE	Delaware Nature Society	Preservation/Education	Various
Public	All	U of Delaware Water Resources Agency	Coordination/Planning	Various
Public	PA	Chester County Water Resources Authority	Coordination, Planning, Monitoring	Various

4.2. Public Outreach

4.2.1. Within the City of Wilmington

Within the City of Wilmington, public outreach for the Source Water Protection Plan has come through meetings with interdepartmental agencies about the plan and SWP Ordinance. Public outreach has been accomplished through handouts at Earth Day and through significant focus in the latest Consumer Confidence Report (CCR) by the City of Wilmington to all of its customers. Over 3 pages of the CCR were dedicated to the Source Water Protection Plan effort. To date, no calls, emails, or correspondence from the public about the CCR focus has been received.

Future efforts will need to focus on communicating the findings of the SWP Plan to the public without divulging security sensitive information. Also integration of the SWP Ordinance and the SWP Plan will be key in its implementation. It is recommended that the SWP Plan and its implementation by Wilmington's Source Water Protection Program is endorsed by City Council and the public. This may involve obtaining a City Council Resolution. Prior to the resolution, key community stakeholders should be identified for focused communication about the plan and to receive input. It is also recommended an Advisory Committee including private citizens, stakeholders, and pertinent city agency leaders be formed to help inform Wilmington's Source Water Protection Program as it implements the plan and for continuous dialogue and communication regarding progress if City Council passes a resolution requiring the plans implementation. However, general public review of portions of the SWP Plan may create security concerns due to the sensitive nature of the material and must be done very carefully.

4.2.2. Upstream Partner Outreach

Implementation of Wilmington's Source Water Protection Plan and Program is dependent upon the involvement of upstream stakeholders. Therefore, communication and partnership with this organization is critical to its success. To date, Wilmington has met with a variety of upstream stakeholders to gather input and discuss its Source Water Protection Plan. These included regulators, conservation districts, watershed groups, conservancies, municipalities, county governments, and water suppliers. These consisted of both formal meetings at stakeholder's offices and discussions at facilitated meetings or events. Wilmington continues to communicate its activities through the Christina Basin Partnership in order to reach the most stakeholders. On 10/3/08, the findings of the plan were presented to stakeholders for input. In addition, draft versions of the plan were distributed for stakeholder comments in late 2008. In early 2009, the plan with recommended changes by stakeholders was revised, presented, and shared with stakeholders. Specific efforts for partner projects were identified and pursued for implementation based on stakeholder input in 2009 and 2010.

4.3. Policy Issues

4.3.1. Needed Policy Changes

Throughout the meetings with stakeholders and analysis of existing information and data in the watershed a number of policy issues were identified. These policy issues fell into general categories involving funding, stormwater, land use ordinances, highway runoff, emergency management, and land preservation.

Funding – There are significant gaps between the funding needs to make significant progress in implementing the water quality goals for the watershed and actual funding sources. A dedicated and consistent source of funding is necessary. A watershed wide restoration or watershed management fund needs to be established. The sources and mechanisms for that fund need to be explored and created by leaders in the watershed.

Stormwater – Upstream communities in New Castle County and Chester County need to develop stormwater utilities that establish and impervious cover based billing system for stormwater. Upstream MS4 permits need to have TMDL's incorporated in a meaningful and productive manner.

Land Use Ordinances – The framework and approach of the Delaware Water Resource Protection Area related ordinances and Chester County municipal ordinances for development and stormwater management have considerable differences. A uniform set of ordinances based on watershed goals is necessary to achieve greater results. This also includes ordinances for riparian buffer protection and forest cover requirements.

Highway Runoff – Data clearly indicates that highway runoff is impacting the sodium and chloride levels in the watershed. Implementation of brining to reduce road salt activities wherever safely possible should be implemented. A pilot program along sensitive stream areas should be developed and implemented.

Emergency Management – Improvement in communication and notification of potential events between dischargers, regulated facilities, health departments, and water suppliers is needed. For example, water suppliers were not informed by health agencies about the cryptosporidiosis outbreak in West Chester, PA above Wilmington's water intake. Downstream notification requirements in Pennsylvania and Delaware should be compared and coordinated to help protect water suppliers.

Land Preservation – It is estimated that most of the forested land in the watershed that can be developed will be developed by 2100. Thus identifying and preserving the most environmentally valuable contiguous forested lands is critical. There is no single acknowledged overall plan for detailed prioritization and implementation of forested or agricultural land preservation in the watershed. A group of stakeholders will need to form a preservation committee and develop clear goals and direction for future watershed preservation.

5. Section 5 - Emergency Preparedness, Spill Response, & Contingency Planning

5.1. Turbidity Early Warning System

The City of Wilmington has the capability to switch from the Brandywine Creek as its main water source to the Hoopes Reservoir during periods of undesirable water quality. In order to maximize this capability, the City of Wilmington contracted the USGS to develop a turbidity early warning system that would provide advance warning of approaching turbidity spikes to the City's intakes so it could switch to the Hoopes supply prior to the arrive of the turbidity spike. Typically during dry weather periods the turbidity is only 1-2 NTU, but during wet weather events it can exceed 200 NTU. These higher turbidities have been associated with elevated levels of other contaminants that are described in depth in section 2.3.

The first step in this process was developing potential relationships between the flow at Chadds Ford and the peak turbidity at Wilmington's intake. It was determined from analysis of existing data that at 2,000 cfs the turbidity at the Wilmington intake exceeded 20 NTU which was greater than desired for use by Wilmington. Another analysis of the timing of the turbidity peaks was conducted by USGS. The USGS determined that when the flow at Chadds Ford reached 2,000 cfs that the turbidity spike would reach Wilmington's intakes in less than 8 hours. This was tested in the summer of 2006 and validated against existing data. Attempts were made later in 2006 by USGS to extend the warning system to upstream stations at the bottom of the East and West Branches of the Brandywine Creek, but similar relationships like the one at Chadds Ford could not be developed.

Analysis of the raw water quality data for the Porter Filtration Plant suggests there is potential for undesirable raw water quality in the Brandywine Creek during periods when the turbidity exceeds 10 NTU. A simple estimate is provided by review of the mean daily online turbidity data at the USGS station in Wilmington shows that overall 16% of the year (58 days) the mean daily turbidity is over the 10 NTU threshold (Figure 5-1). Analysis of 96 years of flow data suggests approximately 7% or 27 days a year the 840 cfs surrogate for the 10 NTU threshold will be exceeded on the Brandywine Creek resulting in a switch over to the Hoopes reservoir (Figure 5-2). Thus, using the flow at Chadds Ford as an indicator of the potential frequency of turbidity above 10 NTU, approximately 7% or 27 days a year the threshold will be exceeded resulting in a switch to the Hoopes reservoir.

Based on the 96 years of historical data a flow at the Chadds Ford station that will trigger the turbidity threshold for more than 5 consecutive days would only occur potentially once per year assuming climate change does not vary flows beyond the historical pattern (Figures 5-3 and 5-4). Based on the historical record, the maximum duration of flow over 840 cfs at Chadds Ford was 30 days, but the 99th percentile of consecutive days over 840 cfs was only 5 days. Thus an extreme event such as a major series of hurricanes or tropical depressions would need to occur and any withdrawals made from Hoopes during these extreme periods would most likely be negated by the recharge and direct rainfall runoff to the Hoopes reservoir during these periods.

A worst case impact scenario for storage in the Hoopes Reservoir under the new 10 NTU

withdrawal threshold suggests no significant reduction in annual storage in a typical year. If an additional 2 feet of storage was added to the Hoopes reservoir, it would create an additional 125 MG/yr of storage that would significantly offset any potential negative storage impacts from using the 10 NTU turbidity threshold to switch from the Brandywine Creek to Hoopes Reservoir (Table 5-1). However, it is still recommended that the impacts of using the new trigger on Hoopes Reservoir storage be monitored and tracked to determine any long term impacts on storage and drought planning that could not be foreseen in the planning estimates.

The turbidity peak timing relationships for Chadds Ford and the Wilmington intake should continue to be updated and refined using the new online turbidity data at the Porter intake in order to ensure the timing is adjusted to reflect future changes in weather patterns (rainfall intensity) and land use changes (more impervious cover) that have the potential to reduce the time for turbidity peaks to reach Wilmington's intakes. If modeling tools and data are readily available for the Brandywine Creek, worst case future land use and weather pattern changes could be modeled to determine the magnitude of impact 20 to 30 years in the future due to climate change. This would be helpful in determining if future watershed changes would result in increased use of the Hoopes Reservoir and provide estimates for any planning for construction of additional storage for the Hoopes Reservoir.

There are concerns that switching to the 10 NTU threshold would cause additional difficulties in operational procedures and protocols. However, based on the changes in timing, the operational impact of using the 10 NTU threshold may allow for more lead time for staff to conduct the switch over to the Hoopes Reservoir from the Brandywine Creek. For example, using the past 25 NTU trigger, the plant only has 7 hours to switch to the Hoopes Reservoir. Using the 10 NTU trigger, the USGS equations suggest that if the peak flow was constant (i.e. the flow peaked at 840 cfs), it would take 30.5 hours for the turbidity peak to reach Wilmington (Figure 5-5). However, using this value is misleading since the peak flows often exceed 840 cfs and rapidly continue to higher flowrates. For example, the flow at Chadds Ford may reach 840 cfs, but within 3 hours later it can exceed the 25 NTU flow of 2000 cfs. Using the 25 NTU peak timing suggests 8 hours until the turbidity peak reaches Wilmington while the 10 NTU peak suggested 30.5 hours creating a significant overestimate of travel time. In order to resolve this concern, an analysis of the 15 minute flow data was conducted at Chadds Ford from 2004 to 2007 since some of the greatest flows in the past 30 years were observed during this period. The difference between the time the flow reached the 10 NTU trigger (840 cfs) and the time the flow reached the 25 NTU trigger (2000 cfs) was calculated and ranked into a cumulative density function to determine the appropriate adjustment factor to the peaking time for the 10 NTU trigger. During the period there were 31 events when the flow exceeded both 840 and 2000 cfs in a single event (Figure 5-6). Over 90% of the difference in the time the flow reaches 840 and 2000cfs at Chadds Ford is less than 8 hours with 3 hours as the median. Only 20% of the events caused the difference in time to be less than 2 hours.

Based on this analysis it suggests that adding 3 hours to the existing 8 hour time of travel prediction for the turbidity peak from the 25 NTU (2000 cfs) trigger would be a more representative description of the timing for the turbidity peak for the 10 NTU (840 cfs) trigger. Therefore, once receiving the call from the USGS station, the plant will have 11 hours to switch to the Hoopes Reservoir. This new timing does not require any significant

changes from the current turbidity arrangement and does not eliminate the potential need for staff to come in on weekends to conduct the switchover, but does eliminate the need to conduct it outside of normal daylight hours.

Using the same flow duration analysis at Chadds Ford, the number of consecutive days at Chadds Ford above 840 cfs was used to estimate the range of consecutive days that Wilmington would potentially draw from the Hoopes Reservoir using the 10 NTU turbidity threshold. As shown in Figure 5, it was estimated that only one time a year the flow exceeds the turbidity threshold for more than 3 days (9 days per year potentially).

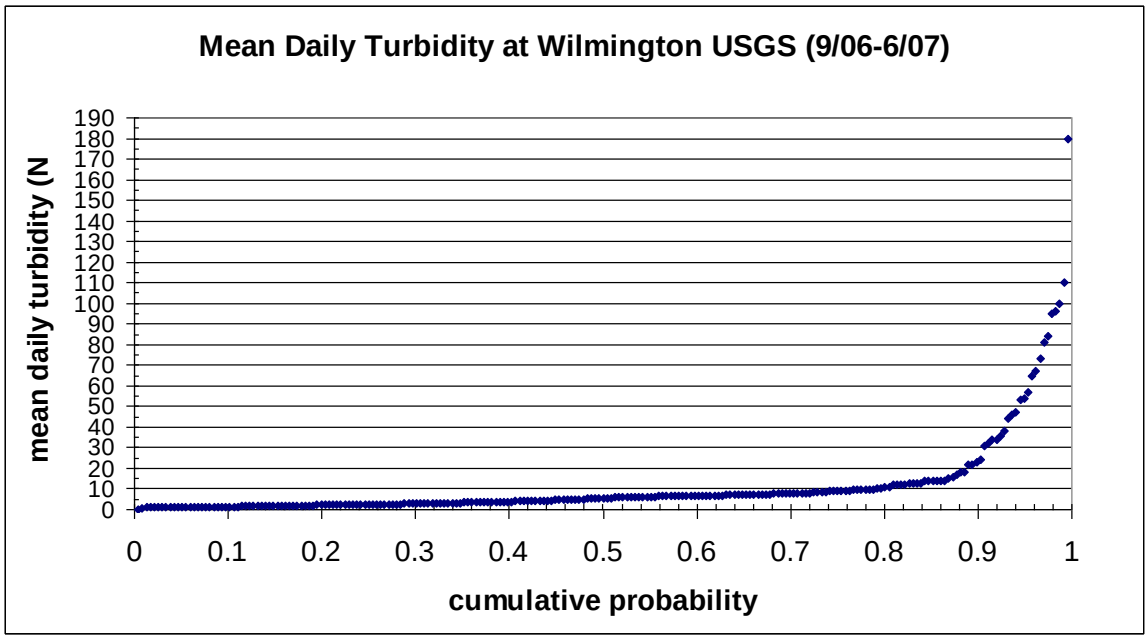


Figure 5-1 – Frequency of Mean Daily Turbidity at Wilmington 2006-2007

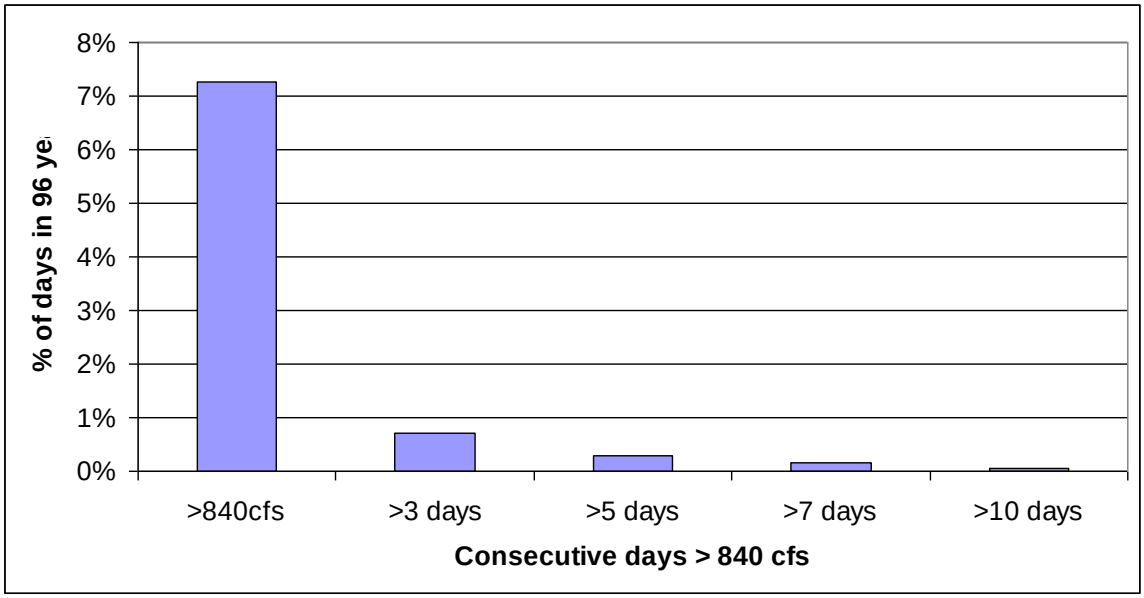


Figure 5-2 – Frequency of Consecutive Days over Flow Trigger at Chadds Ford

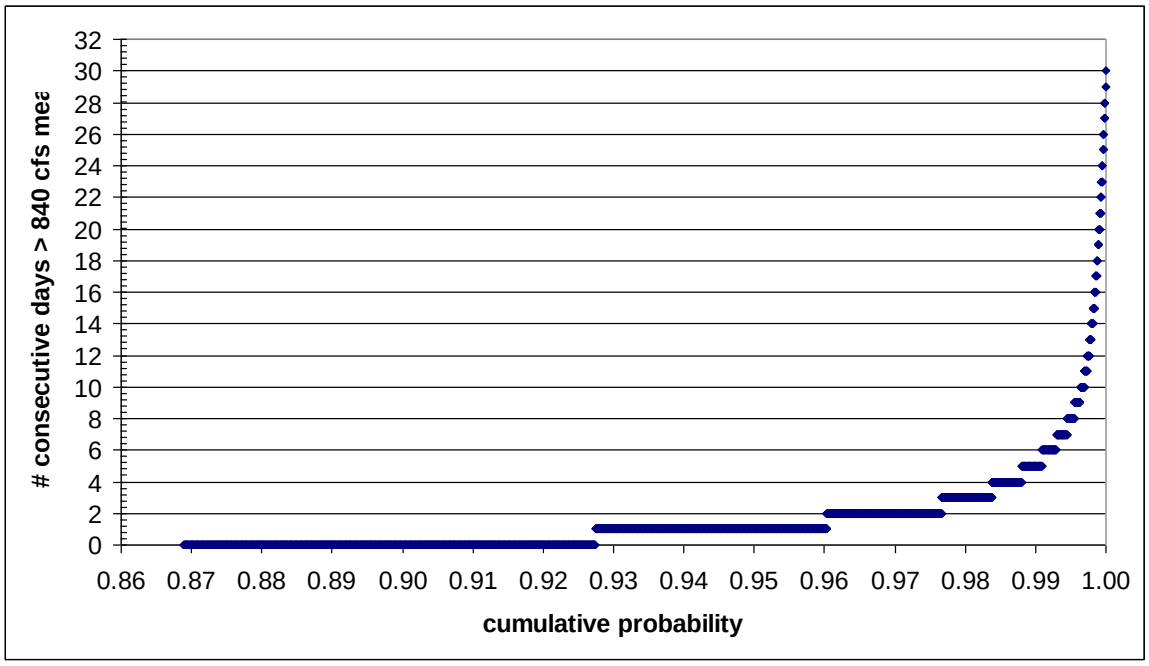


Figure 5-3 – Frequency of Consecutive Days Greater Than Flow Trigger at Chadds Ford

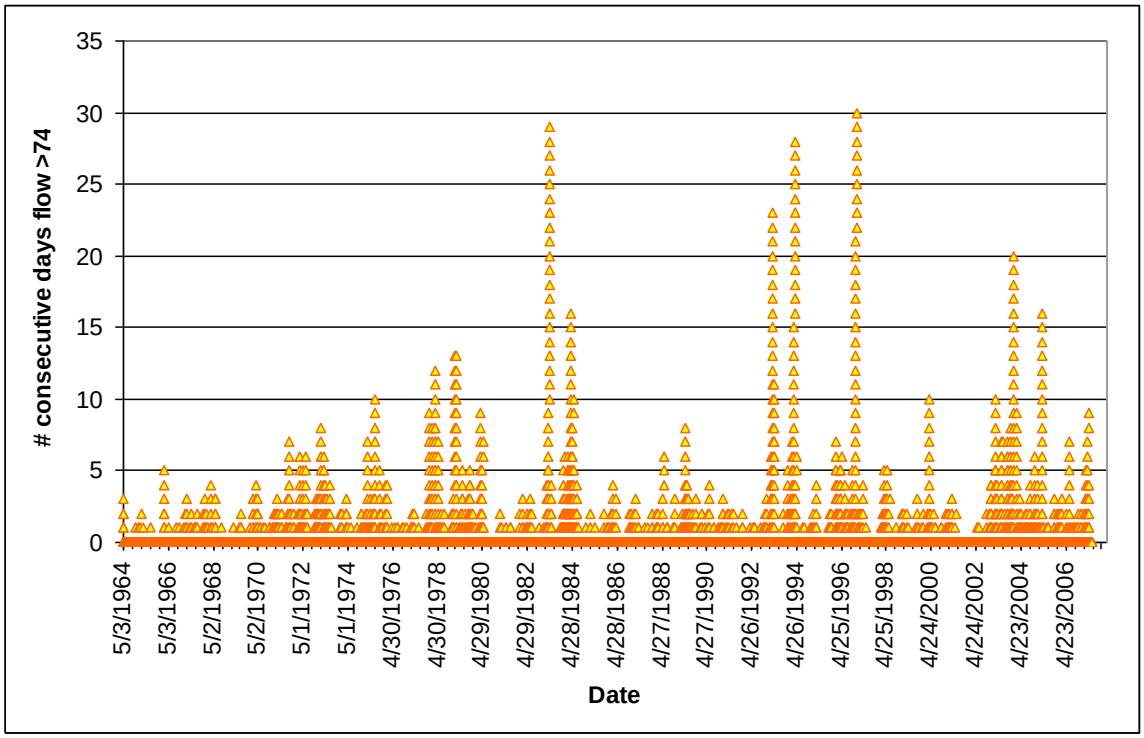


Figure 5-4 – Observed Number of Consecutive Days Greater Than Flow Trigger at Chadds Ford (1964 to 2007)

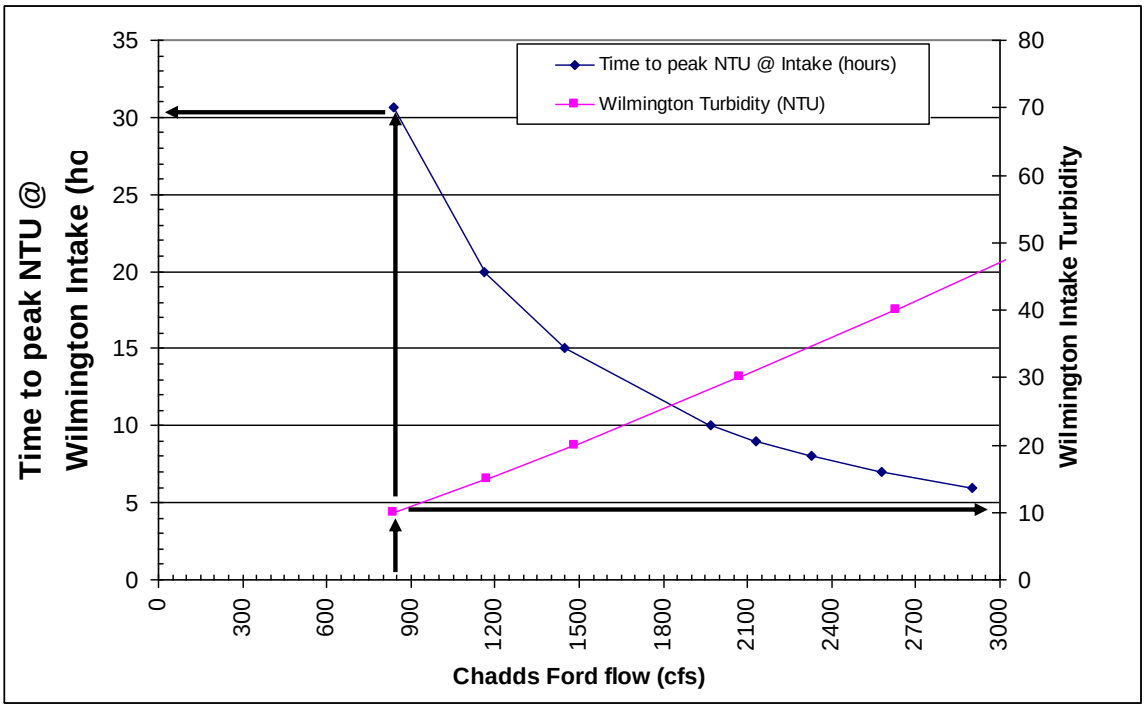


Figure 5-5 – Comparison of Turbidity Peak at the Wilmington Intake and Time for Peak to Reach the Wilmington Intake and Chadds Ford Flow

Note: flows continue to peak past 840 cfs, thus the 30 hour estimate is improper to use. Due to flows

peaking beyond the 840 cfs threshold, action should be taken in under 11 hours.

Table 5-1 – Estimated Annual Impact on Hoopes

Storage Parameter	Storage Impact Using 840 cfs trigger
Annual Hoopes withdrawal using 10 NTU threshold (MG/yr)	662
Hoopes Total Storage (MG)	2,000
% Hoopes storage used annually	33%
Amount recharged annually via rainfall and runoff (MG/yr)	840
Recharge – withdrawal (MG/yr)	178
Additional storage if Hoopes is raised 2 ft for safety purposes (MG/yr)	125
Estimated annual surplus/deficit of storage (MG/yr)	303

*Note: estimate is a gross estimate and does not include periods when individual rainfall events exceed the reservoir storage and are lost. Therefore any estimated surplus could be less.

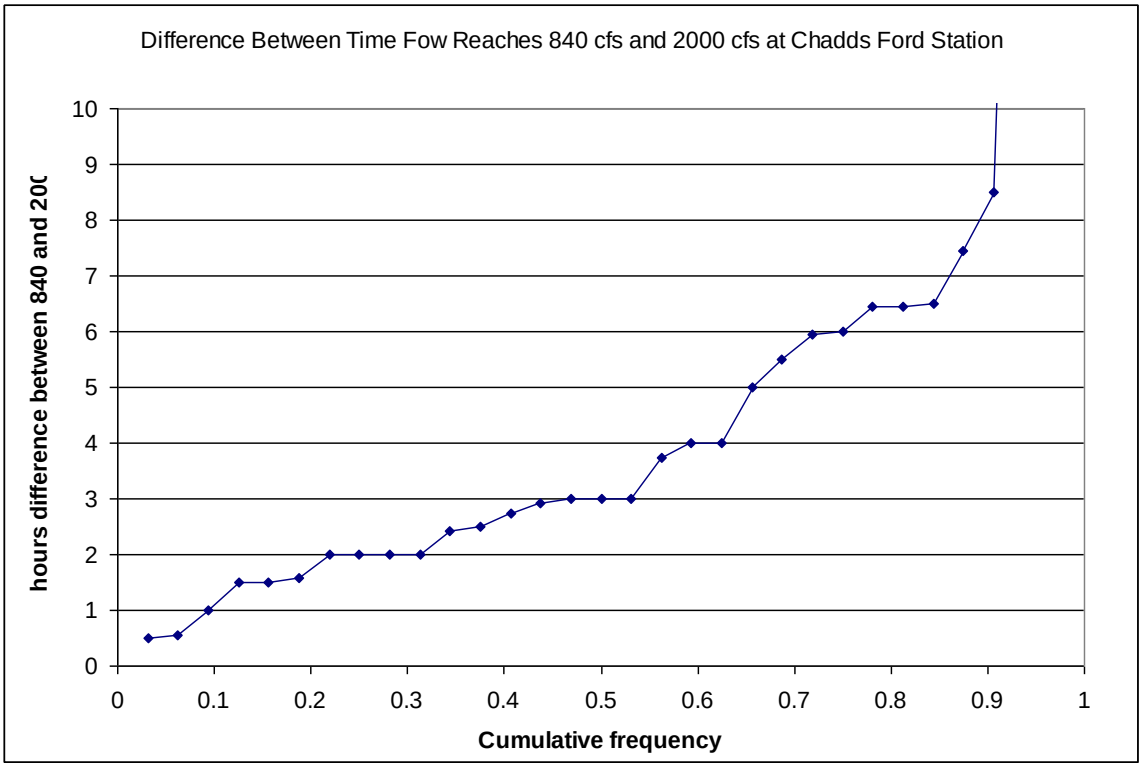


Figure 5-6 – Comparison of The Difference in Time That Flow Reaches 840 cfs and 2000 cfs at the USGS Chadds Ford Station for 31 Events Between 2004 and 2007 (using 15 minute flow data)

5.2. Upstream Notification & Communication

Timely and effective notification to Wilmington about upstream events that could affect water quality is desired for the following reasons:

- There are over 700 regulated facilities, several major highways carrying thousands of cars and trucks per day, major railroad corridors along the stream, and agricultural activities upstream from Wilmington's intake.
- The time of travel to the Wilmington intake can range from less than a few hours to over 6 days depending on the location of an accident or the flow condition.
- Though Wilmington has the ability to switch to the Hoopes Reservoir, it takes time to make the switch and has operational impacts.
- Upstream disease outbreaks and sewage treatment plant upsets could impact

regulatory monitoring and compliance.

Given that most of the watershed is upstream in another state, it is easy for events in Pennsylvania to not be reported to the proper persons in Wilmington. Therefore, it is important to set in place a process that provides opportunities for communication and notification at a variety of levels. The levels of communication and notification are the following:

Individual Facility Level – Upstream facilities have been introduced to Wilmington personnel and educated about the proper contact information and notification protocols. The focus is on getting information on upstream process upsets and accidental discharges that could impact water quality.

County Emergency Responder Level – Key emergency responders in Chester and New Castle counties are educated about the proper contact information and notification protocols. Wilmington's notification is formally included in the water supplier notification process. The focus is on getting information and warning about upstream accidents in transportation corridors, fires, or other situations that could impact water quality.

County Health Department Level - Key public health personnel in Chester and New Castle counties are educated about the proper contact information and notification protocols. Wilmington's notification is formally included in the water supplier notification process. The main focus of this notification is to be warned early about events related to upstream disease outbreaks that could impact Wilmington's intake (such as cryptosporidiosis, giardiasis, or enterovirus outbreaks).

State Emergency Responder Level - Key emergency responders at PADEP and DNREC are educated about the proper contact information and notification protocols. Wilmington's notification is formally included in the water supplier notification process. The focus is on getting additional warnings regarding upstream water quality events.

Inter-Water Supplier Level – upstream water suppliers are educated about the proper contact information and notification protocols. The focus is on getting additional warnings regarding upstream water quality events or changes in water quality. Knowing when something reaches an upstream intake and what upstream treatment techniques are or are not working is essential information to prepare for a spill that could reach the intake.

By implementing a focused outreach program to improve the notification and communication with strategic areas and organizations listed above will result in multiple layers of potential communication providing various pieces of information about potential upstream events that will lead to better responses by Wilmington personnel. It also provides redundancy in case any individual communication path is terminated due to unforeseen circumstances. At the individual facility level Table 5-2 provides recommended frequencies and types of information that Wilmington should gather during the outreach process.

Table 5-2 – Recommended Individual Facility Level Communication Frequency and Data

Point Source Priority	Visit Frequency	Update contact information	Locational / Monitoring Information	Water Quality Impact Preparation
High	Once per year	Check bi-annually	Identify outfalls, detailed location maps, locate sampling points	Conduct estimates of water quality impacts from releases under various extreme scenarios (loss of treatment, full release), estimate and verify time of travel, monitor disease rates
Medium High	Every 2 years	Annually	Identify outfalls, detailed location maps, locate sampling points	Conduct estimates of water quality impacts from releases under various extreme scenarios (loss of treatment, full release), estimate and verify time of travel, monitor disease rates
Medium	Every 3 years	Every 3 years	Identify outfalls only	Conduct estimates using a predetermined worst case screening accident scenario, refine distance estimates, develop low flow and high flow TOT estimates
Low	Every permit cycle	Every permit cycle	Identify outfalls only	Conduct estimates using a predetermined worst case screening accident scenario, refine distance estimates, develop low flow and high flow TOT estimates

5.3. Emergency Response Tools

The only major emergency response tool that Wilmington employs currently is the Turbidity Early Warning System that was described earlier. However, there are several other emergency response tools available to Wilmington.

The simplest tool available is the Chester County Health Department's phone notification chain. This phone chain provides simple, but relatively rapid notification of accidents that result in releases to the streams in Chester County.

A more complex tool that could be available is the Delaware Valley Early Warning System (DVEWS). The DVEWS is an integrated web and phone based system that is operated on the Schuylkill and Delaware Rivers in Pennsylvania and New Jersey. Water suppliers, county, state, and federal agencies are involved in this system and provide information to it. The system would need expansion to include the Brandywine Creek Watershed that may require some costs to Wilmington. In addition, annual membership costs are required for the operation and maintenance of the system that water suppliers contribute.

At the minimum, it is recommended that Wilmington contacts Chester County to get enrolled in the phone notification chain program. Also, Wilmington should investigate the costs and benefits to participation in the Delaware Valley Early Warning System.

5.4. Contingency Planning

5.4.1. Contaminant Response Plans for Accidental or Deliberate Release into Source of Potable Waters

Wilmington can withdraw from two different locations on the Brandywine (Wills Pump Station and Brandywine Race) as well as provide all its water needs for a limited period of time from the Hoopes Reservoir. The standard response to any water quality event in the Brandywine Creek is to switch to the Hoopes Reservoir. In the event the Hoopes Reservoir is not available due to contamination or a major failure of the conveyance system to or from Hoopes to the water facilities, Wilmington has a number of interconnections with other water suppliers and can draw from the raw water basin at Porter for a period of time until the Hoopes system is available. In addition, there is significant finished water storage available in the event the water treatment facilities are shut down. It is assumed that in most cases any contamination event on the Brandywine Creek may pass by the Wilmington intake before raw and finished water storage would run out. Another option during a water quality event is to request a release from one of the upstream reservoirs operated by PA or Chester County in order to dilute any pollution during dry weather periods. Wilmington should update its protocol for communication for an upstream reservoir release. An analysis of the critical failure elements of the Hoopes system, potential redundancies, and repair times in the event of a dual failure is recommended.

5.5. Alternative Supplies

Wilmington can withdraw from two different locations on the Brandywine (Wills Pump Station and Brandywine Race) as well as provide all its water needs for a limited period of time from the Hoopes Reservoir. Therefore, Wilmington does not plan to locate alternate supplies in the short or long term future. If for some reason the Brandywine and Hoopes sources were not going to be available to Wilmington for some unforeseen reason, studies and plans to use the desalinization of the Delaware River would need to be considered.

6. Section 6 – Regulatory Compliance & AWWA Certification

6.1. LT2ESWTR & Stage 2 DBPR

The Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and the Stage 2 Disinfection By-Products Rule (Stage 2 DBPR) are the two major regulations that their drinking water compliance can be impacted by source water quality. The LT2ESWTR is the direct connection of a treatment requirement based on raw water concentrations of *Cryptosporidium*. The Stage 1 DBPR has a direct requirement for Total Organic Carbon (TOC) removal based on source water concentration. The Stage 2 DBPR has an indirect treatment requirement based on the finished water concentration of disinfection by products such as total trihalomethanes TTHMs) and haloacetic acids (HAAs). TTHMs and HAAs are formed as a result of the organic matter in the water reacting to chlorine or disinfection processes. These requirements force the utility to use less disinfection or move disinfection further back in the treatment train such that less DBPs are formed during water treatment. This complicated balancing act of increasing treatment and potentially disinfection to reduce microbial risks from *Cryptosporidium* while reducing disinfection by products is called the Microbial Disinfection By Product (MDBP) challenge to water suppliers.

The purpose of the LT2ESWTR is to reduce disease incidence associated with *Cryptosporidium* and other pathogenic microorganisms in drinking water. The rule applies to all public water systems that use surface water or ground water that is under the direct influence of surface water. The rule was to bolster existing regulations and provide a higher level of protection of drinking water supplies by:

- Targeting additional *Cryptosporidium* treatment requirements to higher risk systems
- Requiring provisions to reduce risks from uncovered finished water storage facilities
- Providing provisions to ensure that systems maintain microbial protection as they take steps to reduce the formation of disinfection byproducts

Under the LT2ESWTR, systems will monitor their water sources to determine treatment requirements. This monitoring includes an initial two years of monthly sampling for Cryptosporidium. Filtered water systems will be classified in one of four treatment categories (bins) based on their monitoring results (See Tables 6-1 to 6-3). Currently Wilmington's Monitoring data indicates that it will be located in Bin 1 for the Porter Filtration Plant, but the data suggests the average is near the Bin 1 upper limit. The Brandywine Filtration Plant is near Bin 1 limit as well, but is installing membrane filtration systems to meet the LT2ESWTR requirements. Systems classified in higher treatment bins

must provide 90 to 99.7 percent (1.0 to 2.5-log) additional treatment for *Cryptosporidium*. Systems will select from a wide range of treatment and management strategies in the "microbial toolbox" to meet their additional treatment requirements. Some of these potential “toolbox” options are the use of improved filtration, increased disinfection, or a watershed control program (source water protection program) (see Table 6-2).

Table 6-1 – Source Water Concentration and Additional Treatment Requirements of the Long Term 2 Enhanced Surface Water Treatment Rule

Source Water Concentration (oocysts/L)	Bin classification	Additional treatment requirement
< 0.075	1	No additional treatment
0.075 to < 1.0	2	1 - log treatment
1.0 to < 3.0	3	2 - log treatment
3.0 or greater	4	3 - log treatment

Table 6-2 – Toolbox Options and *Cryptosporidium* Treatment Credit of the Long Term 2 Enhanced Surface Water Treatment Rule

Toolbox option	*Cryptosporidium* treatment credit
Watershed Control Program	0.5 log credit
Alternative source/intake management	No prescribed credit, based on monitoring
presedimentation basin with coagulation	0.5 log credit, basins must achieve monthly mean reduction of 0.5 log or greater in turbidity
two stage lime softening	0.5 log credit
bank filtration	0.5 log credit
combined filter performance	0.5 log credit, CFE < 0.15 NTU at least 95% of monthly measurements
individual filter performance	0.5 log credit (additive to CFE), IFE < 0.15 NTU at least 95% of monthly measurements per filter
demonstration of performance	based on demonstration
bags and cartridge filters	up to 2 log credit

Toolbox option	*Cryptosporidium* treatment credit
membrane filtration	based on demonstration
second stage filtration	0.5 log credit
slow sand filters	2.5 log credit
chlorine dioxide	based on CT and CT table
ozone	based on CT and CT table
UV	based on UV dose and UV does table

The Stage 1 DBP Rule regulates water systems that use surface water or ground water under the direct influence of surface water and use conventional filtration treatment. These systems are required to remove specified percentages of organic materials, measured as total organic carbon (TOC) that may react with disinfectants to form DBPs (See Table 6-3). Removal will be achieved through a treatment technique (enhanced coagulation or enhanced softening) unless a system meets alternative criteria. As discussed in Section 2, Wilmington's TOC and Alkalinity have changing trends that could affect this required removal rate making it potentially more difficult and costly to achieve over the long term.

Table 6-3 - Required Removal of Total Organic Carbon by Enhanced Coagulation and Enhanced Softening for Subpart H Systems Using Conventional Treatment[1]

Source Water TOC (mg/L)	Source Water Alkalinity (mg/L as $CaCO_3$)		
	0-60	>60-120	$>120_2$
>2.0-4.0	35.0%	25.0%	15.0%
>4.0-8.0	45.0%	35.0%	25.0%
>8.0	50.0%	40.0%	30.0%

[1]Systems meeting at least one of the alternative compliance criteria in the rule are not required to meet the removals in this table.
[2]Systems practicing softening must meet the TOC removal requirements in the last column to the right.

The Stage 2 DBP rule builds upon earlier rules that addressed disinfection byproducts to improve drinking water quality and provide additional public health protection from disinfection byproducts. This final rule strengthens public health protection for customers by tightening compliance monitoring requirements for two groups of DBPs, trihalomethanes (TTHM) and haloacetic acids (HAA5). The rule targets systems with the greatest risk and will reduce potential health risks related to DBP exposure and provide more equitable public health protection.

Under the Stage 2 DBP rule, systems will conduct an evaluation of their distribution

systems, known as an Initial Distribution System Evaluation (IDSE), to identify the locations with high disinfection byproduct concentrations. These locations will then be used by the systems as the sampling sites for Stage 2 DBP rule compliance monitoring.

Compliance with the maximum contaminant levels for two groups of disinfection byproducts (TTHM and HAA5) will be calculated for each monitoring location in the distribution system. This approach, referred to as the locational running annual average (LRAA), differs from current requirements, which determine compliance by calculating the running annual average of samples from all monitoring locations across the system.

The Stage 2 DBP rule also requires each system to determine if they have exceeded an operational evaluation level, which is identified using their compliance monitoring results. The operational evaluation level provides an early warning of possible future MCL violations, which allows the system to take proactive steps to remain in compliance. A system that exceeds an operational evaluation level is required to review their operational practices and submit a report to their state that identifies actions that may be taken to mitigate future high DBP levels, particularly those that may jeopardize their compliance with the DBP MCLs.

Wilmington is currently conducting its ISDE monitoring and results are not available to evaluate its potential compliance and linkage to source water quality at this time.

6.2. Watershed Control Program Certification Evaluation

The LT2ESWTR allows water suppliers to implement a number of items if additional *Cryptosporidium* treatment is required. If Wilmington chooses to apply for the Watershed Control Program Credit (though it is not necessary at this time). The Watershed Control Program Credit is a credit offered by implementing a watershed protection program. In order to be eligible to receive this credit initially, it must perform the following steps:

Notify the State of the intent to develop a new or continue an existing watershed control program for *Cryptosporidium* treatment credit no later than two years prior to the date Wilmington must comply with additional *Cryptosporidium* treatment requirements under today's rule.

Submit a proposed watershed control plan to the State for approval no later than one year prior to the date the Wilmington must comply with additional *Cryptosporidium* treatment requirements under today's rule. The watershed control plan must contain these elements:

1. The designation of an ''area of influence'' in the watershed, which is defined as the area outside of which the likelihood of *Cryptosporidium* contamination affecting the treatment plant intake is not significant;

2. The identification of both potential and actual sources of *Cryptosporidium*

contamination, including a qualitative assessment of the relative impact of these contamination sources on water quality at the treatment plant intake;

3. An analysis of control measures that could mitigate the sources of *Cryptosporidium* contamination, including the relative effectiveness of control measures in reducing *Cryptosporidium* loading to the source water and their feasibility; and

4. A statement of goals and specific actions the Wilmington will undertake to reduce source water *Cryptosporidium* levels, including a description of how the actions will contribute to specific goals, watershed partners and their roles, resource requirements and commitments, and a schedule for plan implementation.

Based on the previous elements of the Source Water Protection Plan, it is believed that Wilmington has and will accomplish each of the four requirements outlined above in order to receive the credit if it so chooses to apply for it. If the State approves the watershed control plan for *Cryptosporidium* treatment credit, Wilmington must perform the following steps to be eligible to maintain the credit:

- Submit an annual watershed control program status report to the State no later than a date specified by the State. The status report must describe the following: (1) how Wilmington is implementing the approved watershed control plan; (2) the adequacy of the plan to meet its goals; (3) how Wilmington is addressing any shortcomings in plan implementation; and (4) any significant changes that have occurred in the watershed since the last watershed sanitary survey.

- Notify the State prior to making any significant changes to the approved watershed control plan. If any change is likely to reduce the planned level of source water protection, Wilmington must include in this notification a statement of actions that will be taken to mitigate this effect.

- Perform a watershed sanitary survey no less frequently than Wilmington must undergo a sanitary survey under 40 CFR 142.16(b)(3)(i), which is every three to five years, and submit the survey report to the State for approval. The State may require a PWS to perform a watershed sanitary survey at an earlier date if the State determines that significant changes may have occurred in the watershed since the previous sanitary survey. A person approved by the State must conduct the watershed sanitary survey and the survey must meet applicable State guidelines. The watershed sanitary survey must encompass the area of influence as identified in the State-approved watershed control plan, assess the implementation of actions to reduce source water *Cryptosporidium* levels, and identify any significant new sources of *Cryptosporidium*.

Wilmington is eligible to receive *Cryptosporidium* treatment credit under today's rule for preexisting watershed control programs (e.g., programs in place at the time of rule promulgation). To be eligible for credit, such programs must meet the requirements stated in this section and the watershed control plan must address future actions that will further reduce source water *Cryptosporidium* levels.

If the State determines that Wilmington is not implementing the approved watershed

control plan (i.e., Wilmington is not carrying out the actions on the schedule in the approved plan), the State may revoke the *Cryptosporidium* treatment credit for the watershed control program. Failure by Wilmington to demonstrate treatment credit at least equal to its *Cryptosporidium* treatment requirement under today's rule due to such a revocation of credit is a treatment technique violation. The violation lasts until the State determines that Wilmington is implementing an approved watershed control plan or is otherwise achieving the required level of *Cryptosporidium* treatment credit.

Wilmington must make the approved watershed control plan, annual status reports, and watershed sanitary surveys available to the public upon request. These documents must be in a plain language style and include criteria by which to evaluate the success of the program in achieving plan goals. If approved by the State, Wilmington may withhold portions of these documents based on security considerations.

The required elements for a watershed control plan are the minimum necessary for a program that will be effective in reducing levels of *Cryptosporidium* and other pathogens in a treatment plant intake. These elements include defining the area of the watershed where contamination can affect the intake water quality, identifying sources of contamination within this area, evaluating control measures to reduce contamination, and developing an action plan to implement specific control measures.

Wilmington will need to leverage other Federal, State, and local programs in developing the elements of their watershed control plans. In 2002, EPA launched the Watershed Initiative (67 FR 36172, May 23, 2002) (USEPA 2002b), which will provide grants to support watershed-based approaches to preventing, reducing, and eliminating water pollution. In addition, EPA recently promulgated regulations for Concentrated Animal Feeding Operations that will limit discharges that contribute microbial pathogens to watersheds.

Since Wilmington does not control the watersheds of their sources of supply. Their watershed control plans should involve partnerships with watershed landowners and government agencies that have authority over activities in the watershed that may contribute *Cryptosporidium* to the water supply. Stakeholders that control activities that could contribute to *Cryptosporidium* contamination include municipal government and private operators of wastewater treatment plants, livestock farmers and persons who spread manure, individuals with failing septic systems, logging operations, and other government and commercial organizations.

After a State approves a watershed control plan for Wilmington and initially awards 0.5-log *Cryptosporidium* treatment credit, Wilmington must submit a watershed control program status report to the State each year. These reports are required for States to exercise oversight and ensure that Wilmington implement the approved watershed control plan. They also provide a mechanism for Wilmington to work with the States to address any shortcomings or necessary modifications in watershed control plans that are identified after plan approval.

In addition, Wilmington must undergo watershed sanitary surveys every three to five years by a State-approved party. These surveys will provide information to PWSs and States regarding significant changes in the watershed that may warrant modification of the approved watershed control plan. Also, they allow for an assessment of watershed control

plan implementation.

The proposed rule required watershed sanitary surveys annually, but EPA has reduced the frequency to every three to five years in today's final rule. This frequency is consistent with existing requirements for sanitary surveys. If significant changes in the watershed do occur, Wilmington must identify these changes in their annual program status reports. In addition, States have the authority to require that a watershed sanitary survey be conducted at an earlier date if the State determines that significant changes may have occurred in the watershed since the previous survey. The current rule gives States authority to revoke *Cryptosporidium* treatment credit for a watershed control program at any point if a State determines that Wilmington is not implementing the approved watershed control plan.

Wilmington should be eligible to receive *Cryptosporidium* treatment credit for watershed control programs that are in place prior to the treatment compliance date such as its easement efforts with the Brandywine Conservancy. The same requirements for watershed control program treatment credit apply regardless of whether the program is new or existing at the time Wilmington submits the watershed control plan for approval. In the case of existing programs, the watershed control plan must list future activities Wilmington will undertake that will reduce source water contamination.

The Toolbox Guidance Manual lists programmatic resources and guidance available to assist Wilmington in building partnerships and implementing watershed protection activities. It also incorporates information on the effectiveness of different control measures to reduce *Cryptosporidium* levels and provides case studies of watershed control programs.

In addition to this guidance and other technical resources, EPA provides funding for watershed and source water protection through the Drinking Water State Revolving Fund (DWSRF) and Clean Water State Revolving Fund (DWSRF). Under the DWSRF program, States may fund source water protection activities by PWSs, including watershed management and pathogen source reduction plans. CWSRF funds can be used for agricultural best management practices to reduce pathogen loading in receiving waters and for the replacement of failing septic systems.

6.3. AWWA SWP Accreditation Evaluation

The City of Wilmington can choose to develop the Source Water Protection Program in order to achieve accreditation by AWWA. In order to accomplish accreditation it will need to have a program and plan that includes the following six major elements:

- Vision of the program
- Source water characterization

- Goals
- Action Plan
- Implementation of the action plan
- Provides evaluation and revision

The vision of the program must do the following:

- Recognize that source water protection as one of the steps in the multiple barrier approach
- Ensure safety and quality of the drinking water
- Commit or intention to commit sufficient resources to accomplish the vision
- Identify key stakeholders to develop a vision statement

In Wilmington's current plan in Section 7, the goals of the program currently acknowledge most of these elements. However, a formal vision will need to be written for the program. A draft vision for the program could potentially include the following language:

Source Water Protection is a key step in the multiple barrier approach to drinking water for the City of Wilmington, and therefore, the City of Wilmington in order to ensure the future safety and quality of the drinking water supply for future generations will commit the appropriate resources to implementing its source water protection plan. The City of Wilmington will implement the source water protection program and plan with its many upstream stakeholders.

Management and key leaders in the City of Wilmington potentially including City Council may need to formally acknowledge and endorse this vision and plan.

A source water characterization must include the following elements:

- Delineation of the source water area
- Water quality and quantity data analysis
- Contaminant sources and landuse including evaluation of controls of those sources
- Compliance with regulatory requirements
- Security issues – describe response of personnel in case of security incident
- Emergency preparedness and response
- Stakeholders

Section 2 of the Source Water Protection Plan includes all of these elements in considerable

detail. This area of accreditation is covered well.

The accreditation program also requires goals to be defined. These goals are different than the goals in the Source Water Protection plan because they are very specific. Therefore the objectives in Section 7 would be more similar to the goals required for accreditation. Goals for accreditation would need to provide the following elements:

- Address specific problems or issues
- Be expressed in terms that can be measured
- Meet or surpass existing or pending regulations

Since all the goals and objectives in the plan in Section 7 include 46 indicators to measure progress, it is believed the elements of the current plan could be easily rearranged into a set of specific programmatic goals.

The action plan required for accreditation is similar to the implementation tasks discussed in Section 7. An action plan is focused on identifying actions to mitigate water quality in the watershed. The action plan must include the following:

- Identify specific projects, programs, and activities for mitigation
- Prioritization of projects and sources
- Identify resources needed for mitigation
- Identify problems and obstacles
- Implements controls to monitor progress

The implementation plan in section 7 appears to include these elements.

The program implementation is the way the source water program develops, promotes, or implements a combination of voluntary or regulatory programs/practices. This element includes:

- Watershed planning
- Land conservation
- Landuse controls

Currently Wilmington is implementing all three of the previous elements so program implementation would most likely be considered satisfactory. The remaining steps in accreditation include the provisions to review and evaluate the program and verification of implementation or improvements. Wilmington's program includes indicators to monitor and evaluate success of the plan as well as verification. Since the program is new conscious and documented requirements to conduct review, evaluation, and verification, at the project and program level need to be developed.

7. Section 7 - Brandywine Watershed Source Water Protection Objectives, Progress Indicators, & Implementation Activities

Based on the information provided in the previous sections, a series of goals, objectives, indicators, and implementation tasks (short and long term) were developed for the City of Wilmington's water supply. Overall, 4 major goals, 29 major objectives, 78 implementation tasks covering various time periods, and 46 potential progress indicators were created as part of the implementation plan for Wilmington to initiate and sustain a Source Water Protection Program that can lead to successful achievement of its goals.

These goals, objectives, and tasks are not to be considered a separate effort from the overall efforts of stakeholders in the watershed, but a specific prioritization of activities related to protection of the City of Wilmington's drinking water source that can be integrated with upstream efforts. The following items significantly complement the general goals and recommendations of the Chester County Compendium, the Brandywine Action Plan, the Delaware Pollution Control Strategy, and the TMDLs for the Brandywine Creek Watershed. Therefore, synergy of common SWP activities with activities from the other stakeholders and plans is encouraged and recommended during implementation of this program.

7.1. SWP Goals

Goals are meant to be general descriptions of the ultimate achievement of an endeavor. Therefore, the goals for Wilmington's source water protection efforts are provided to give a vision of what is desired in the long term. As shown the four major goals are:

1. Develop and operate a nationally recognized sustainable source water protection program with in-house expertise and save capital and operating dollars;
2. Preserve or improve the current water quality and quantity of the Brandywine Creek and Hoopes Reservoir for Wilmington's water supply;
3. Improve early warning and emergency communications;
4. Establish relationships and participate in efforts with stakeholders that shape and influence policy, regulation, resources, and initiatives in the watershed
    - Have a strong voice in activities that influence water policy in the region
    - Develop key partnerships with stakeholders that can impact the future of Wilmington's water supply
    - Leverage the efforts and resources of other stakeholders to address priority water quality issues

7.2. SWP Objectives

Under each goal there are a number of objectives serving as the stepping stones for achievement. Objectives are clear actions having measurable outcomes. The objectives are provided in accordance with the intended goal below.

1. Goal - Develop and operate a nationally recognized sustainable source water protection program with in-house expertise and save capital and operating dollars.

    - Hire, train, and support an in-house dedicated staff member (or staff member with Source Water Protection (SWP) in its job description) to attend stakeholder and community meetings, conduct studies, manage contracts, coordinate and monitor efforts, and participate in various internal, stakeholder, and regulator activities in the watershed related to Source Water Protection. Provide expert assistance and resources to the in-house staff as needed. This staff member is also responsible for the pursuit of external funding to support the City's SWP efforts.

    - Develop a program that obtains accreditation from American Water Works Association (AWWA) by meeting the requirements of the AWWA Source Water Protection Standard

    - Achieve regional and national recognition for its source water protection efforts.

2. Goal - Preserve or improve the current water quality and quantity of the Brandywine Creek and Hoopes Reservoir for Wilmington's water supply.

    Partner with other watershed stakeholders, such as Chester County Conservation District, Brandywine Conservancy, Brandywine Valley Association, Chester Water Resources Authority, United States Geological Survey, Water Resources Association of the University of Delaware and others to:

    - Develop and implement conservation and nutrient management plans and streambank fencing on all dairy farms along first and second order streams in the Honey Brook region of the West Branch of the Brandywine Creek watershed.

    - Preserve as much farmland as possible in riparian buffer areas along first and second order streams by 2070. With specific milestones for 2020.

    - Develop an initiative to preserve remaining forested riparian buffer lands along first and second order streams between 2030 and 2070.

    - Partner with upstream communities to identify which areas need to develop and implement land use ordinances similar to the New Castle County Water Resource Protection Area (WRPA) ordinance that reduce impervious cover in critical riparian areas. Support efforts to extend riparian land protections

similar to the NCC WRPA ordinances upstream along all tributaries of the Brandywine Creek.

- Support the development of storm water utilities with impervious cover parcel based billing systems in the Brandywine Creek Watershed to reduce stormwater runoff and improve long term groundwater recharge.
- Support efforts by upstream communities to improve and enforce stormwater and riparian ordinances.
- Encourage upstream communities to reduce road salt application through the use of brining to reduce chloride impacts and reduce road salting costs while maintaining proper road safety in the Brandywine Creek Watershed.
- Partner with upstream communities to reduce pathogen and emerging contaminants in upstream wastewater discharges.
- Conclusively identify the dominant upstream sources of *Cryptosporidium* and bacteria in the watershed.
- Identify contributing sources of trace organics from human or animal activity during wet and dry weather periods in the Brandywine Creek Watershed.
- Conduct studies using thermal sensing equipment and flyovers to identify sewage infiltration to the Brandywine River and its tributaries.

3. Goal - Improve early warning of spills or water quality or quantity changes in stream and emergency communications

    - Participate in the Chester County Health Department (CCHD) Notification System and set up protocol for notification of events by CCHD.
    - Develop a working group of water suppliers and emergency responders to discuss and improve emergency notification/communication and response to events that pose a risk to water quality and water treatment.
    - Develop a Standard Operating Procedure (SOP) listing the locations, methods, equipment, and personnel needed to sample the Brandywine Creek and Hoopes Reservoir in response to a serious water quality event.
    - Conduct a study of current in-stream monitoring network and ways it can be enhanced for improved warning and response while providing useful long term source water protection data.
    - Conduct a study using a time of travel and dilution/concentration model of various contaminant types (conservative, non-conservative, oils) spilled into the Brandywine Creek to improve intake pumping and monitoring responses. Link

the spill model to stream monitoring network for real time projections.

4. Goal - Establish relationships and participate in efforts with stakeholders that shape and influence policy, regulation, resources, and initiatives in the watershed

    - Continue to actively participate in Christina Clean Water Partnership.
    - Continue to participate in watershed events such as annual clean ups with various organizations.
    - Support enhanced funding initiatives to sustain water quality improvements to the Brandywine Creek Watershed.
    - Develop a water supplier initiative for the Brandywine Creek.
    - Join the Source Water Collaborative with EPA.
    - Develop funding agreements with upstream stakeholder and watershed organizations to leverage specific efforts.
    - Support and/or participate in grant applications with partnering organizations to support projects that improve or protect water quality.

7.3. Implementation Activities

The various activities that are necessary for implementation can be divided into the following types of major implementation activity areas:

- Agricultural Mitigation
- Agricultural Preservation
- Forest Preservation
- Riparian Buffer and Forest Reforestation
- Wastewater Discharge Management and Emergency Response Preparation and Communication
- Stormwater Runoff Mitigation
- Stakeholder Partnerships and Outreach & Public Education
- Monitoring & Technical Studies

- Hoopes Reservoir Protection
- Financial Support and Analysis

These activities can have short term and long term elements as well as localized and watershed wide components. The most pertinent activities include the following:

7.3.1. Agricultural Mitigation

Top Priority Areas: Honey Brook Township clusters 1, 2, and 3 and immediately upstream of Wilmington's intake in New Castle County Delaware (see Figure 7-1)

Secondary Priority Areas: W. Branch of Brandywine Creek

Key Activity: Streambank fencing to reduce livestock access and runoff impacts. Nutrient management and conservation plans at livestock and dairy farms.

Major Program Milestone for 2020: 100 farms with streambank fencing and management plans and/or 20 miles of streambank fencing. Completion of streambank fencing in Honey Brook cluster 1 or 3. (see Figure 7-1)

Wilmington's Role/Responsibility: Technical support, minor/limited match funding support, monitoring support, grant support

Amount of Financial Assistance Necessary from Other Sources: $450,000 per year from Federal, State, Local, and private sources. Usually the greatest challenge is locating a local match to the USDA funding sources. In most cases the farmer cannot provide the entire required federal match, but should be required to have some match in the projects.

Benefits to Wilmington's Water Supply: Prevents and reduces pathogens such as *Cryptosporidium*, sediment, livestock pharmaceuticals, ammonia, nitrate, and phosphorus. A study by AWWA and the Trust for Public Lands of water supplies suggested that for every 4 percent increase in raw water turbidity, treatment costs increase 1 percent. (Trust for Public Lands, 2004)

Partners: Chester County Conservation District, Brandywine Conservancy, Honey Brook Township, New Castle County Conservation District, Delaware Nutrient Management Commission, USDA NRCS, DNREC, PADCNR, PADEP, Trout Unlimited, Ducks Unlimited.

There are 327.7 miles of agricultural lands along first order streams in the Brandywine Creek Watershed. However, agricultural mitigation efforts need to focus primarily on the Honey Brook Township area of the West Branch Brandywine Creek, where 1,700 acres of land and 25 miles of stream are in need of protection in this priority area. Within this larger area, approximately 7 farms covering 450 acres are of the highest priority because of cattle access to the stream. In order to protect the Honey Brook clusters, roughly 10% or 170

acres or 2.5 miles of streambank would need mitigation annually. It is estimated that $217,000 per mile of streambank with fencing with a total cost of over 5 million dollars is ultimately required to protect the Honey Brook township clusters.

In the New Castle County section of the main stem of the Brandywine Creek, activities need to focus on projects to get cows and livestock out of the tributaries to the main stem Brandywine Creek from the City's intake upstream to the Delaware border. Roughly 3 miles of tributaries and stream along agricultural properties in Delaware upstream of Wilmington's intake, requires some level of mitigation or protection. It is estimated that 92 acres of pasture areas also need examination for potential mitigation. An immediate priority to implement streambank fencing in areas where livestock are accessing the stream in Delaware and a long term effort to protect the remaining areas in Delaware.

Throughout the watershed the most important mitigation activities include streambank fencing and implementation of conservation and nutrient management plans at dairy and livestock farms. It is estimated that $450,000 per year should be dedicated to these efforts with a total of 8.9 million dollars to implement 20 miles of streambank fencing and mitigation work at 100 farms over the next 10 to 20 years.

The following are specific priority agricultural activities that should be considered for implementation immediately:

- Meet with landowners and partners to support a project to get cows out of the stream as soon as possible at farms near Smiths Bridge Road.
- Meet with New Castle County Conservation District to discuss initial approaches for farm protection projects for remaining farms along tributaries and the main stem.
- Meet with Chester County Conservation District to identify leveraging opportunities and to identify farms in the Honey Brook priority area that are ready for streambank fencing and protection projects.
- Facilitate efforts for funding and implementation of Honey Brook Clusters 1 & 3. (see Figure 7-1)
- Facilitate and match funding efforts for funding of additional no-till farm equipment for Amish farming. Meet with Chester County Conservation District to determine mechanisms of how to support this effort.
- Officially recognize the recent preservation of the Harsh Farm property.
- Develop a process for Wilmington to officially recognize award winning farms upstream.
- Identify and prioritize dairy farms with and without conservation and nutrient management plans in the Honey Brook area.
- Expand upon the agricultural preservation priorities in the Upper East Branch to Honey Brook township and the West Branch of the Brandywine Creek.

- Identify, scope, and support application for PA American Water Works Service Company Watershed grant and PADEP Growing Greener grant project to support an agricultural mitigation priority project in the Honey Brook clusters.

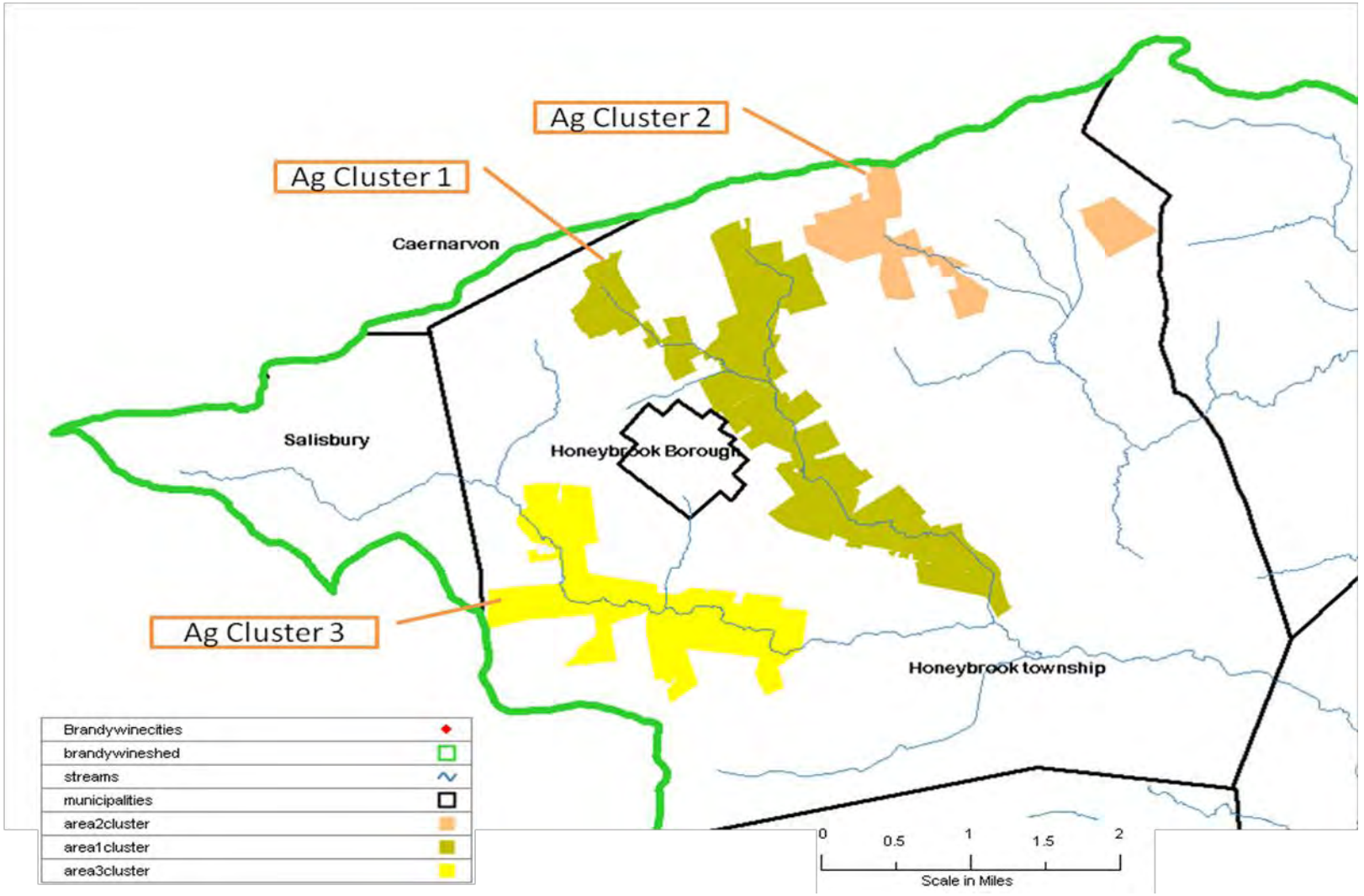


Figure 7-1 – Priority Agricultural Mitigation Areas on West Branch Brandywine Creek in Honey Brook

7.3.2. Agricultural Preservation

Top Priority Areas: Honey Brook Township clusters 1, 2, and 3 and immediately upstream of Wilmington's intake in New Castle County Delaware. (see Figure 7-2)

Secondary Priority Areas: W. Branch of Brandywine Creek

Key Activity: Preserve farmland, with primary emphasis on parcels with first order streams or adjacent to streams.

Major Program Milestone for 2020: 5,500 acres preserved.

Wilmington's Role/Responsibility: Technical support, minor/limited match funding support, monitoring support, grant support

Amount of Financial Assistance Necessary from Other Sources: $5 million per year from Federal, State, Local, and private sources.

Benefits to Wilmington's Water Supply: Prevents and reduces pathogens such as *Cryptosporidium*, sediment, ammonia, nitrate, and phosphorus as well as contaminants related to urbanization of farmland from urban stormwater. A study by AWWA and the Trust for Public Lands of water supplies suggested that for every 4 percent increase in raw water turbidity, treatment costs increase 1 percent (Trust for Public Lands, 2004).

Partners: Chester County Conservation District, Brandywine Conservancy, Honey Brook Township, New Castle County Conservation District, Delaware Nutrient Management Commission, USDA NRCS, DNREC, PADCNR, PADEP, Trout Unlimited, Ducks Unlimited.

Properly managed and preserved farmland can support significant riparian buffers and prevents the addition of urban/suburban stormwater challenges due to development. Agricultural Preservation efforts should focus on preserving as much farmland as possible in riparian buffer areas along first and second order streams by 2100. In order to preserve roughly 60% of the existing farmland in the watershed (or 69 square miles of land) requires roughly $5 million per year for 100 years (preserving 550 acres/yr). The Honey Brook area on the West Branch, Buck and Doe Run, and the Upper East Branch prime agricultural parcels should be the primary area of initial focus.

In New Castle County it is estimated that 1,778 acres of farmland needs to be assessed for its preservation status. It is estimated that 2700 acres of farms are adjacent to 33 miles of stream within Honey Brook Township. These lands represent initial priorities for preservation during the initial 5 to 10 year period in conjunction with other key preservation areas identified in the West Branch.

The following are specific priority agricultural activities that should be considered for implementation immediately:

- Identify preserved farms in Honey Brook Township for comparison to priority cluster areas

- Identify preserved or eased farms in New Castle County for comparison to remaining farm areas.
- Identify mechanisms/frameworks for agricultural preservation
- Identify ways to enhance/accelerate current agricultural preservation efforts

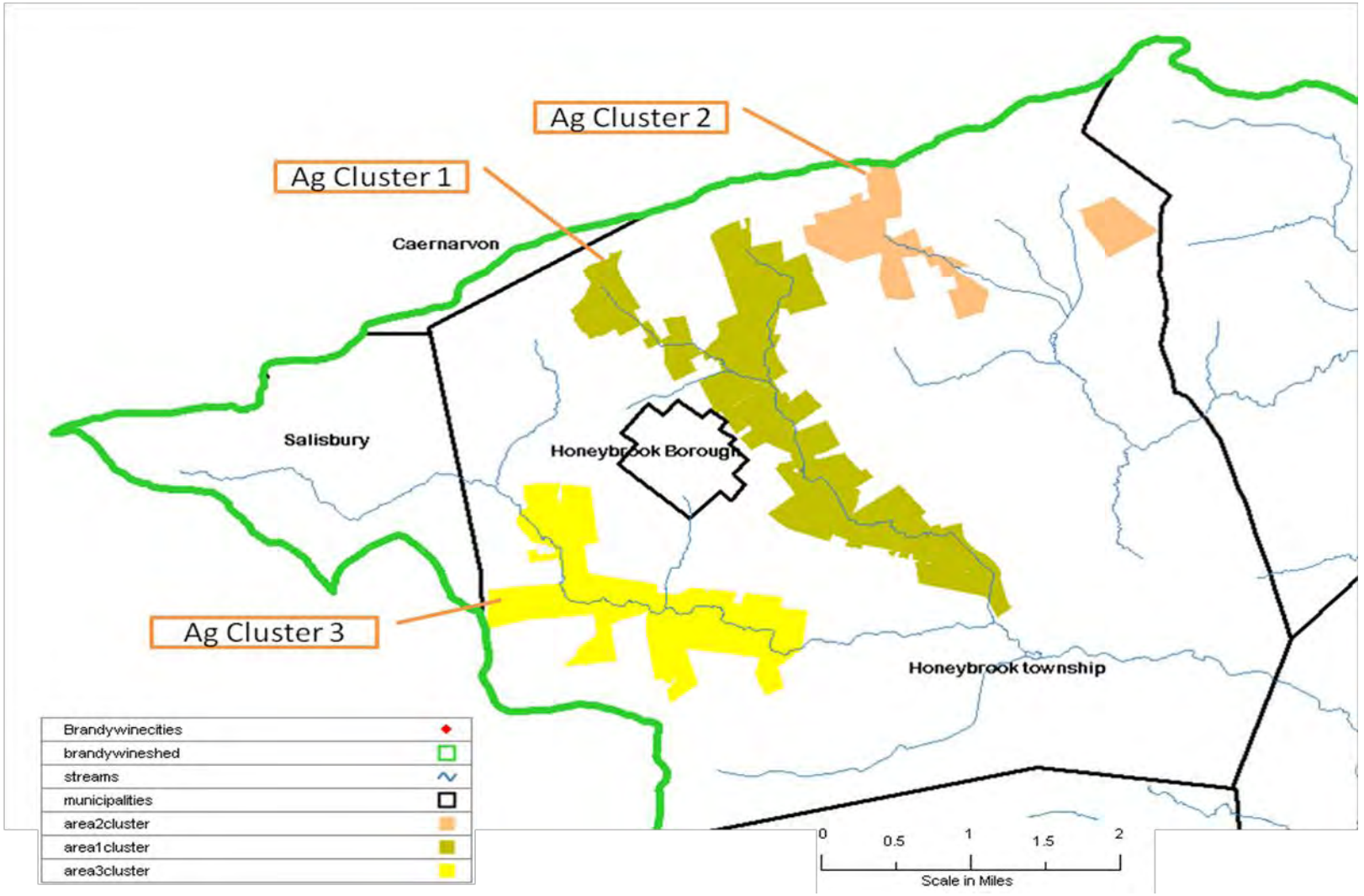


Figure 7-2 – Priority Agricultural Preservation Areas on West Branch Brandywine Creek in Honey Brook

7.3.3. Forest Preservation

Top Priority Areas: Perkins Run and Indian Run clusters (See Figure 7-3)

Secondary Priority Areas: Marsh Creek and Upper East Branch

Key Needed Activity: Preserve forested lands especially along first order tributaries via conservation easements and other approaches.

Major Program Milestone for 2020: 20 miles/10,000 acres (2 miles/1,000 acres per year). The rate is nearly twice the annual rate of loss of forested land due to development in the watershed.

Wilmington's Role/Responsibility: Technical support, minor/limited match funding support, monitoring support, grant support.

Amount of Financial Assistance Necessary from Other Sources: $800,000 per year from various public and private funding sources.

Benefits to Wilmington's Water Supply: Prevents pathogens such as *Cryptosporidium*, road salts, and increased flows due to development. Forests reduce/filter sediment, ammonia, nitrate, and phosphorus. Treatment costs increase as forested lands drop below 40% of the watershed. For every 10 percent increase in forest cover in the source area, treatment and chemical costs decreased approximately 20 percent, up to about 60 percent forest cover as reported in a study by AWWA and the Trust for Public Lands (Trust for Public Lands, 2004).

Partners: Brandywine Conservancy, USDA Forest Service, DNREC, PADCNR, PADEP, Natural Lands Trust, Trust for Public Lands, William Penn Foundation, Conservation Fund, Pennsylvania Environment Coalition, Delaware Horticultural Society, Delaware Nature Society.

Forest Preservation efforts need to focus the short term efforts on the Perkins Run and Indian Run cluster areas along first order streams. Within the Delaware portion of the Brandywine Watershed there is approximately 1,000 acres of riparian forested lands that need to be examined for preservation.

Preservation of priority areas will require about $800,000 per year and protect 2 miles of stream bank and 1,000 acres per year. Watershed wide approximately 75 square miles need to be preserved at a cost of approximately 48 million dollars. Some potential partners for this effort include the Pennsylvania Department of Conservation of Natural Resources, Chester County Water Resources Authority, New Castle County, Delaware Natural Resources Environmental Conservation, Chester County, Brandywine Conservancy, Brandywine Valley Association, Natural Lands Trust, Trust for Public Lands, William Penn Foundation, Conservation Fund, Pennsylvania Environment Coalition, Delaware Horticultural Society, Delaware Nature Society.

The following are specific priority forest preservation activities that should be considered

for implementation immediately:

- Continue the Brandywine Conservancy headwaters preservation, track leveraging and benefits
- Initiate, facilitate, and support efforts to preserve forested riparian buffer areas in Indian Creek and Perkins Run along the Upper East Branch
- Lead and facilitate the initial efforts for a larger effort to prioritize and preserve forested buffer areas watershed wide.

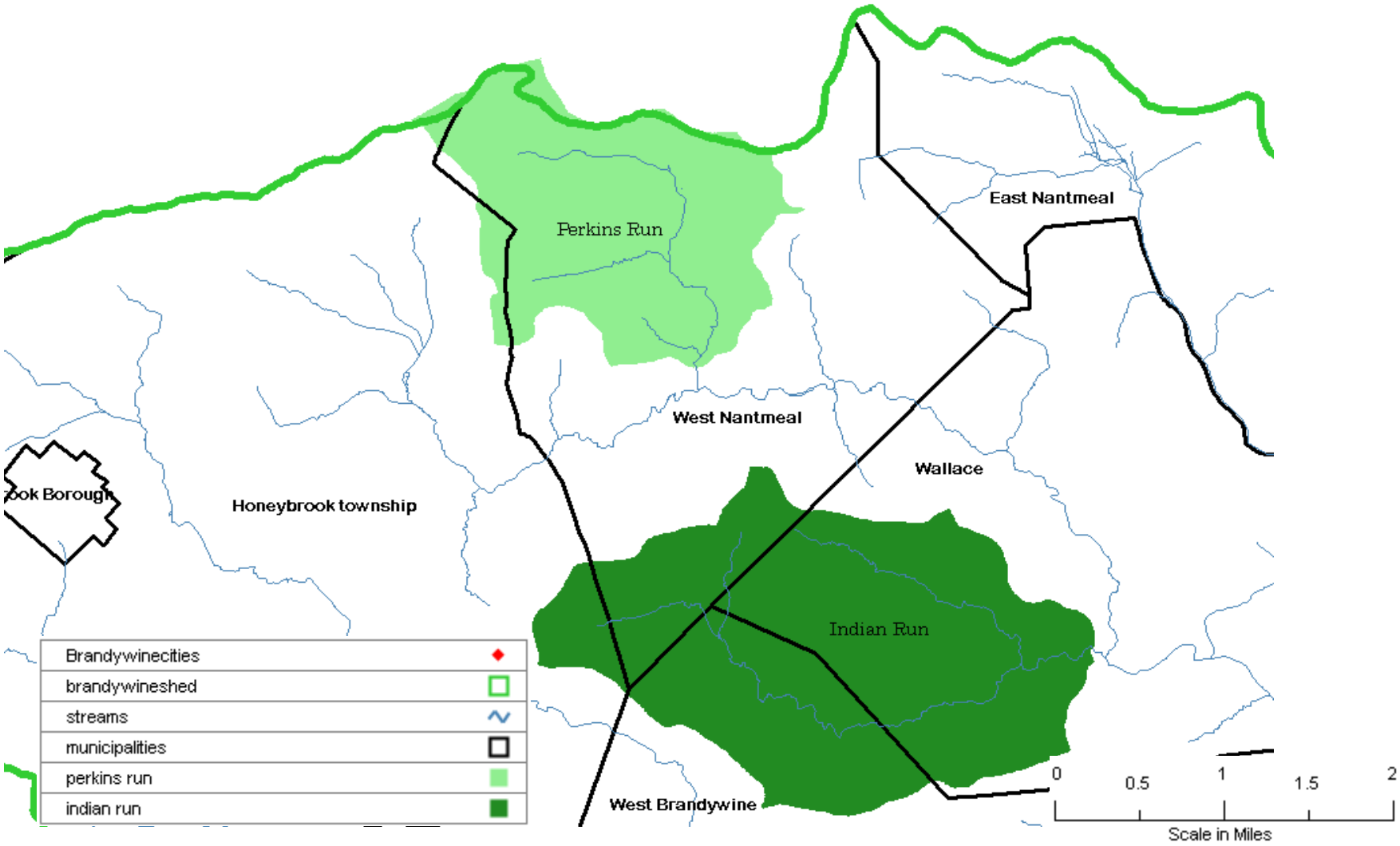


Figure 7-3 – Priority Forest Preservation Areas of Perkins Run and Indian Run on East Branch Brandywine Creek

7.3.4. Riparian Buffer & Forest Reforestation

Top Priority Areas: First order riparian lands and headwaters areas

Secondary Priority Areas: Watershed Wide

Key Needed Activity: Reforest lands along first order tributaries and along the riparian corridor in general.

Major Program Milestone for 2020: 582 acres per year. The rate is roughly equal to the annual rate of loss of forested land due to development in the watershed.

Wilmington's Role/Responsibility: Technical support, minor/limited match funding support, monitoring support, grant support.

Amount of Financial Assistance Necessary from Other Sources: $500,000 per year from various public and private funding sources.

Benefits to Wilmington's Water Supply: Prevents pathogens such as *Cryptosporidium*, road salts, increased flows due to development. Forests reduce/filter sediment, ammonia, nitrate, and phosphorus. Treatment costs increase as forested lands drop below 40% of the watershed. For every 10 percent increase in forest cover in the source area, treatment and chemical costs decreased approximately 20 percent, up to about 60 percent forest cover in a study by AWWA and the Trust for Public Lands (Trust for Public Lands, 2004).

Partners: Brandywine Conservancy, USDA Forest Service, DNREC, PADCNR, PADEP, Natural Lands Trust, Trust for Public Lands, William Penn Foundation, Conservation Fund, Pennsylvania Environment Coalition, Delaware Horticultural Society, Delaware Nature Society.

Riparian Buffer Restoration efforts require a detailed watershed wide analysis and groundtruthing of riparian buffer gaps to be completed. In lieu of complete information watershed wide, a teamed grant application to fund a study for the watershed wide analysis should be completed. On a parallel track, initial efforts by the City of Wilmington should be piloted within the tributaries to the main stem in New Castle County where detailed information is available and effectiveness can be monitored. Detailed information provided by the Brandywine Conservancy suggests the lands in the Wilson Run tributary and the agricultural lands near Smiths Bridge Road in Ramsey Run, Beaver Run, and an unnamed tributary are the greatest priority (See Figure 7-4). This work involves a relatively limited number of stakeholders and property owners. The City of Wilmington should immediately meet with these stakeholders to discuss ways to improve riparian buffer protection in these areas. Given, the garden lands and the nearby golf course are large landowners with potential for matching interests, it is recommended that efforts start with those two locations first.

In addition, a watershed wide initiative for reforestation should be developed that is linked to potential funding sources via carbon credits, carbon sequestration, or carbon cap and

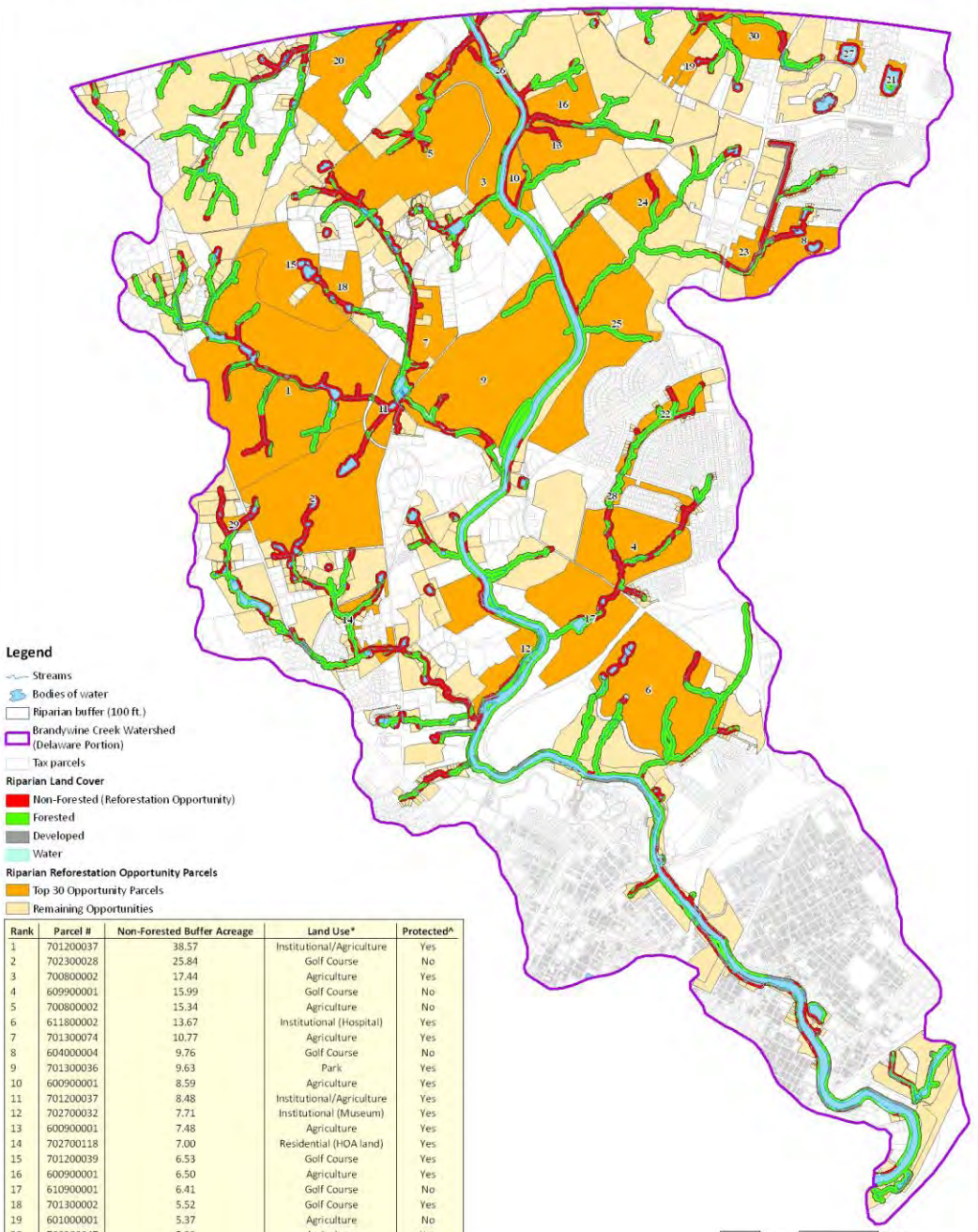
trade programs for energy suppliers and businesses. There are many large industries in the watershed and region that may be interested in this approach. However a framework needs to be developed that regulators will accept and a champion to administer and implement the program will need to be identified.

Some initial steps to starting this effort include the following:

- Develop programs to reforest key riparian parcels upstream of COW intake in New Castle County along the main stem and first order streams.
- Develop funding agreements with Brandywine Conservancy and Brandywine Valley Watershed association to leverage specific reforestation efforts in first order streams or headwaters areas.
- Develop regional initiative with BCC, BVA, water suppliers, and Chester County to reforest remaining forested riparian buffer lands along first and second order streams by 2100.

Figure 7-4

Riparian Reforestation Opportunities, Delaware Portion of the Brandywine Creek Watershed



Rank	Parcel #	Non-Forested Buffer Acreage	Land Use*	Protected^
1	701200037	38.57	Institutional/Agriculture	Yes
2	702300028	25.84	Golf Course	No
3	700800002	17.44	Agriculture	Yes
4	609900001	15.99	Golf Course	No
5	700800002	15.34	Agriculture	No
6	611800002	13.67	Institutional (Hospital)	Yes
7	701300074	10.77	Agriculture	Yes
8	604000004	9.76	Golf Course	No
9	701300036	9.63	Park	Yes
10	600900001	8.59	Agriculture	Yes
11	701200037	8.48	Institutional/Agriculture	Yes
12	702700032	7.71	Institutional (Museum)	Yes
13	600900001	7.48	Agriculture	Yes
14	702700118	7.00	Residential (HOA land)	Yes
15	701200039	6.53	Golf Course	Yes
16	600900001	6.50	Agriculture	Yes
17	610900001	6.41	Golf Course	No
18	701300002	5.52	Golf Course	Yes
19	601000001	5.37	Agriculture	No
20	700200047	5.29	Agriculture	Yes
21	601200231	5.01	Residential (HOA land)	Yes
22	606400033	4.97	Park	Yes
23	602900009	4.91	Institutional (College)	No
24	602800005	4.56	Agriculture	Yes
25	602800002	4.48	Park	Yes
26	600100005	4.43	Park	Yes
27	600400025	4.39	Commercial	No
28	608800018	4.33	Park	Yes
29	702300022	4.11	Residential	No
30	600400002	3.77	Agriculture	No

*Derived from 2007 aerial photography and tax parcel records.
^Refers to ownership, or easements held, by nonprofits, land trusts, public agencies, and HOAs.

7.3.5. Wastewater Discharge Enhancements and Emergency Response Preparation and Communication

Top Priority Activities: Visit high priority point sources. Increase notification of emergency and water quality events upstream that have potential to impact water supply.

Key Needed Activity: Monitor upstream discharger and point source facility activities. Improve communication of potential water quality events with upstream facilities.

Major Program Milestone for 2010: Visit all top priority point source facilities and establish lines of communication/notification.

Wilmington's Role/Responsibility: Facilitator, technical

Amount of Financial Assistance Necessary from Other Sources: Staff time

Benefits to Wilmington's Water Supply: Improved response and awareness of upstream accidents and activities that could result in acute water quality events or long term water quality changes that will impact Wilmington's intakes

Partners: PADEP, DNREC, Chester County Health Department, New Castle County, City of Coatesville, City of Downingtown, upstream water suppliers

Point source management and emergency response efforts should focus on the following priority activities:

- Support upgrades to advanced tertiary and UV treatment to mitigate pathogens
- Enhance communications with Health Departments regarding upstream occurrence of waterborne or gastrointestinal disease greater than would otherwise be expected in a particular time and place.
- Increase communication for improved responses in case of accident
- Convene a workshop with PADEP, CCHD, DNREC, and pertinent health agencies for future warning to water suppliers about Cryptosporidiosis outbreaks and monitoring of upstream wastewater discharges during events
- Enroll in Chester County upstream notification - get calls from phone chain
- Receive calls from Marsh Creek Lake during releases – contact Park Manager
- Develop internal protocols to respond to calls from upstream dischargers, water suppliers, etc.
- Visit high point sources – ongoing effort that requires training staff and developing outreach / communication information for upstream facilities.

- Develop appropriate phone and contact information list for high priority point sources immediately.
- Establish protocol for watershed surveys and data collection

Emergency response efforts should focus on the following priority activities:

- Visit high ranked facilities upstream, update internal information, and exchange emergency contact information
- Visit all major upstream discharges upstream – exchange contact information
- Contact Chester County Health and get added to phone chain for spills
- Investigate enrolling in Delaware Valley Early Warning System
- Improve notification about reservoir releases upstream (CWRA)
- Enhance the turbidity early warning system to include conductivity warnings for road salt application
- Contact emergency responders in NCC upstream of COW intake and drinking water to communicate water supply sensitivity to wash down and accidents.
- Design and install water supply educational roadway signs at key locations in the watershed & Hoopes Reservoir.
- Develop an SOP listing the locations, methods, equipment, and personnel needed to sample the Brandywine Creek and Hoopes Reservoir in response to a serious water quality event.

7.3.6. Stormwater Runoff Mitigation

Top Priority Activities: Incentives**,** implementation, and enforcement of stormwater management ordinances for all development. Enhancement of upstream MS4 programs.

Key Needed Activity: Consistent and complementary regulations, standards, protections, buffers, steep slope requirements, implementation, and enforcement of stormwater ordinances and regulations throughout the entire Brandywine Creek Watershed.

Major Program Milestone for 2020: Implementation and enforcement of consistent and complementary stormwater regulations and ordinances watershed wide

Wilmington's Role/Responsibility: Facilitator, technical

Amount of Financial Assistance Necessary from Other Sources: Staff time

Benefits to Wilmington's Water Supply:

Partners: PADEP, DNREC, Chester County Water Resources Authority, New Castle County

Stormwater management should focus on the following priority activities:

- Identify opportunities to match SWP efforts with ACT 167 and Chester County Ordinance Initiatives (Landscapes, Watersheds, etc.)
- Support riparian buffer ordinance protections upstream in DE and PA
- Monitor TMDL activities related to upstream MS4 permits
- Provide support and assistance during the creation of upstream stormwater utilities
- Support the adoption of LEEDs requirements for new construction in upstream communities
- Develop and implement a pilot project with DELDOT and COW for using brining to reduce road salt application near intake
- Reconvene a Public Works working group at Wilmington about road salt and brining to identify key areas for brining and resources/barriers to implementing brining in these areas.
- Develop a pilot program with DNREC, DELDOT, and PENNDOT to identify critical areas to reduce road salt application through the use of brining to reduce chloride impacts and reduce road salting costs while maintaining proper road safety in the Brandywine Creek Watershed
- Integrate and enhance the aspects of the PADEP and Chester County stormwater regulations with the steep slope and erosion prone slope related aspects of the New Castle County Water Resource Protection Area ordinance watershed wide.

7.3.7. Stakeholder Partnerships and Public Education & Outreach

Key Needed Activity: Staff involvement and attendance at key stakeholder events and forums. Routine communication and engagement of stakeholders.

Major Program Milestone for 2020: Known by all stakeholders as a key partner in the watershed and stakeholders consider the Brandywine Creek's top priority is water supply protection.

Wilmington's Role/Responsibility: Facilitator, technical

Amount of Financial Assistance Necessary from Other Sources: Staff time

Benefits to Wilmington's Water Supply: Potential opportunities to leverage other resources and efforts to achieve a source water goal

Partners: Members of the Christina Basin Coalition

Stakeholder partnership efforts should focus on the following priority activities:

- Implementation of the SWP Ordinance
- Participate in the Phase 7 scope of work development for the EPA Watersheds Grant
- Support efforts for workshops to enroll upstream golf courses in Audubon Certification Program and the continued participation of golf courses.
- Arrange SWP Program in order to submit application for AWWA Accreditation.
- Set up water supplier meeting to discuss SWP Plan, support for watershed protection, and coordination of efforts, set up protocols for calls and communication during events
- Evaluate the need and develop, if appropriate, funding agreements with partnering organizations in the watershed, which will leverage specific preservation and restoration efforts.
- Participate in watershed events such as annual clean ups with various organizations.
- Initiate and facilitate discussions to develop a combined water supplier funding initiative for the Brandywine Creek
- Conduct an annual SWP workshop on the Brandywine
- Obtain approval and endorsement of the Wilmington Source Water Protection Plan by key stakeholders, PADEP, DNREC, and EPA Region 3
- Design and install water supply educational roadway signs at key locations in the Brandywine Creek watershed (near the intakes) & Hoopes reservoir areas.

7.3.8. Monitoring & Technical Studies

Key Needed Activity: Monitoring to identify upstream sources of pollution for prioritization and mitigation.

Major Program Milestone for 2020: Identification of major pathogen sources upstream for mitigation. Development of an early warning monitoring system for water quality

events.

Wilmington's Role/Responsibility: Facilitator, technical

Amount of Financial Assistance Necessary from Other Sources: Staff time and laboratory resources

Benefits to Wilmington's Water Supply: Awareness, understanding, and knowledge of water quality trends, phenomena, and events through monitoring can allow for predictive and preventative actions.

Partners: USGS, water suppliers, DNREC, PADEP, EPA, local/regional universities

Monitoring efforts should focus on the following priority activities:

- Pathogen source tracking study plan
- Add conductivity to early warning system upstream where needed
- Participate in emerging contaminant monitoring as needed
- Conduct a study using a time of travel and dilution/concentration model of various contaminant types (conservative, non-conservative, oils) spilled into the Brandywine Creek to improve intake pumping and monitoring responses. Eventually link the spill model to stream monitoring network for real time projections.
- Enhance the turbidity early warning system to include conductivity warnings for road salt application
- Explore, plan, & conduct microbial source tracking studies to identify dominant sources of Cryptosporidium and pathogens in watershed
- Conduct a study of current in-stream monitoring network and ways it can be enhanced for improved warning and response while providing useful long term source water protection data.
- Share data with PA and DE stakeholders and regulatory agencies for watershed wide water quality trending
- Assess the risk and management options for forest fires at Hoopes Reservoir

7.3.9. Hoopes Reservoir Protection

Key Needed Activity: Reforestation of deforested areas. Forest management plan.

Major Program Milestone for 2020: Reforestation of deforested areas along the reservoir

Wilmington's Role/Responsibility: Facilitator, technical

Amount of Financial Assistance Necessary from Other Sources: Staff time

Benefits to Wilmington's Water Supply: Sustained long term high quality water supply

Partners: Mt. Cuba Center, emergency responders, neighboring property owners

Hoopes Reservoir management should focus on the following priority activities:

- Conduct forest survey of Hoopes
- Improve markers of COW Property boundaries
- Create an enforcement process for deforestation
- Educate adjacent property owners
- Develop a stakeholder group (Friends of Hoopes Reservoir)
- Reforest the Hoopes Area
- Identify areas for critical land acquisition/easements around Hoopes if any remain
- Initiate communication and education of emergency responders near Hoopes and put up appropriate signage at key road crossings.
- Assess the risk and management options for forest fires at Hoopes Reservoir
- Develop a volunteer surveillance and notification program with stakeholders near the reservoir to observe forest health, trespassing, and unusual occurrences in and around the reservoir.

7.3.10. Financial Support and Analysis

Key Needed Activity: Identification and acquisition of long term sustainable funding sources to implement efforts in the protection plan

Major Program Milestone for 2020: Sustainable funding framework created.

Wilmington's Role/Responsibility: Facilitator, technical

Amount of Financial Assistance Necessary from Other Sources: To be determined

Benefits to Wilmington's Water Supply: Long term funding will lead to consistent implementation of water supply protection goals. Without funding programs in the watershed will not be able to mitigate current and future pollution sources and the water quality will degrade in the Brandywine Creek.

Partners: All

Support the efforts of the Christina Basin Coalition to develop a long term framework for sustainable funding.

Determine the cost and benefit of water supply protection specific to the City of Wilmington in terms of avoided long term treatment, operating, capital costs, and triple bottom line findings.

7.4. Recommended Immediate Priority Activities

It may be difficult to determine where to start implementing the Source Water Protection Plan with the limited resources available since there are such a large number of activities recommended in the plan. The following activities are recommended for initial implementation.

- Implement the SWP Ordinance
- Facilitate and support streambank fencing at farms near Smith's Bridge Road
- Continue to leverage preservation efforts with watershed partners such as Brandywine Conservancy
- Partner with Brandywine Conservancy on larger efforts for forest preservation and reforestation
- Implement several streambank fencing projects with CCCD and BVA and evaluate benefit to Wilmington.
- Estimate the cost benefit and long term impacts of deforestation of the watershed on long term water quality and treatment costs
- Enhance current protocols for Hoopes Reservoir usage due to Brandywine Creek water quality
- Develop and establish protocols to respond to upstream notifications
- Familiarize staff with watershed and key upstream dischargers and information on watershed
- Continue to build partnerships with upstream stakeholders
- Present the SWP Plan to stakeholders and educate the value to key City staff and officials
- Obtain resolution approving the SWP Plan by City Council
- Initiate monitoring for the Microbial Source Tracking Project
- Identify and leverage opportunities through the Christina Coalition
- Initiate road salt reduction discussions and develop a pilot project

- Secure nomination for the EPA Region 3 SWP Award
- Compete for the AWWA Exemplary SWP Program National Award

7.5. Cost Estimates

In Table 7-1 and 7-2 the following assumptions were used to estimate some of the costs presented.

Farm mitigation costs were estimated using the following values:

Stream bank crossings required every 1500 LF of stream, $3,000 per crossing

Stream bank fencing = $1.75 / Linear foot of stream

General barnyard and manure storage improvements = $83,000 per farm

Nutrient management plan preparation = $20 per acre

Farm and Forested Land Preservation costs were estimated using the following:

Based on average parcel costs provided by Brandywine Conservancy every preserved farm or forested parcel (in most cases the parcel includes both land use types) was assumed to cost roughly $10,000.

The historical rate of land preservation in the watershed is approximately 1,200 acres per year. Using this rate over 40 years produces 48,000 acres or roughly 75 square miles of forested cover preserved or about 23% of the watershed. Over 111 square miles of land exists inside first order drainage areas according to estimates in the Chester County Compendium (CCWRA, 2001).

7.6. Progress Indicators

A number of potential indicators can be used to measure the progress and performance of the various major objectives and goals for the City of Wilmington's SWP Program. Some metrics are qualitative while some are quantitative. Many of the indicators are provided below and summarized in Table 7-2.

Table 7-2 Progress Indicators for Wilmington's SWP Plan

Goal Level	WQ priority	Activity Area	Measurement	Unit	Annual Goal (units)	Ultimate Goal (units)	Annual Goal (%)	Ultimate Goal (%)	Timeframe
1	All	preservation	forested land preserved in watershed	acres	1,000	48,000	3	100	50+ years
1.1	All	preservation	forested land preserved in riparian areas along all first order streams	miles	8	107	7	100	40 years
1.1.1	All	preservation	forested riparian land preserved in key headwater streams of Perkins Run, Indian Run, and Marsh Creek	miles	2	20	10	100	10 years
1.1.2	All	preservation	forested riparian areas along the main stem Brandywine from COW's intake upstream to the E. and W. Branch split - PA section	acres	50	500	10	100	10 years
1.1.3	All	preservation	forested riparian areas along the main stem Brandywine from COW's intake upstream - DE/NCC section	acres/miles	0.4 / 9	4.0 / 90	10	100	10 years

Goal Level	WQ priority	Activity Area	Measurement	Unit	Annual Goal (units)	Ultimate Goal (units)	Annual Goal (%)	Ultimate Goal (%)	Timeframe
1.1.4	All	preservation	first order stream wooded parcels in riparian corridors for preservation/easements in the Pocopson creek subbasin watersheds to complement agricultural mitigation clusters	miles	0.5	5	10	100	10 years
1.2	All	preservation	Hoopes Reservoir lands reforestation of critical drainage areas	acres	NA	NA	NA	100	5 years
2	All	agricultural	stream miles preserved in agricultural lands along first order streams	miles	3	126.2	2	100	40 years
2.1	All	agricultural	miles of streambank fencing along first order streams	miles	10	327.7	3	100	40 years
2.2	All	agricultural	acres preserved in Honey Brook clusters	acres	170	1700	10	100	10 years
2.1.1	All	agricultural	miles of streambank fencing in Honey Brook clusters	miles	2.5	25	10	100	10 years

Goal Level	WQ priority	Activity Area	Measurement	Unit	Annual Goal (units)	Ultimate Goal (units)	Annual Goal (%)	Ultimate Goal (%)	Timeframe
2.3	All	agricultural	streambank fencing of the tributaries to the main stem Brandywine from COW's intake upstream to the DE border	acres/miles	3 / 0.5	16 / 3	18	100	6 years
2.4	All	agricultural	streambank fencing in the Pocopson creek subbasin watersheds	miles	1	10	10	100	10 years
3	All	agricultural	area of agricultural land preserved	acres	550	44,160	2	100	40 years
3.1	All	agricultural	area of agricultural land with nutrient management plans	acres	1,000	40,000	2	100	40 years
3.2	All	agricultural	area of agricultural land with conservation management plans	acres	1,000	40,000	2	100	40 years
4	All	agricultural	# of dairy farms with nutrient management plans	# farms	10	all	10	100	40 years
5	All	agricultural	# of dairy farms with conservation management plans	# farms	10	all	10	100	40 years

Goal Level	WQ priority	Activity Area	Measurement	Unit	Annual Goal (units)	Ultimate Goal (units)	Annual Goal (%)	Ultimate Goal (%)	Timeframe
6	All	agricultural	# of farms in watershed with nutrient management plans	# farms	20	all	10	100	40 years
7	All	agricultural	# of farms in watershed with conservation management plans	# farms	20	all	10	100	40 years
8	All	agricultural	# of no-till devices and usage by Amish in West Branch	# farms	2	5	40	100	5 years
9	pathogens	agricultural / wastewater	2 year average concentration of Cryptosporidium at Wilmington intake	oocysts/L	TBD	< 0.075 oocysts/L	5	25	5 years
10	emerging contaminants	wastewater	Number of emerging contaminants detected above the ppt level from human sources	#	1	< 10	NA	NA	10 years
11	emerging contaminants	agricultural	Number of emerging contaminants detected above the ppt level from agricultural sources	#	1	< 10	NA	NA	10 years
12	sodium & chloride	roads/ highways	maximum sodium and chloride concentrations at the Wilmington intake during winter	mg/L	< SMCL	< SMCL	TBD	TBD	10 years

Goal Level	WQ priority	Activity Area	Measurement	Unit	Annual Goal (units)	Ultimate Goal (units)	Annual Goal (%)	Ultimate Goal (%)	Timeframe
13	sodium & chloride	roads/ highways	winter loads of sodium and chloride at the Wilmington intake	mg /day	TBD	decrease	TBD	TBD	10 years
14	sodium & chloride	roads/ highways	Annual road application of road salts (tons) along Brandywine sensitive roads	tons/yr	TBD	decrease	TBD	TBD	10 years
15	sodium & chloride	roads/ highways	miles of sensitive/critical roads in the Brandywine with brining road salt application protocols	miles	TBD	all	TBD	TBD	10 years
16	algae / nutrients	all	concentrations of geosmin and MIB at the Wilmington intake and other water intakes	# events > 10 ppt	2	always below 10 ppt	NA	NA	10 years
17	turbidity	stormwater	Average annual sediment load and compliance with the sediment TMDL	% compliance	TBD	100%	NA	NA	40 years
18	All	stormwater	Reduction in the number of impaired stream miles in the Brandywine Creek watershed	miles	TBD	TBD	2	100	40 years

Goal Level	WQ priority	Activity Area	Measurement	Unit	Annual Goal (units)	Ultimate Goal (units)	Annual Goal (%)	Ultimate Goal (%)	Timeframe
19	pathogens	all	# of locations meeting bacteria standards in the Brandywine Creek watershed	Number of Pathogens	TBD	100%	NA	NA	40 years
20	pathogens	all	Compliance with the bacteria TMDL	% compliance	TBD	100%	NA	NA	40 years
21	emergency response	spills/ accidents	frequency/# of water quality events requiring water intake closure	Number of Spills/Accidents	0	never	NA	NA	40 years
22	emergency response	spills/ accidents	# of notifications by CCHD or upstream users/responders about potential WQ events (more is good)	Number of Spills/Accidents	10	all	NA	100	3 years
23a	All	partnerships	Funding for agricultural mitigation activities in the watershed	$	1 million	40 million	3	100	40 years
23b	All	partnerships	Funding for agricultural preservation activities in watershed	$	$ 5 million	400 million	1.25	100	80 years
24	All	partnerships	Funding for forest preservation activities in the watershed	$	$ 8 million	$ 48 million	3	100	40 years

Goal Level	WQ priority	Activity Area	Measurement	Unit	Annual Goal (units)	Ultimate Goal (units)	Annual Goal (%)	Ultimate Goal (%)	Timeframe
25	All	partnerships	Funding for riparian buffer reforestation in the watershed	$	$ 250,000	$ 10,000,000	3	100	40 years
26	All	partnerships	Funding for stormwater management in the watershed	$	TBD	300 million / yr	TBD	100	40 years
27	turbidity/ pathogens/ DBP	stormwater	% of townships that have similar or better ordinance elements to the NCC WRPA ordinance	%	3%	all	3	100	40 years
28	turbidity/ pathogens/ DBP	stormwater	% of townships with parcel based impervious cover stormwater billing	%	3%	all	3	100	40 years
29	All	partnerships	Involvement in the Christina Coalition/Partnership and presence on CC committees	# meetings/ calls attended	NA	all	NA	NA	40 years
30	All	SWP Program	In-house ability for SWP	# staff	1 full time staff	1 full time staff	NA	NA	1 year
31	All	SWP Program	In-house ability for SWP	$ allocated	150,000	$ 6,000,000	NA	NA	40 years

Goal Level	WQ priority	Activity Area	Measurement	Unit	Annual Goal (units)	Ultimate Goal (units)	Annual Goal (%)	Ultimate Goal (%)	Timeframe
32	All	preservation	# of golf courses with Audubon Certification	# golf courses	2	12	17	100	6 years
33	All	education	Public awareness of Brandywine as drinking water supply	% of customers surveyed	5%	100%	5	100	20 years
34	All	restoration	Riparian buffer reforestation & restoration in New Castle County	# acres	30	300	10	100	10 years

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Appendix A
Point Source Inventory Ranking

TABLE A-1 - Rank of Potentially Significant Point Sources Upstream of Wilmington's Intake

				NPDES	NPDES	UST	UST		
MASTERID	Site Name	Site Type	PS Score	Flow (MGD)	Intake Distance (miles)	Capacity (gallons)	Substance Code	Overall score	Rank
PA0026531	Downingtown Area Regional Authority	PCS/NPDES	8.63	7.134	20.1			9.63	High
PA0026859	Coatesville City Authority	PCS/NPDES	5.16	3.85	27.5			6.16	High
6437	DUPONT EXPERIMENTAL STATION	SFUND & TRI	4.35					5.60	High
7107	E I Dupont Experimental Station	HW_Gen & TRI	3.39					4.64	High
PA0026018	West Chester Borough MUA/Taylor Run	PCS/NPDES	3.42	1.8	15.1			4.42	High
569614	ZEKES HC SHEELER	AST	2.45			20000	HO	3.95	High
508704	REILLY & SONS	AST	2.36			20000	HO	3.86	High
508704	REILLY & SONS	AST	2.36			20000	DIESL	3.86	High
569614	ZEKES HC SHEELER	AST	2.13			12000	HO	3.63	High
569614	ZEKES HC SHEELER	AST	1.97			8000	KERO	3.47	High
569614	ZEKES HC SHEELER	AST	1.87			20000	HO	3.37	High
517410	JC HAYES	AST	1.83			20000	HO	3.33	High
517410	JC HAYES	AST	1.83			20000	KERO	3.33	High
4161	Brandywine Raceway Assoc Inc	UST	1.55					3.05	High

				NPDES	NPDES	UST	UST		
MASTERID	Site Name	Site Type	PS Score	Flow (MGD)	Intake Distance (miles)	Capacity (gallons)	Substance Code	Overall score	Rank
4400	HAGLEY MUSEUM & LIBRARY	UST	1.55					3.05	High
593737	PETROCON	AST	1.55			4000	KERO	3.05	High
DE0021768	Winterthur Museum	PCS/NPDES	2.03	0.025	0.0			3.03	High
PA0043982	Broad Run Sewer Co.	PCS/NPDES	1.94	0.4	18.2			2.94	High
PA0053449	Birmingham Twp. STP	PCS/NPDES	1.93	0.15	8.9			2.93	High
6644	BANCROFT MILLS	SFUND	2.42					2.92	High
593737	PETROCON	AST	1.41			550	GAS	2.91	High
PA0054917	Uwchlan Twp. Municipal Authority	PCS/NPDES	1.89	0.475	23.3			2.89	High
PA0055476	Birmingham TSA/Ridings at Chadds Ford	PCS/NPDES	1.88	0.04	6.4			2.88	High
511023	TEXACO 100250	UST	1.37			12000	GAS	2.87	High
PA0024473	Parkersburg Borough Authority WWTP	PCS/NPDES	1.86	0.7	33.5			2.86	High
PA0055484	Keating, Herbert & Elizabeth	PCS/NPDES	1.84	0.0005	6.4			2.84	High
PA0055085	Winslow, Nancy	PCS/NPDES	1.84	0.0005	6.4			2.84	High
PA0030848	Unionville - Chadds Ford Elem. School	PCS/NPDES	1.83	0.0063	7.0			2.83	High
PA0057011	Thornbury Twp./Bridlewood Farms STP	PCS/NPDES	1.82	0.0773	10.2			2.82	High

				NPDES	NPDES	UST	UST		
MASTERID	Site Name	Site Type	PS Score	Flow (MGD)	Intake Distance (miles)	Capacity (gallons)	Substance Code	Overall score	Rank
1542	CHESTER CNTY AIRPORT	AST	1.32			15000	AVGAS	2.82	High
1542	CHESTER CNTY AIRPORT	AST	1.32			15000	JET	2.82	High
4830	Carpenter Estates	UST	1.32					2.82	High
3682	Dupont Winterthur Museum	UST	1.32					2.82	High
5086	Estate of Neil H Keough J	UST	1.32					2.82	High
5040	LANPHEAR Property ALBERT	UST	1.32					2.82	High
4838	St Joseph On the Brandywine	UST	1.32					2.82	High
4198	Wilmington Country Club	UST	1.32					2.82	High
PA0036200	Radley Run Mews	PCS/NPDES	1.81	0.032	8.9			2.81	Medium High
PA0031097	Radley Run C. C.	PCS/NPDES	1.79	0.017	8.9			2.79	Medium High
511023	TEXACO 100250	UST	1.29			10000	DIESL	2.79	Medium High
511023	TEXACO 100250	UST	1.29			10000	GAS	2.79	Medium High
569163	LONGWOOD GARDENS	AST	1.26			6000	DIESL	2.76	Medium High
PA0056120	Schindler	PCS/NPDES	1.76	0.0005	9.5			2.76	Medium High

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
4986	A FELIX Dupont	UST	1.24					2.74	Medium High
4666	Alapoccas Maintenance Base	UST	1.24					2.74	Medium High
4374	Alexis I Dupont Middle School	UST	1.24					2.74	Medium High
4674	Bayard Sharp Estate	UST	1.24					2.74	Medium High
3604	Brandywine Commons	UST	1.24					2.74	Medium High
3838	Concord Pike Gulf	UST	1.24					2.74	Medium High
4744	Craven Property	UST	1.24					2.74	Medium High
3611	Dupont Experimental Station	UST	1.24					2.74	Medium High
4865	HANK BLACKS FOREIGN CAR	UST	1.24					2.74	Medium High
5076	HENRY Property John	UST	1.24					2.74	Medium High
6089	Laird Property	UST	1.24					2.74	Medium High

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
4280	LINCOLN TOWERS	UST	1.24					2.74	Medium High
5077	Norwood Property	UST	1.24					2.74	Medium High
4114	Porter Filter Plant	UST	1.24					2.74	Medium High
6229	REED Property	UST	1.24					2.74	Medium High
4557	ROSS HOLDEN	UST	1.24					2.74	Medium High
6135	Stonesgate Retirement Community	UST	1.24					2.74	Medium High
6105	THORNTON Property	UST	1.24					2.74	Medium High
4620	WIDENER University	UST	1.24					2.74	Medium High
4386	Wilmington Piece Dye Company	UST	1.24					2.74	Medium High
4878	WOODLAWN TRUSTEES Inc	UST	1.24					2.74	Medium High
PA0056171	McGlaughlin, Jeffrey	PCS/NPDES	1.73	0.0005	10.8			2.73	Medium High

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
PA0036897	South Coatesville Borough	PCS/NPDES	1.72	0.39	26.9			2.72	Medium High
511023	TEXACO 100250	UST	1.21			8000	GAS	2.71	Medium High
515503	THORNDALE EXXON	UST	1.21			10000	GAS	2.71	Medium High
573143	SUNOCO 0013 6804	UST	1.20			8000	GAS	2.70	Medium High
569511	SUNOCO 0318 3209	UST	1.19			12000	GAS	2.69	Medium High
PA0044776	NW Chester Co. Municipal Authority	PCS/NPDES	1.68	0.6	36.8			2.68	Medium
1542	CHESTER CNTY AIRPORT	AST	1.17			15000	JET	2.67	Medium
3940	Ace Citgo	UST	1.16					2.66	Medium
3863	Avenue Gulf MICHAEL FUSCO	UST	1.16					2.66	Medium
4920	BARBARA PRUITT EI DUPON	UST	1.16					2.66	Medium
4752	BIDERMAN GOLF COURSE	UST	1.16					2.66	Medium
5143	Brandywine Creek State Park	UST	1.16					2.66	Medium
4418	City of Wilmington Parks	UST	1.16					2.66	Medium
3826	Conoco Inc #08008	UST	1.16					2.66	Medium

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
3537	Delaware Auto Service	UST	1.16					2.66	Medium
4273	Dupont BARLEY MILLRECORD MGMT	UST	1.16					2.66	Medium
4043	Dupont Country CLUB	UST	1.16					2.66	Medium
4903	Estate OF PS Dupont III	UST	1.16					2.66	Medium
3867	Exxon/JAMES L GARDNER	UST	1.16					2.66	Medium
3753	FLINT Robert	UST	1.16					2.66	Medium
4921	Jacques Amblard Property	UST	1.16					2.66	Medium
4434	John Wanamaker Dept Store	UST	1.16					2.66	Medium
4111	Kennett Pike Sub Station	UST	1.16					2.66	Medium
4925	LINCOLN CAMERA Shop	UST	1.16					2.66	Medium
4754	M&E Auto Service Center	UST	1.16					2.66	Medium
4684	Medical Center of Delaware	UST	1.16					2.66	Medium
3734	Shell Station Ponti	UST	1.16					2.66	Medium
4148	STRAND MILLAS	UST	1.16					2.66	Medium
3951	Sunoco 0004/6771	UST	1.16					2.66	Medium
3957	Sunoco 0004/7019	UST	1.16					2.66	Medium

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
4248	Texaco Service Station 140450075	UST	1.16					2.66	Medium
4737	WICK Property	UST	1.16					2.66	Medium
4112	Wills Pump Station	UST	1.16					2.66	Medium
569163	LONGWOOD GARDENS	AST	1.16			3000	GAS	2.66	Medium
515090	EXTON EXXON	UST	1.16			15000	GAS	2.66	Medium
PA0029912	Embreeville Hospital	PCS/NPDES	1.65	0.1	18.2			2.65	Medium
515503	THORNDALE EXXON	UST	1.13			8000	GAS	2.63	Medium
PA0057282	Jonathan & Susan Pope	PCS/NPDES	1.62	0.0005	15.1			2.62	Medium
569511	SUNOCO 0318 3209	UST	1.11			10000	GAS	2.61	Medium
515503	THORNDALE EXXON	UST	1.09			12000	GAS	2.59	Medium
PA0053937	Johnson Ralph & Gayla	PCS/NPDES	1.58	0.0005	17.0			2.58	Medium
PA0056618	O'Cornwell, David & Jeanette	PCS/NPDES	1.58	0.0005	17.0			2.58	Medium
569163	LONGWOOD GARDENS	AST	1.08			2000	DIESL	2.58	Medium
569163	LONGWOOD GARDENS	AST	1.08			2000	GAS	2.58	Medium
508704	REILLY & SONS	UST	1.07			10000	DIESL	2.57	Medium
508704	REILLY & SONS	UST	1.07			10000	GAS	2.57	Medium
515090	EXTON EXXON	UST	1.04			12000	DIESL	2.54	Medium

				NPDES	NPDES	UST	UST		
MASTERID	Site Name	Site Type	PS Score	Flow (MGD)	Intake Distance (miles)	Capacity (gallons)	Substance Code	Overall score	Rank
PA0053996	Redmond, Michael	PCS/NPDES	1.53	0.0005	18.8			2.53	Medium
PA0012815	Sunoco Products	PCS/NPDES	1.52	1.028	20.1			2.52	Medium
515240	GETTY 69205	UST	0.99			10000	GAS	2.49	Medium
569163	LONGWOOD GARDENS	AST	0.98			1500	DIESL	2.48	Medium
270237	CHESTER CNTY PRISON	AST	0.97			2000	HZSUB	2.47	Medium
507814	FH 38291	UST	0.96			10000	GAS	2.46	Medium
507814	FH 38291	UST	0.96			10000	KERO	2.46	Medium
250910	ALCOA FLEXIBLE PKG DOWNINGTOWN PLT	AST	0.96			5000	OTHER	2.46	Medium
1542	CHESTER CNTY AIRPORT	UST	0.94			12000	JET	2.44	Medium
PA0052663	Knight's Bridge Co/Villages at Painters	PCS/NPDES	1.43	0.09	6.4			2.43	Medium
4394	1401 Condominium Apartments	UST	0.93					2.43	Medium
6124	1506 DelawareAvenue Corp	UST	0.93					2.43	Medium
3904	Amoco #711	UST	0.93					2.43	Medium
5000	BAGELS & DONUTS	UST	0.93					2.43	Medium
6024	BENEFICIAL NATIONAL Bank	UST	0.93					2.43	Medium
6033	Brandywine REALTY & DEV Inc	UST	0.93					2.43	Medium

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
5137	Casscells Property	UST	0.93					2.43	Medium
3805	CERTIFIED Auto Service	UST	0.93					2.43	Medium
4604	CHRIST Church	UST	0.93					2.43	Medium
5042	CONCORD CLEANERS	UST	0.93					2.43	Medium
6125	CYNWYD Corp	UST	0.93					2.43	Medium
3575	Delaware Motor Sales Inc	UST	0.93					2.43	Medium
3566	J & M LITTERELLE Inc	UST	0.93					2.43	Medium
4790	KELLERS DRY CLEANERS	UST	0.93					2.43	Medium
4803	LEXUS OF Wilmington	UST	0.93					2.43	Medium
4931	NAPA Auto Parts	UST	0.93					2.43	Medium
6351	Pawliczek Property	UST	0.93					2.43	Medium
4874	SHARP Estate	UST	0.93					2.43	Medium
5146	Sienna Hall	UST	0.93					2.43	Medium
4587	ST ANNS Church	UST	0.93					2.43	Medium
4526	St Francis Hospital	UST	0.93					2.43	Medium
4919	STOCKWell ANTIQUARIES	UST	0.93					2.43	Medium
4422	STRATFORD Apartments	UST	0.93					2.43	Medium

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
4085	TALLEYVILLE POST Office	UST	0.93					2.43	Medium
3592	UNION Park HONDA	UST	0.93					2.43	Medium
3591	UNION Park PONTIAC	UST	0.93					2.43	Medium
4973	UNION Park PONTIACEMPTY	UST	0.93					2.43	Medium
458805	HESS MART 38353	UST	0.92			10000	KERO	2.42	Low
573143	SUNOCO 0013 6804	UST	0.91			1000	USDOL	2.41	Low
517410	JC HAYES	UST	0.91			10000	GAS	2.41	Low
PA0047252	Pantos Corp/Painters Crossing	PCS/NPDES	1.41	0.07	6.4			2.41	Low
515902	TOLENTINO ENTERPRISES	UST	0.91			10000	GAS	2.41	Low
PA0053228	Gramm, Jeffery	PCS/NPDES	1.41	0.0005	23.8			2.41	Low
PA0053236	Woodward, Raymond Sr.	PCS/NPDES	1.41	0.0005	23.8			2.41	Low
PA0036374	Eaglepoint Dev. Association	PCS/NPDES	1.40	0.015	24.5			2.40	Low
PA0053082	Mendenhall Inn	PCS/NPDES	1.39	0.0206	5.1			2.39	Low
PA0050458	Little Washington Drainage Co.	PCS/NPDES	1.39	0.0531	26.4			2.39	Low
PA0057274	Michael & Antionette Hughs	PCS/NPDES	1.39	0.0005	24.5			2.39	Low
505452	HESS 38307	UST	0.89			10000	DIESL	2.39	Low
505452	HESS 38307	UST	0.89			10000	GAS	2.39	Low

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
569389	SUNOCO 0014 1028	UST	0.88			10000	DIESL	2.38	Low
510844	SCOTT FAMILY PARTNERSHIP	UST	0.88			4000	GAS	2.38	Low
250910	ALCOA FLEXIBLE PKG DOWNINGTOWN PLT	AST	0.87			3000	OTHER	2.37	Low
569522	GETTY 69730	UST	0.87			15000	GAS	2.37	Low
4741	Academy of Visitation	UST	0.85					2.35	Low
4271	Acme Market #1205	UST	0.85					2.35	Low
4468	AstraZeneca Pharmaceuticals LP	UST	0.85					2.35	Low
5937	BARONE JIM	UST	0.85					2.35	Low
4517	Bayard Property	UST	0.85					2.35	Low
6077	BLAIR Property	UST	0.85					2.35	Low
4358	Brosius Eliason Company	UST	0.85					2.35	Low
6345	Brown Property	UST	0.85					2.35	Low
4497	Bush Special School	UST	0.85					2.35	Low
4323	Catholic Diocese of Wilmington	UST	0.85					2.35	Low
4324	Catholic Diocese of Wilmington	UST	0.85					2.35	Low
5063	CHARIS HOUSE GRACE Church	UST	0.85					2.35	Low

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
4229	CIGNA Corporation	UST	0.85					2.35	Low
4500	Concord High School	UST	0.85					2.35	Low
4275	Council of the Devon	UST	0.85					2.35	Low
4175	Delaware Motor Sales Body	UST	0.85					2.35	Low
4573	DR Charles L MINOR	UST	0.85					2.35	Low
4532	duPont Property IRENE	UST	0.85					2.35	Low
3874	Exxon/Louis Novakis #27238	UST	0.85					2.35	Low
3982	FISKEKILL Estate	UST	0.85					2.35	Low
4042	Former Dupont Elementary School	UST	0.85					2.35	Low
6319	Former HADFIELD SEAFOOD	UST	0.85					2.35	Low
6137	Former Mobil Station	UST	0.85					2.35	Low
6349	Former WELSH Property	UST	0.85					2.35	Low
5124	FormerLY BP GAS & GO	UST	0.85					2.35	Low
4675	Frederic A Blank	UST	0.85					2.35	Low
4872	GEORGE EDMONDS	UST	0.85					2.35	Low
3944	Getty Service Station 08676	UST	0.85					2.35	Low
4518	GIOFFRE FRANK J	UST	0.85					2.35	Low

				NPDES	NPDES	UST	UST		
MASTERID	Site Name	Site Type	PS Score	Flow (MGD)	Intake Distance (miles)	Capacity (gallons)	Substance Code	Overall score	Rank
5085	Harrington Property	UST	0.85					2.35	Low
4917	HERLIHY Property	UST	0.85					2.35	Low
4379	Highlands Elementary School	UST	0.85					2.35	Low
4545	HIGHLANDS IMMANUEL Church	UST	0.85					2.35	Low
4677	INVERGARRY	UST	0.85					2.35	Low
4540	Laird Property	UST	0.85					2.35	Low
4923	LAZYBOY FURNITURE SHOWCAS	UST	0.85					2.35	Low
4452	M Fierro & Sons Inc	UST	0.85					2.35	Low
5080	May Property	UST	0.85					2.35	Low
4980	Merkel	UST	0.85					2.35	Low
4492	Michael L Hershey	UST	0.85					2.35	Low
4875	Monument Square Apartments	UST	0.85					2.35	Low
6287	Padua Academy	UST	0.85					2.35	Low
4521	Pennsylvania Avenue Association	UST	0.85					2.35	Low
3541	Pep Boys	UST	0.85					2.35	Low
6074	POTTER Office Building	UST	0.85					2.35	Low
5025	ROWLAND Property WALTER	UST	0.85					2.35	Low

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
6153	ROYAL CLEANERS	UST	0.85					2.35	Low
6199	RUST Estate	UST	0.85					2.35	Low
6078	ST ANTHONYS Church	UST	0.85					2.35	Low
4311	ST MARY MAGDALEN Church	UST	0.85					2.35	Low
4527	ST STEPHENS LUTHERAN Church	UST	0.85					2.35	Low
3976	State LINE MACHINE Inc	UST	0.85					2.35	Low
5098	THE PILOT School Inc	UST	0.85					2.35	Low
3683	Tower Hill School	UST	0.85					2.35	Low
6231	West END NEIGHBORHOOD HOUSE	UST	0.85					2.35	Low
4489	WILKINSON Property BENJAMIN	UST	0.85					2.35	Low
4631	WOODLAWN TRUSTEES	UST	0.85					2.35	Low
458805	HESS MART 38353	UST	0.84			10000	GAS	2.34	Low
517410	JC HAYES	UST	0.83			8000	DIESL	2.33	Low
569392	COUNTRYSIDE FOOD MART & DELI	UST	0.83			10000	GAS	2.33	Low
569107	ZEKES SVC STA	UST	0.82			10000	GAS	2.32	Low
569277	SUNOCO 0012 4180	UST	0.82			8000	GAS	2.32	Low
PA0050547	Indian Run Village	PCS/NPDES	1.31	0.0375	28.9			2.31	Low

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
569655	GETTY 69242	UST	0.81			10000	GAS	2.31	Low
569601	BRUNO & SONS	UST	0.80			12000	GAS	2.30	Low
510844	SCOTT FAMILY PARTNERSHIP	UST	0.80			2000	NMO	2.30	Low
PA0052990	Mitchell, Rodney	PCS/NPDES	1.28	0.0005	28.7			2.28	Low
PA0056073	Vreeland, Russell	PCS/NPDES	1.28	0.0005	28.7			2.28	Low
569743	GETTY 69724	UST	0.78			10000	GAS	2.28	Low
PA0055492	Topp, John & Jane	PCS/NPDES	1.28	0.0005	28.9			2.28	Low
PA0050229	unknown	PCS/NPDES	1.28	0.0005	28.9			2.28	Low
4801	Alfred I Dupont Institute	UST	0.78					2.28	Low
3545	Diver Chevrolet	UST	0.78					2.28	Low
4616	Former HESSLER Building	UST	0.78					2.28	Low
4552	KENTMERE/MERCIFUL REST SOCIETY	UST	0.78					2.28	Low
3886	LYNAMS Mobil	UST	0.78					2.28	Low
4680	Raskal Foundation	UST	0.78					2.28	Low
4578	ROSIN REALTOR	UST	0.78					2.28	Low
4758	SHINN PAINT CO FRANK B	UST	0.78					2.28	Low

				NPDES	NPDES	UST	UST		
MASTERID	Site Name	Site Type	PS Score	Flow (MGD)	Intake Distance (miles)	Capacity (gallons)	Substance Code	Overall score	Rank
3680	Wilmington Friends School	UST	0.78					2.28	Low
569389	SUNOCO 0014 1028	UST	0.77			8000	GAS	2.27	Low
569392	COUNTRYSIDE FOOD MART & DELI	UST	0.75			8000	GAS	2.25	Low
PA0054691	Stoltzfus Ben Z.	PCS/NPDES	1.25	0.0005	30.2			2.25	Low
569170	FADDIS CONCRETE PROD	AST	0.73			500	DIESL	2.23	Low
PA0051365	West Chester Area Mun. Authority	PCS/NPDES	1.23	0.369	15.7			2.23	Low
569601	BRUNO & SONS	UST	0.72			10000	GAS	2.22	Low
569180	SUNOCO 0343 4008	UST	0.72			10000	GAS	2.22	Low
7936	Alexis I DuPont High School	HW_Gen	1.45					2.20	Low
7152	State Line Mach Inc	HW_Gen	1.45					2.20	Low
7232	Wilmington Piece Dye Co	HW_Gen	1.45					2.20	Low
PA0036161	Lincoln Crest MHP STP	PCS/NPDES	1.20	0.036	33.5			2.20	Low
PA0057231	Archie & Cloria Shearer	PCS/NPDES	1.16	0.0005	33.5			2.16	Low
569107	ZEKES SVC STA	UST	0.66			6000	DIESL	2.16	Low
510844	SCOTT FAMILY PARTNERSHIP	UST	0.65			2000	USDOL	2.15	Low
569737	EAGLE MOBIL	UST	0.64			8000	DIESL	2.14	Low
569737	EAGLE MOBIL	UST	0.64			8000	GAS	2.14	Low

				NPDES	NPDES	UST	UST		
MASTERID	Site Name	Site Type	PS Score	Flow (MGD)	Intake Distance (miles)	Capacity (gallons)	Substance Code	Overall score	Rank
PA0036412	Tel Hai Retirement Community	PCS/NPDES	1.13	0.055	36.8			2.13	Low
PA0056324	Mobil SS#16 - GPB	PCS/NPDES	1.12	0.044	17.0			2.12	Low
270147	EXTON TERM	AST	0.61			1000	HZSUB	2.11	Low
510844	SCOTT FAMILY PARTNERSHIP	UST	0.61			1000	HZSUB	2.11	Low
270147	EXTON TERM	AST	0.60			350	HZSUB	2.10	Low
270147	EXTON TERM	AST	0.59			300	USDOL	2.09	Low
PA0057339	Brian & Cheryl Davidson	PCS/NPDES	1.08	0.0005	36.8			2.08	Low
517410	JC HAYES	UST	0.57			6000	GAS	2.07	Low
569737	EAGLE MOBIL	UST	0.56			6000	GAS	2.06	Low
517410	JC HAYES	UST	0.55			1000	KERO	2.05	Low
463960	VA MED CTR	UST	0.53			2000	DIESL	2.03	Low
463960	VA MED CTR	UST	0.50			1000	DIESL	2.00	Low
PA0055531	Khalife, Paul	PCS/NPDES	1.00	0.0007	20.1			2.00	Low
569737	EAGLE MOBIL	UST	0.48			4000	KERO	1.98	Low
569406	EAST FALLOWFIELD TWP CHESTER CNTY	UST	0.47			1000	DIESL	1.97	Low
569406	EAST FALLOWFIELD TWP CHESTER CNTY	UST	0.47			1000	GAS	1.97	Low

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
463960	VA MED CTR	UST	0.45			1000	DIESL	1.95	Low
463960	VA MED CTR	UST	0.45			1000	DIESL	1.95	Low
PA0027987	Pennsylvania Tpk./Caruiel Service Plaza	PCS/NPDES	0.94	0.05	24.5			1.94	Low
463960	VA MED CTR	UST	0.42			2500	GAS	1.92	Low
PA0050005	Sun Company	PCS/NPDES	0.87	0.14	10.8			1.87	Low
PA0011568-001	Lukens Steek Co.	PCS/NPDES	0.81	0.5	27.5			1.81	Low
PA0011568-016	Lukens Steek Co.	PCS/NPDES	0.81	0.5	27.5			1.81	Low
463960	VA MED CTR	UST	0.27			1500	DIESL	1.77	Low
PA0055697	Spring Run Estates	PCS/NPDES	0.77	0.049	31.2			1.77	Low
PA0051497	Lenape Forge	PCS/NPDES	0.76	0.03	10.8			1.76	Low
7579	Alfred I DuPont Institute	HW_Gen	0.97					1.72	Low
7897	Amoco #711	HW_Gen	0.97					1.72	Low
7153	Blue Swan Inc	HW_Gen	0.97					1.72	Low
7704	Concord Mall Cleaners	HW_Gen	0.97					1.72	Low
7498	Custom Auto Body Inc	HW_Gen	0.97					1.72	Low

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
7851	Cutler Camera	HW_Gen	0.97					1.72	Low
7402	Delaware Mitsubishi	HW_Gen	0.97					1.72	Low
7116	Diver, Frank W Inc	HW_Gen	0.97					1.72	Low
7508	DuPont Country Club	HW_Gen	0.97					1.72	Low
7148	Eden Buick	HW_Gen	0.97					1.72	Low
6990	Exxon	HW_Gen	0.97					1.72	Low
6949	Fairfax Valet Cleaners	HW_Gen	0.97					1.72	Low
7250	Fairfax Valet Cleaners	HW_Gen	0.97					1.72	Low
7884	J & M Litterelle Inc.	HW_Gen	0.97					1.72	Low
7001	Jiffy Lube	HW_Gen	0.97					1.72	Low
7783	Kays Dry Cleaners	HW_Gen	0.97					1.72	Low
7010	Larrys Amoco	HW_Gen	0.97					1.72	Low
7717	Larrys Amoco	HW_Gen	0.97					1.72	Low
7809	Lynams Service Station	HW_Gen	0.97					1.72	Low
7961	McClafferty Printing	HW_Gen	0.97					1.72	Low
7462	One Hour Martinizing	HW_Gen	0.97					1.72	Low
7997	R&R Dipping & Paint Stripping	HW_Gen	0.97					1.72	Low

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
7421	Royal Cleaners	HW_Gen	0.97					1.72	Low
7209	Seymours Cleaners	HW_Gen	0.97					1.72	Low
6974	Shell Oil Co.	HW_Gen	0.97					1.72	Low
7636	Shell Oil Company	HW_Gen	0.97					1.72	Low
7262	St Francis Hospital Inc	HW_Gen	0.97					1.72	Low
7549	Star Enterprise	HW_Gen	0.97					1.72	Low
7551	Star Enterprise	HW_Gen	0.97					1.72	Low
6920	State Line Mach Inc.	HW_Gen	0.97					1.72	Low
7963	Steve Swyka Auto Repair Spec	HW_Gen	0.97					1.72	Low
6998	Sunoco	HW_Gen	0.97					1.72	Low
7422	Towne & Country Cleaners	HW_Gen	0.97					1.72	Low
8000	Union Park Pontiac Inc.	HW_Gen	0.97					1.72	Low
PA0056561	Richard M. Armstrong Co.	PCS/NPDES	0.64	0	14.4			1.64	Low
PA0051918	Pepperidge Farms	PCS/NPDES	0.63	0.144	20.8			1.63	Low
PA0054747	Trans-Materials, Inc.	PCS/NPDES	0.62	0	15.1			1.62	Low
PA0053561	Johnson Matthey	PCS/NPDES	0.61	0.036	17.0			1.61	Low
PA0054305	Sun Co. Inc. (R&M)	PCS/NPDES	0.58	0	17.0			1.58	Low

				NPDES	NPDES	UST	UST		
MASTERID	Site Name	Site Type	PS Score	Flow (MGD)	Intake Distance (miles)	Capacity (gallons)	Substance Code	Overall score	Rank
PA0030228	Downingtown I&A School	PCS/NPDES	0.50	0.0225	20.8			1.50	Low
PA0057126	Hess Oil SS # 38291	PCS/NPDES	0.48	0	20.8			1.48	Low
PA0053678	Lambert Earl R.	PCS/NPDES	0.48	0	20.8			1.48	Low
PA0053660	Mobil Oil Company #016	PCS/NPDES	0.48	0	20.8			1.48	Low
6503	CONTAINER CORP	SFUND	0.97					1.47	Low
PA0012416	Coatesville Water Plant Rock Run	PCS/NPDES	0.42	0.14	28.7			1.42	Low
PA0057045	Shyrock Brothers, Inc.	PCS/NPDES	0.40	0	23.9			1.40	Low
PA0052949	Phila. Suburban Water Co.	PCS/NPDES	0.39	0	24.5			1.39	Low
PA0053821	Chester County Aviation Inc.	PCS/NPDES	0.31	0	27.5			1.31	Low
PA0052728	Farmland Industries Inc./Turkey Hill	PCS/NPDES	0.25	0.0004	30.0			1.25	Low
598074	CCSWA LANCHESTER STABILIZED DSPL	Com/Hazwaste						0.75	Low
252600	DELAWARE CONTAINER COMPANY, INC.	Com/Hazwaste						0.75	Low
598074	IU CONVERSIONS SYS DSPL SITE	Com/Hazwaste						0.75	Low
6614	BANCROFT MILLS- PRE REMEDIAL	SFUND	-0.48					0.02	Low
7946	Amoco #711	HW_Gen	-0.97					-0.22	Low
6993	Pep Boys	HW_Gen	-0.97					-0.22	Low

MASTERID	Site Name	Site Type	PS Score	NPDES Flow (MGD)	NPDES Intake Distance (miles)	UST Capacity (gallons)	UST Substance Code	Overall score	Rank
6966	Towne & Country	HW_Gen	-0.97					-0.22	Low

Appendix B

Grant Funding In the Brandywine Watershed

TABLE B-1 – Grant Funding In the Brandywine Watershed From Pennsylvania

Applicant	Title	Description	Total Project Cost	Grant Amount Requested	Grant	Acres Acq.	Funding Source	Grant Year	Counties
Brandywine Conservancy	Odell Property Acquistion / Brandywine Battlefield	Open Space Acquisition	$4,919,300	$1,000,000	$300,000	25.2	GG2	2006	Chester
Brandywine Valley Association	Kranich Property Acquisition	Critical Habitat Acquisition	$270,000	$55,000	$50,000	4.3	GG1	2004	Chester
Caln Township	Lloyd Park Master Plan	Master Site Development Plan	$30,000	$15,000	$15,000		COMM_Key	2003	Chester
Caln Township	Lloyd Park Phase 1 Development	Park Rehab / Dev Project	$594,700	$200,000	$200,000		COMM_Key	2006	Chester
Caln Township	King Highway Master Plan	Master Site Development Plan	$35,000	$17,500	$17,000		COMM_Key	2006	Chester
Charlestown Township	McDevitt Conservation Easement	Land Acquisition	$2,895,000	$1,447,500	$200,000	65.6	COMM_Key	2007	Chester
Charlestown Township	Stevens Property Conservation Easement	Land Acquisition	$159,400	$79,700	$79,000	7.6	COMM_Key	2007	Chester
Charlestown Township	Coleman Conservation Easement (Pigeon Run)	Land Acquisition	$852,700	$426,400	$109,000	9	COMM_Key	2007	Chester

Applicant	Title	Description	Total Project Cost	Grant Amount Requested	Grant	Acres Acq.	Funding Source	Grant Year	Counties
Chester County	Exton Park Site	Park Rehab / Dev Project	$510,000	$255,000	$200,000		COMM_Key	2003	Chester
Chester County	Black Rock Sanctuary - Phase III	Park Rehab / Dev Project	$392,800	$196,400	$195,000		LWCF	2004	Chester
Chester-Ridley-Crum Watersheds Association	Crum Creek Watershed Conservation Plan	Rivers Conservation Plan	$159,100	$79,500	$70,000		RIVER_Key	2003	Chester, Delaware
Coatesville City	Palmer Park	Park Rehab / Dev Project	$3,000,000	$500,000	$100,000		COMM_Key	2003	Chester
Coatesville City	Brandywine Creek Trail	Park Rehab / Dev Project	$1,500,000	$250,000	$250,000		COMM_Key	2007	Chester
Downingtown Borough	Sky's the Limit All-Abilities Playground Project	Park Rehab / Dev Project	$374,400	$100,000	$75,000		COMM_Key	2004	Chester
East Bradford Township	Paradise Farms Easement Project	Land Acquisition	$3,993,000	$1,996,500	$200,000	330.8	GG1	2004	Chester
East Bradford Township	Sykes Property Acquisition	Land Acquisition	$399,000	$179,600	$179,000	23	GG2	2006	Chester
East Brandywine Township	Community Park Addition / Brown Property	Land Acquisition	$165,000	$50,000	$50,000	7	COMM_Key	2005	Chester

Applicant	Title	Description	Total Project Cost	Grant Amount Requested	Grant	Acres Acq.	Funding Source	Grant Year	Counties
East Fallowfield Township	Community Park Development - Phase 1	Park Rehab / Dev Project	$550,000	$250,000	$250,000		COMM_Key	2006	Chester
East Vincent Township	Francis Parcel Acquisition	Land Acquisition	$138,900	$69,400	$10,900	3.2	COMM_Key	2003	Chester
East Vincent Township	Reiff Tract Acquisition	Land Acquisition	$1,827,500	$912,500	$800,000	36	COMM_Key	2007	Chester
Franklin Township	Trail Feasibility Study	Feasibility Study	$38,000	$19,000	$19,000		COMM_Key	2006	Chester
Franklin Township	Howard Property Acquisition	Land Acquisition	$482,000	$241,000	$241,000	28.9	GG2	2006	Chester
French & Pickering Creeks Conservation Trust, Inc.	Landscape Conservation Plan		$50,000	$25,000	$25,000		GG1	2005	Chester
French & Pickering Creeks Conservation Trust, Inc.	Miller Marsh Project	Open Space Acquisition	$105,000	$52,200	$52,000	14.2	LT_Key	2003	Chester
French & Pickering Creeks Conservation Trust, Inc.	French Creek Trail Easement	Open Space Acquisition	$155,000	$77,500	$75,000	3.8	LT_Key	2005	Chester
Green Valleys Association of Southeastern PA	Sustainable Municipal Watershed Management	Rivers Conservation Implementation Project	$292,000	$115,000	$42,500		RIVER_Key	2003	Chester

Applicant	Title	Description	Total Project Cost	Grant Amount Requested	Grant	Acres Acq.	Funding Source	Grant Year	Counties
Kennett Square Borough	Red Clay Greenway Trail	Park Rehab / Dev Project	$540,100	$100,000	$50,000		COMM_Key	2003	Chester
Kennett Township	Kennett Pike Bikeway Study	Trail Study	$97,400	$42,200	$42,000		COMM_Key	2006	Chester
Kennett Township Land Trust	Whittle Conservation Easement	Open Space Acquisition	$1,770,300	$550,000	$450,000	44	LT_Key	2007	Chester
Lancaster County Conservancy	Octorara Creek Acquisition	Rivers Conservation Acquisition	$782,210	$391,100	$391,000	150	GG2	2007	Chester, Lancaster
London Britain Township	Nichol Park Addition (Dehorty Acquisition)	Land Acquisition	$398,000	$199,000	$199,000	14.5	COMM_Key	2005	Chester
London Britain Township	Nichol Park Expansion Project	Master Site Development Plan	$25,000	$12,500	$12,500		COMM_Key	2007	Chester
London Britain Township	Mason-Dixon Greenway South Trail	Park Rehab / Dev Project	$506,300	$250,000	$250,000		COMM_Key	2007	Chester
London Britain Township Land Trust	Walters Easement	Critical Habitat Acquisition	$719,300	$359,700	$300,000	26	LT_Key	2007	Chester
London Grove Township	Community Park Master Site Plan	Master Site Development Plan	$70,000	$35,000	$35,000		COMM_Key	2005	Chester
Natural Lands Trust, Inc.	Birch Run Forest Preserve Project	Rivers Conservation Acquisition	$432,000	$230,000	$200,000	112.4	RIVER_Key	2003	Chester

Applicant	Title	Description	Total Project Cost	Grant Amount Requested	Grant	Acres Acq.	Funding Source	Grant Year	Counties
Natural Lands Trust, Inc.	White Clay Creek Preserve Expansion	Critical Habitat Acquisition	$1,800,000	$900,000	$700,000	133	GG1	2003	Chester
Natural Lands Trust, Inc.	Sadsbury Woods Preserve	Critical Habitat Acquisition	$597,000	$298,500	$295,000	81	GG1	2003	Chester
Natural Lands Trust, Inc.	Paradise Farms Easement	Critical Habitat Acquisition	$3,993,000	$1,996,500	$400,000	340.8	GG1	2004	Chester
Natural Lands Trust, Inc.	Great Marsh Easement	Critical Habitat Acquisition	$836,500	$418,000	$350,000	163.8	GG1	2004	Chester
Natural Lands Trust, Inc.	Karillian Property Acquisition	Open Space Acquisition	$275,000	$137,500	$137,500	4.7	LT_Key	2005	Chester
Natural Lands Trust, Inc.	Armstrong East Property Acquisition	Open Space Acquisition	$840,000	$420,000	$420,000	65.8	LT_Key	2005	Chester
Natural Lands Trust, Inc.	Skiles Property Acquisition (Sadsbury Woods)	Open Space Acquisition	$75,000	$37,500	$37,500	10	LT_Key	2005	Chester
Natural Lands Trust, Inc.	Indian Run Easement	Critical Habitat Acquisition	$1,520,000	$760,000	$760,000	106.8	GG2	2006	Chester
Natural Lands Trust, Inc.	Spackman Farm Easement	Open Space Acquisition	$1,130,000	$565,000	$565,000	52	GG2	2006	Chester
Natural Lands Trust, Inc.	Whittaker Farm Easement	Open Space Acquisition	$733,600	$366,800	$326,000	30	GG2	2006	Chester

Applicant	Title	Description	Total Project Cost	Grant Amount Requested	Grant	Acres Acq.	Funding Source	Grant Year	Counties
Natural Lands Trust, Inc.	Whittaker Property Acq.	Open Space Acquisition	$50,000	$25,000	$25,000	22	GG2	2006	Chester
Natural Lands Trust, Inc.	Unionville Barrens Acquisition	Open Space Acquisition	$5,200,000	$2,600,000	$1,000,000	261	LT_Key	2006	Chester
Natural Lands Trust, Inc.	Preserve Recreation Planning Project		$154,900	$55,000	$50,000		LT_Key	2006	Chester, Delaware, Montgomery
New Garden Township	Greenways Plan	Greenway Plan	$35,000	$17,500	$17,500		COMM_Key	2007	Chester
North Coventry Township	Coventry Woods Acq.- Phase II--Brown / Barnard Properties	Land Acquisition	$178,000	$239,000	$205,000	47.6	COMM_Key	2003	Chester
North Coventry Township	Coventry Woods, Phase 3	Land Acquisition	$249,600	$124,800	$120,000	31.4	COMM_Key	2004	Chester
North Coventry Township	Coventry Woods - Phase IV(Salyor Property)	Land Acquisition	$143,000	$71,500	$71,500	16.3	COMM_Key	2005	Chester
North Coventry Township	Nueva Esperanza Property Acquisition	Land Acquisition	$852,000	$426,000	$426,000	104.1	COMM_Key	2006	Chester
North Coventry Township	Baker Property Acquisition	Land Acquisition	$730,000	$365,000	$350,000	52.7	COMM_Key	2006	Chester
North Coventry Township	Shaner / Kauffman Properties	Land Acquisition	$110,000	$55,000	$55,000	8.9	COMM_Key	2007	Chester

Applicant	Title	Description	Total Project Cost	Grant Amount Requested	Grant	Acres Acq.	Funding Source	Grant Year	Counties
Oxford Area Recreation Authority	Gray Farm Master Site Plan	Master Site Development Plan	$40,000	$20,000	$20,000		COMM_Key	2004	Chester
Oxford Area Recreation Authority	Oxford Area Regional Park	Park Rehab / Dev Project	$500,000	$200,000	$200,000		COMM_Key	2007	Chester
Parkesburg Borough	Minch Park-Phase 2 Development	Park Rehab / Dev Project	$585,500	$292,700	$200,000		COMM_Key	2006	Chester
Pennsbury Land Trust	Mendenhall Conservation Easement	Open Space Acquisition	$1,298,700	$231,900	$231,900	8.9	GG2	2006	Chester
Pennsylvania Horticultural Society	Southeastern Pennsylvania Tree Cover Project	Conservation / Sound Land Use Plan	$1,000,000	$1,540,000	$1,540,000		GG1	2004	Bucks, Chester, Delaware, Montgomery, Philadelphia
Phoenixville Borough	Melchiorre Tract Park MSDP	Master Site Development Plan	$25,000	$12,500	$12,500		COMM_Key	2004	Chester
Phoenixville Borough	Schuylkill River Trail	Park Rehab / Dev Project	$252,200	$126,100	$126,100		COMM_Key	2005	Chester
Phoenixville Borough	Reservoir Park Expansion Acquisition	Land Acquisition	$935,000	$467,500	$467,500	7.4	GG2	2006	Chester
Phoenixville Borough	Thornton Park	Park Rehab / Dev Project	$326,800	$163,400	$60,000		COMM_Key	2006	Chester

Applicant	Title	Description	Total Project Cost	Grant Amount Requested	Grant	Acres Acq.	Funding Source	Grant Year	Counties
Pocopson Township	Community Trail Feasibility Study	Trail Study	$433,000	$135,000	$14,000		COMM_Key	2005	Chester
Sadsbury Township	Bert Reel Park Renovation	Park Rehab / Dev Project	$121,300	$60,600	$60,000		COMM_Key	2006	Chester
Schuylkill River Greenway Association	Land and Water Trail	Park Rehab / Dev Project	$331,700	$165,800	$120,000		GG1	2005	Berks, Chester, Montgomery, Philadelphia
Schuylkill River Greenway Association	Schuylkill River Heritage Area Development Hubs	Park Rehab / Dev Project	$150,000	$75,000	$60,000		GG1	2006	Berks, Chester, Montgomery, Philadelphia
South Coventry Township	Woody's Woods Open Space Acquisition	Land Acquisition	$140,000	$70,000	$70,000	17.8	COMM_Key	2005	Chester
Thornbury Township	Squire Cheyney Pk / Waln Run Pk. Master Site Plans	Master Site Development Plan	$60,000	$30,000	$30,000		COMM_Key	2005	Chester
Tredyffrin Township	Westover Park Master Site Plan	Master Site Development Plan	$43,100	$21,600	$20,000		COMM_Key	2004	Chester
Tredyffrin Township	West Swedesford Road Greenways Acquisition	Land Acquisition	$800,000	$200,000	$200,000	5.4	COMM_Key	2004	Chester
Tredyffrin Township	Westover Park Development	Park Rehab / Dev Project	$1,346,200	$250,000	$250,000		COMM_Key	2006	Chester

Applicant	Title	Description	Total Project Cost	Grant Amount Requested	Grant	Acres Acq.	Funding Source	Grant Year	Counties
Upper Oxford Township	Stankywicz Estate Acquisition	Land Acquisition	$423,000	$104,000	$104,000	13.9	COMM_Key	2005	Chester
West Caln Township	Birch Run Forest - West Acquisition	Land Acquisition	$1,100,000	$550,000	$550,000	103	GG2	2006	Chester
West Chester Borough	John O. Green Park - Phase 2	Park Rehab / Dev Project	$97,600	$48,800	$48,000		COMM_Key	2005	Chester
West Sadsbury Township	Zion Hill & Zook Roads Acquisition	Land Acquisition	$242,300	$121,200	$110,000	31.9	COMM_Key	2003	Chester
Willistown Conservation Trust	Kirkwood Preserve Acquisition	Open Space Acquisition	$5,038,000	$750,000	$500,000	60	LT_Key	2005	Chester
Willistown Township	Okehocking Preserve - Phase 2	Land Acquisition	$1,793,400	$771,200	$750,000	10	LWCF	2003	Chester
Willistown Township	Okehocking Preserve - Phase 3 Acquisition	Land Acquisition	$1,500,000	$500,000	$500,000	10	COMM_Key	2005	Chester
Willistown Township	Okehocking Nature Center	Feasibility Study	$106,300	$52,000	$52,000		COMM_Key	2007	Chester
Willistown Township	Okehocking Preserve Acquisition - Phase IV	Land Acquisition	$1,516,300	$500,000	$500,000	12.8	GG2	2007	Chester