1.0. INTRODUCTION

In order to protect and enhance river resources throughout the state of Pennsylvania, the Pennsylvania Department of Environmental Resources (DER) created the Pennsylvania Rivers Conservation Program. Its mission is to help local municipalities "conserve, restore and enhance" their local river resources. The program provides technical and financial assistance for river conservation planning and for plan implementation. In conjunction with the program, the state established the Pennsylvania Rivers Conservation Registry to recognize important resources. Registration with the state enhances conservation efforts by endorsing local plans and encouraging public agencies to act in a consistent manner.

Doylestown Township was awarded a Rivers Conservation Grant in July 1995 by the Pennsylvania Department of Conservation and Natural Resources (DCNR). The grant is being used to develop a Rivers Conservation Plan (RCP) for the Neshaminy Creek Watershed The plan, once reviewed by local municipalities, will be submitted to DCNR for approval and inclusion in the Rivers Conservation Registry.

The Rivers Conservation Plan develops detailed guidelines for management of a portion of the creek watershed. This plan will focus on improving recreation opportunities and on best management practices (BMPs) for the project area. It will provide standards for effective use and protection of the area and make recommendations for appropriate actions to be taken. In order to determine the best management practices, the study area was inventoried and mapped. The area included the Neshaminy Creek and selected tributaries within the municipalities of Doylestown Township, and Chalfont, Doylestown and New Britain Boroughs. Performing water quality and ground water studies were not part of the study process.

The project will be completed in June 1997, when individual municipalities will be asked to consider the adoption of a resolution to accept the recommendations in the findings report.

Heritage Conservancy was retained to manage the project and perform the Geographic Information Systems (GIS) mapping and develop a findings report in partnership with the Doylestown Township Environmental Advisory Council (EAC).

1.1. The Study Area

The total study area is approximately 13,286 acres (See Figure 1). Doylestown Township is the largest segment, with 10,018 acres or 75% of the study area, followed by Doylestown Borough with 1,384 acres or 10% of the study area. Chalfont Borough makes up 1,061 acres or 8% of the study area, and New Britain Borough 823 acres or 6% of the study area.

The Neshaminy Creek Watershed RCP includes part of the main branch of the Neshaminy Creek, most of Pine Run and Country Club Creeks, and all of Cooks Run. The total length of the main branch of the Neshaminy Creek in the study area is approximately 11 miles. This includes the north and west branches, but does not include the New Britain Township segments below Chalfont and New Britain Boroughs (approximately 1.5 miles). The New Britain Township segments were not considered in the study. Pine Run is approximately 5 miles long, Cooks Run approximately 4 miles long, and Country Club Creek approximately 5 miles long.

The west and north branches of the creek enter the study area in Chalfont. The headwaters of the north branch are in Buckingham Township, east of Route 413. A dammed portion of the north branch forms Lake Galena (the Peace Valley reservoir), a recreation area. The headwaters of the west branch of the Neshaminy Creek are in Hatfield Township, Montgomery County.

1.2. The Rivers Conservation Planning Process

The Neshaminy Creek Watershed Rivers Conservation Plan commenced with a public informational meeting and workshop in April 1996 to announce the initiation of the rivers conservation planning activities of the Neshaminy Creek Watershed Rivers Conservation Plan. In addition to providing information, RCP planners generated public input to the plan. An announcement was placed in the local newspaper three weeks in advance of the meeting.

Doylestown Township, the lead municipality administering the grant, and Heritage Conservancy, the project manager, presented background information on the project including the project schedule, goals and process steps, and the DCNR Rivers Conservation Program.

The workshop portion of the meeting was used to determine the concerns of people living in the municipalities and using the creek resources. The participants were divided into 2 groups to facilitate discussion. The discussion groups were asked to respond to a list of questions about the Neshaminy Creek Watershed. They were asked their hopes and goals for the future of the creek, including what uses should be recommended or discouraged. The participants ranked the issues in order of importance, and the primary elements were then discussed by the entire group. After discussion, the participants voted on the ranked issues to stress their most pressing concerns. Each participant was given five votes to distribute as they saw fit.

The issues listed below each received at least two votes (numbers in parentheses indicate number of votes):

- (6) Balancing public access with environmental protection.
- (5) Managing water pollution from point and non-point source pollution and siltation.

- (5) Identifying and protecting viable natural communities along the Neshaminy Creek.
- (5) Ensuring proper creek flow to offset sewer contamination.
- (5) Recognizing river protection throughout the development process, and possibly revising ordinances toward that end.
- (4) Balancing private versus public environmental issues and concerns; land use rights.
- (4) Listing and preserving wetlands.
- (3) Enhancing recreational possibilities.
- (2) Monitoring effects of continued land development on stream quality.
- (2) Defining levels of public access, to address issues of overuse and safety.
- (2) Establishing public trails and natural areas in the floodplains.
- (2) Maintaining adequate ground water recharge.
- (2) Ensuring water quality and protection of natural communities, especially during summer months.

The Appendix contains the full list of issues identified by participants.

A Rivers Conservation Advisory Committee was formed from participants attending the public meeting. This committee represents the three boroughs and other public agencies who may assist in the project. Their role in the RCP process is to assist in collecting data and in developing the plan. The program requires that persons representing the individual municipalities carry information back to their respective municipalities and obtain supporting resolutions at the end of the process.

1.3. Survey

To better understand the views of landowners, a survey was sent by Doylestown Township to residents with waterfront property in the study area of Neshaminy Creek and its tributaries, Pine Run, Cooks Run and Country Club Creek. Names and addresses were obtained from property tax records. Of the 305 questionnaires mailed in June 1996, 83 residents responded (27% of the total) and 15 were undeliverable. The majority of those responding (77%, or 63 people) live in Doylestown Township.

1.3.1. Survey Findings

- There is very strong support for conservation management of stream corridors in the River Conservation Plan Study area.
- Residents listed wildlife habitat, open space, water quality and scenic beauty as qualities they valued in their environment, and significant in their decision to live along these creeks.
- Over 90 percent of those responding encouraged protection of these resources. Eighty percent would support a conservation plan and land use regulations.

1.3.2. Land Ownership, Land Use and Residence

- The majority of respondents (82%) are living at a primary residential property.
- Only 5 percent of land use is agricultural, and only 7 percent is industrial or commercial.
- One hundred percent (100%) of respondents recommended preservation of the scenic character of the creek. At least 95 percent recommended preservation of undeveloped land, existing farmland and the area's rural character, wildlife habitat and historic resources.
- While most residents value creek-related recreation -- primarily nature observation and fishing -- a quarter of the respondents make no recreational use of stream corridors (or are unable to do so because of limited access), and less than 10 percent boat, swim or bicycle.
- Landowners reported the existence of wetlands for 6 percent of properties and open space (woodlands or fields) for 20 percent of properties.
- None of the properties exceeds 30 acres, and the majority (37%) are less than one acre. Thirty-one percent are between 1 and 6 acres. Of those responding, 12 percent report that they do not own waterfront property. (It is not clear if these are owners or renters.)

1.3.3. Issues and Management Options

- Of future management options in the Neshaminy Creek area, the overwhelming majority of respondents (over 90%) endorsed preservation of open space and scenic character with protection of wildlife habitat, woodlands and water quality, and would discourage more residential and commercial development.
- In regard to conservation programs to protect the creek corridors, nearly 90 percent would support conservation planning and regulation.
- When asked who should have major responsibility for management, respondents favored local oversight rather than state or federal. However, there was no clear consensus as to which local agency should take primary responsibility.
- Respondents gave fairly even endorsement for primary management responsibility to municipal government, county government, conservation organizations, private citizens and coalitions of public and private organizations. This seems to indicate opportunity for a public-private partnership.
- They also would like to see better government planning (which probably includes better inter-agency government coordination).
- Landowners believe responsibility for conservation management also rests with themselves (78%), and the majority would like to learn more about techniques and opportunities to help conserve natural, historic and recreational resources.

2.0. RESOURCE INVENTORY AND ANALYSIS

The natural and cultural resources within the study area were inventoried, mapped on GIS where compatible data were available, and analyzed to gain an understanding of their significance and relationship to the Neshaminy Creek. The map coverages are:

- Land Use
- Generalized Zoning
- Hydrography
- Hydric Soils
- Cultural Resources and Recreation
- Visual Analysis

Resources and characteristics discussed and analyzed in this report are topography, land use, zoning, hydrography (including floodplains and wetlands), dams and reservoirs, soils, geology, threatened and endangered species, cultural and historical resources, recreational resources, local ordinances, population, and visual observations.

2.1. Topography

The study area consists predominantly of gently rolling hills that are characteristic of the Piedmont region of southeastern Pennsylvania. The most gently sloping land is in the area north of Route 202 and Doylestown Borough, extending north to Pine Run Creek. South of Route 202 the topography is more diverse, with land elevations from 200' to 350'. The steepest slopes are found near the Warwick and Buckingham Township lines.

Steep slopes are also found along the course of the Neshaminy Creek. When these areas are vegetated, they prevent stormwater runoff and erosion, siltation of streams, and the degradation of water quality. Construction activities that remove vegetation and replace it with impervious road and roof surfaces increase erosion through runoff and surges of water, and can cause flooding. Additionally, the vegetated slopes provide the most scenic views when seen from the creek.

2.2. Land Use

The **Land Use Map** indicates the general coverages of land uses. Data was developed from 1990 aerial maps obtained from the Delaware Valley Regional Planning Commission (DVRPC).

The **Percent of Land Use Acreage in Study Area** pie chart on the Land Use Map (Figure 2), generated from the GIS database, indicates that the banks of the Neshaminy Creek and its tributaries are largely covered by vegetation, with many

wooded areas. This is encouraging, as it indicates that preservation is currently being practiced in the area. The most extensive use by far is single family detached housing at 45%. The trees and shrubs which are maintained by homeowners make up a large part of the vegetation in the riparian area. The next most common uses are agriculture and woodlands, at 15% and 16% respectively. Most of the other uses are quite minimal, at 5% or less.

2.3. Zoning Districts

Zoning analysis reflects the compatibility of current use designations with other area activities and natural characteristics. The generalized **Zoning Map** shows the current zoning districts in the four municipalities. The data was obtained from the Bucks County Planning Commission, combining all municipal zoning into a generalized form. The information primarily dates from the mid-1990's.

The pie chart **Zoning Districts as Percent of the Study Area** (Figure 3, shown on the Zoning Map), generated from the GIS database, indicates that 45% of the land is zoned for between 1 and 2 dwelling units per acre (du/acre). Nineteen percent is zoned at less than 1 du/acre. The higher housing densities comprise a smaller area, with zones of 2 du/acre to 4 du/acre at 10%, and zones greater than 4 du/acre at 9%. Institutional uses occupy 7% of the land, and mixed, light industrial, and office heavy industrial only 6%.

2.4. Hydrography

Hydrography is the geographic location of flowing surface water, ponds, wetlands, and floodplains. The **Hydrography Map** illustrates the locations of each of these, except for the National Wetland Inventory (NWI) designated wetlands. They are shown on a separate mylar overlay map, since this coverage is not available in digital form for the Doylestown and Buckingham Geological Survey (USGS) Quadrangles. Also located on the **Hydrography Map** are area dams and reservoirs, discussed below.

2.4.1. Floodplains

Of the total study area, floodplains make up about 1,996 acres or 15 percent. They serve primarily to accommodate floodwater during periods of heavy precipitation. They may also recharge aquifers, create wildlife habitats, and provide for recreation access points. As development occurs, the floodwater levels tend to rise. This happens when more impervious surfaces are built and runoff increases, meaning that water cannot be absorbed into the soil. Stormwater runoff volumes and velocity increase, and the length of time required for the precipitation to become runoff shortens, resulting in larger and more frequent flows. The pie chart **Land Use as a Percent of Total Area within Floodplain** indicates the uses within the floodplain boundaries (Figure 4, shown on the Hydrography Map). The pie chart

Zoning Districts as Percent of Floodplain Area indicates the districts that lie within the floodplain boundaries (Figure 5, Hydrography Map).

Although most of the municipalities meet at least the minimum standards required by the National Flood Insurance Program, this study was not able to determine how many structures are currently in the floodplain. However, an informal field estimate was made by observing the distance and elevation of buildings relative to the creek waters. This evaluation shows that at least some structures have been constructed in the floodplain.

2.4.2. Wetlands

Wetlands are typically areas where groundwater reaches the surface or the land is covered by water. They are commonly called marshes, bogs or swamps, and occur along Neshaminy Creek, its tributaries and ponds. Some wetlands, however, occur in upland areas where groundwater or runoff collects. Wetlands are extremely important to the health of rivers and streams. The values they provide can be grouped into the following categories:

- Water Quality: Wetlands act as filters, removing metals, nutrients, toxins, sediment and other pollutants.
- Fish and Wildlife Habitat: Hundreds of species of birds, mammals, fish, reptiles, amphibians and invertebrates depend on wetlands for nesting areas, food and cover.
- Flood Control: Wetlands act as sponges. They store flood water and decrease the amount and speed of flood flow, thereby reducing downstream property damage.
- Groundwater Discharge and Recharge: Wetlands sometimes exist in places where groundwater flows to the surface to recharge streams. Where this occurs, wetlands help maintain stream flow during dry periods. In other wetlands, the flow can be in the opposite direction, replenishing groundwater supplies.
- Streambank Erosion Control: Wetlands plants decrease the rate of streambank erosion by anchoring the soil with their roots. They also slow water, thus decreasing its ability to erode, and help collect sediment that can stabilize or rebuild streambanks.
- Recreation and Aesthetic Value: Wetlands are often beautiful areas frequented by outdoor enthusiasts, hunters and fishermen.

The **National Wetlands Inventory Map**, indicates the estimated locations of protected wetlands, most of which can be found along the Neshaminy Creek and its tributaries.

Note: NWI maps are produced by the U.S. Fish and Wildlife Service only by aerial flyovers. The data has not been confirmed by field surveys and so it may be incomplete or inaccurate in some instances. A formal delineation will be necessary to confirm the existing data for an individual parcel prior to any proposed disturbances.

Wetlands indicated on NWI maps are classified according to the Cowardin Classification System. Several classifications of wetlands have been identified on NWI maps within the Neshaminy Creek watershed:

Lacustrine

- limnetic, open water,permanently flooded (L1OWHh). (Pine Run Reservoir is the only area of this designation within the study area)

Palustrine

- open water, intermittently exposed/permanent (POWZ)
- forested, broad-leaved deciduous, temporarily flooded (PFO1A)
- emergent, narrow-leaved, persistent, temporarily flooded (PEM5A)
- combination forested and scrub-shrub (PFO1 or SSA)
  EM5
- Flat, semi-permanent (PFLF)

Riverine

- lower perennial, open water, permanently flooded (R2OWH)
- lower perennial, emergent, non-persistent, seasonally flooded (R2EM2C)

The wetlands generally lie in the floodplain areas and consist of fairly typical wetlands for the Piedmont region. In the recent heavy rain events, residents downstream on the Neshaminy Creek experienced extensive flooding. While this was mostly due to the unprecedented volume of rain, some of the runoff may be attributed to the decrease in the area of floodplains or wetlands. Factors include new construction, which creates more impervious surfaces, increasing the volume of runoff; removal of vegetation in floodplains; obstruction of the water flow to floodplains and wetlands; and destruction of wetlands and adjacent areas.

2.5. Dams and Reservoirs

There are several dams in the study area: Pine Run Dam, one unnamed dam on Country Club Creek/Trout Run, Reed Dam on the Neshaminy Creek, one unnamed dam on the north branch of the Neshaminy, and the ruins of Mill Run Dam on the Neshaminy.

Pine Run Reservoir and dam (PA 616) were built by the Neshaminy Valley Resources Authority in the early 1970's to control floodwaters. The dam is currently managed by Bucks County Emergency Management Agency (BCEMA). The seven- to eight hundred acre corridor immediately surrounding the stream is also county property.

According to Charles H. Steinbach, Director of General Services for BCEMA, the reservoir is only for flood control purposes. The county does not encourage public access to the reservoir because of the potential for dam failure. More people on the reservoir would lead to greater erosion problems, which could lead to dam failure.

The county currently has no intention of adding any recreation amenities or providing access to the reservoir or dam area. The only potential recreation opportunity may be limited walking trails in the wooded areas. However, although public access must be restricted, BCEMA's practices provide the creek and riparian buffer with protection by barring development and preserving vegetation.

Outside of the study area, the county has proposed a plan to build Dark Hollow Dam in Warwick Township. This dam is the subject of much opposition from local residents and approval is uncertain. At a public meeting on December 4, 1996, the county commissioners decided to request an Environmental Impact Statement (EIS) from the Natural Resources Conservation Service. Discussion on dam approval will continue after the findings from the EIS have been reported.

The effects of the dam would be felt well outside of the structure's immediate area. According to Dennis Livrone of Bucks County Planning Commission, at full capacity during major floods the flood pool for the Dark Hollow Dam would back up to Castle Valley at the Lower State Road bridge, by Route 611. This is the case for the dry dam that is currently under consideration; the effects of other alternatives will be studied by the EIS.

2.6. Soils

Soils are classified according to their suitability for supporting various uses, including the growth of plant life, degree of erosion or drainage, and development of wildlife habitat or scenic vegetation.

Many of the soils bordering the creek are hydric soils, shown on the **Hydric Soils Map**. Hydric soils are important because they often indicate the presence of wetlands, which serve to maintain ecosystem quality. They play a significant role in flood control and water quality. GIS maps were created for this RCP for the largest group of hydric soils, which includes those classified as Doylestown and Bowmansville soils. This type of soil is one of the three prime indicators of wetlands areas, which are regulated by the U.S. Army Corps of Engineers under the Clean Water Act. Floodplain soils were not mapped. Because soil maps are not yet available in digital form, the hydric soils were digitized manually. The data was digitized from uncorrected aerial photographs, producing a slight error in boundary matching with other GIS data.

The Bowmansville soils consist of deep, poorly drained silt loams on the floodplains. The surface is usually level and the soils have a high water capacity, creating only slight runoff and erosion hazards. The Doylestown series consists of deep, poorly drained silt loams with slow to medium runoff and a slight to moderate erosion hazard. The surface layer is ponded at times and water is near or on the surface during wet seasons.

2.7. Geology

Geological formations determine the topography of the landscape, the soils and groundwater supply. The study area is underlain by the Lockatong and Stockton Formations, which were formed in the Triassic period (see **Geology Map**, Figure 6). A fault line which runs east to west, north of the main branch of Neshaminy Creek, appears to be the dividing line for the two formations. The fault crosses the creek at several points around Chalfont and New Britain boroughs. The Stockton Formation, which is in the northeastern portion of the study area, generally provides a reliable water supply. The Lockatong Formation is found in the southwest area and, because of its fractures and low permeability rate, is known to be a cause for septic system failure.

2.8. Threatened and Endangered Species

Several endangered, threatened or rare plant species are cited for the Neshaminy Creek watershed in the Doylestown and Buckingham USGS Quads. Information is from the files of the Flora of Pennsylvania Project, Morris Arboretum of the University of Pennsylvania. The Pennsylvania Natural Diversity Inventory (PNDI) corroborates the data. The following list, obtained from PNDI, is only a historic record and has not been confirmed in the field. The status dates indicate the most recent sighting of each species, where this information was available. For their protection, the species locations are not mapped.

Hydrocotyl umbellata	
(water pennywort)	status: extirpated
1 mile SE of Chalfont	1908
Doylestown	1899
Lycopodium appressum	
(southern Bog clubmoss)	status: threatened
Chalfont, near Pine Run	1986
Aster dumosus (aster)	status: undetermined
NW of Neshaminy	
Aster solidagineus	
(narrow-leaved white-topped aster)	status: endangered
Doylestown	

The only historic occurrence of an endangered animal is the bog turtle (*Clemmys muhlenbergii*). According to PNDI, it was last collected in 1946 in the Edison area, but has not been seen since.

GEOLOGY

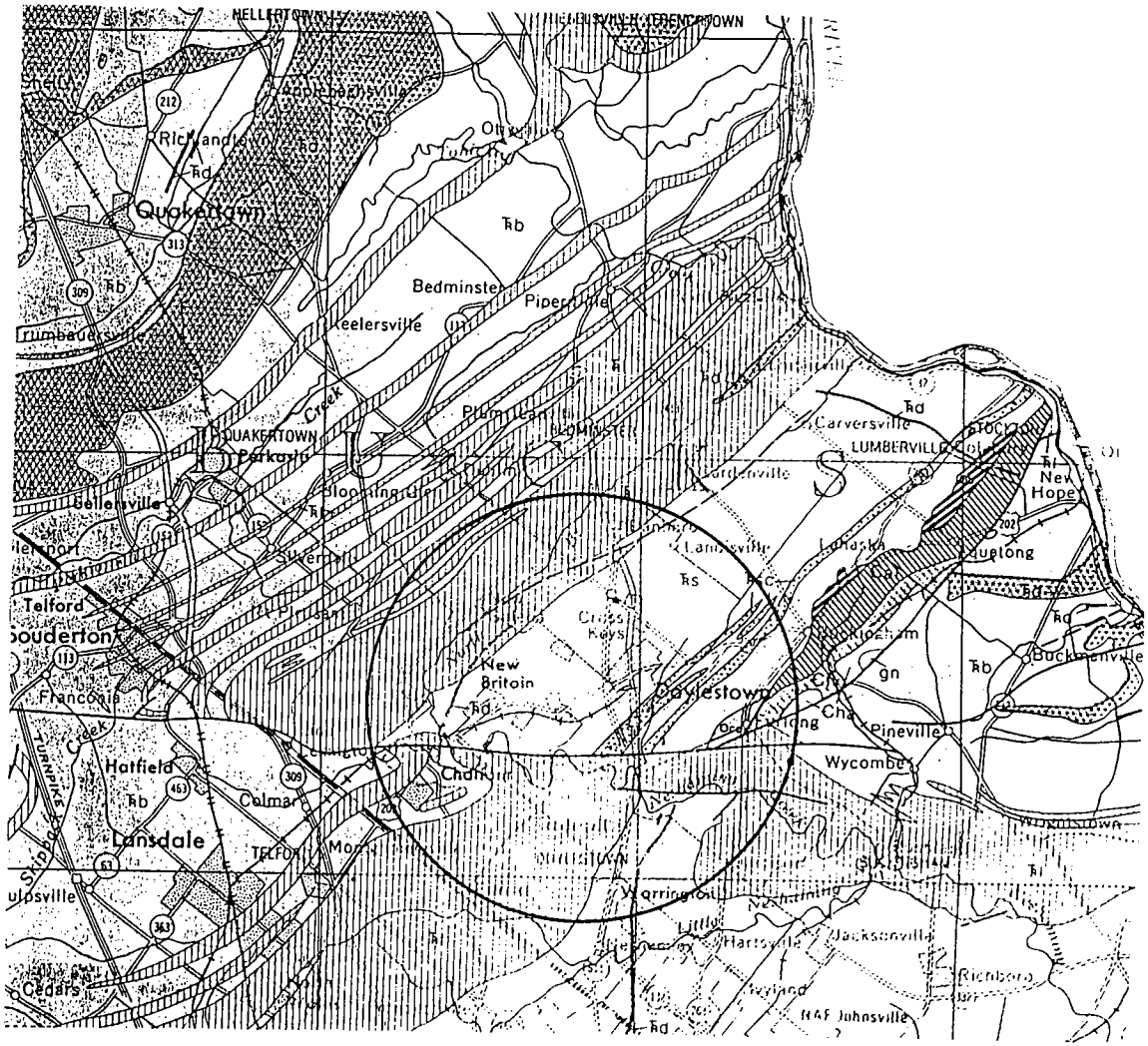
estimated location of study area

Scale: 1: 250,000

from "Geological Map of Pennsylvania", Commonwealth of Pennsylvania, 1980

TRIASSIC

- DIABASE
- LIMESTONE FANGLOMERATE
- QUARTZ FANGLOMERATE
- Trgb — GETTYSBURG, HAMMER CREEK, AND BRUNSWICK FORMATIONS, UNDIVIDED
- Trgh — HEIDLERSBURG MEMBER OF GETTYSBURG FORMATION
- Trl — LOCKATONG FORMATION
- Trhc — HAMMER CREEK CONGLOMERATE
  Also includes some conglomerate in Gettysburg Formation
- Trns — NEW OXFORD AND STOCKTON FORMATIONS, UNDIVIDED
- Trnc — NEW OXFORD CONGLOMERATE



2.9. Cultural and Historical Resources

The federal government defines a significant cultural or historical resource by four main criteria. It is an area, site, or object that (a) is associated with events that have shaped history; (b) is associated with a significant person; (c) possesses "distinctive characteristics" from a certain type of construction or time period, is the work of a master, or possesses high artistic value; or (d) has yielded or is likely to yield information. These criteria are used to evaluate the eligibility of a resource for inclusion in the National Register of Historic Places.

A number of culturally and historically significant sites are located in the study area. (See Table 1, Land Use of Cultural Resources, which notes the type of resource and land use in that location.) They include historic districts, farms, mansions and houses, museums, municipal buildings, parks and covered bridges. This information was obtained from the Comprehensive Bucks County Historic Resource Survey (BCHRS) performed by Heritage Conservancy. The survey was conducted from July 1988 to July 1990. As part of the survey methodology, each site was photographed, the pre-1940 resources on the property described, and the site mapped on appropriate Bucks County municipal tax maps. One of the purposes of this survey was to identify historically significant buildings eligible for listing on the National Register.

In addition to the properties in the study area identified by Heritage Conservancy through the BCHR survey, twenty-four resources have been determined to be eligible for listing in the National Register. These are located in Chalfont Borough, Doylestown Township and New Britain Borough, and were identified as part of the 1994 U.S. Route 202 Section 700 Historic Resources Inventory and Determination of Eligibility. Seven of these resources are within the study area.

Historic and culturally significant resources on parcels completely or partially within the delineated areas of the four municipalities are shown on the **Cultural Resources and Recreation Map**. A complete list of properties is included in the Appendix.

2.10. Recreational Resources

The study area is rich in outdoor recreational resources of many kinds. The **Land Use Map** shows the general land areas that are currently in recreational use, and the **Cultural and Recreational Resources Map** shows the individual sites and their locations. Parks and fields are found in widely scattered locations in the boroughs and the township. Pedestrian and bicycle paths exist in places along the Neshaminy Creek, and are planned for other areas. Bucks County has proposed an extensive system of linked parks, but at the time of writing, much of this is yet to be implemented.

Residents enjoy using the creek and its surroundings for many different kinds of recreation. They especially prize the scenic beauty of the area, and reported in the survey that they often use the creek corridor for nature observation and bird watching. The Neshaminy is regularly used for fishing and hiking. It is also used, though less frequently, for swimming, canoeing, kayaking and other kinds of boating, and for hunting or trapping. Water levels vary throughout the year, especially on the main branch of the Neshaminy, thus limiting swimming, boating and kayaking opportunities.

Local fishermen report anecdotally that fish stocks in the Neshaminy have improved tremendously in recent years. Small mouth bass have returned in large numbers over the past decade. In addition, the river is stocked yearly with trout. In years of exceptionally high rainfall, as occurred last year, fishing improves. During years of typical rainfall, however, the fish population is quickly depleted. This appears to be part of a water sustainability situation created by groundwater withdraw for new development. Treated effluent may be the the main source of water during some times of the year.

2.11. Local Ordinances

Currently, all four municipalities within the study area have adopted regulations for stormwater and floodplain management. The Neshaminy Creek Watershed Stormwater Management Plan has been adopted by Bucks County and Montgomery County for the Neshaminy Basin. In some cases, even though the plan has been adopted by the municipalities, the provisions have not been implemented or enforced.

Doylestown Township has generally excellent protective ordinances; however, Doylestown Borough, Chalfont Borough and New Britain Borough do not have comprehensive regulations for protection of natural resources and are lacking site capability standards for construction.

2.12. Population Profile, 1980-1990

The entire Central Bucks County region is growing at a rapid rate. According to data from the Bucks County Planning Commission, total population increased over 17% between the censuses of 1980 and 1990, resulting in a 1990 population of 187,991. Population projections show the population increasing steadily through 2020. The number of housing units has also increased, growing 32% from 51,354 to 67,863 while average household size declined.

Chalfont Borough has seen a 9% increase in population, from 2,802 to 3,069, and a 27% increase in housing units. With a land area of only 1.65 square miles, Chalfont is expected to draw an additional 611 residents by the year 2010.*

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* Data in this section assumes the middle-range projection of the Bucks County Planning Commission's

Doylestown Borough has seen a small drop in population (1.63%) to 8,575 but a moderate increase in population density and the number of housing units, as the average household size has fallen. The population density rose from 3,773 inhabitants per sq. mi. to 3,898/sq. mi., and housing units rose from 3,633 to 4,100. Bucks County Planning Commission has projected a slow increase in population through 2020 instead of a continuation of the decrease that occurred between 1980 and 1990.

Doylestown Township, by far the largest in area of the four municipalities, has seen a rate of population increase greater than that of the county as a whole. Between 1980 and 1990, population grew by 22.7%, to 14,510, and housing units grew by 33%, to 4,857. As in the other municipalities, these trends are expected to continue on an upswing; population projections show a total of 23,970 residents by the year 2010.

New Britain Borough, like Doylestown Borough, saw a slight drop in population between the 1980 and 1990 censuses. The 1990 population was 2,174, down from 2,519, while the number of housing units was at 828, up 16%. Projections show an expected increase to a total population of 3,090 residents by the year 2010.

Just as important in a broad-based project like this one are the larger trends occurring throughout Bucks County. Because the Neshaminy Creek runs through many municipalities in two counties, it is affected by the greater trends, even though population may have decreased slightly along a few miles of its length. It is important to maintain enough recreation area for residents and to protect the natural resources in each municipality from extensive use by the growing numbers of people.

2.13. Visual Analysis

The primary purpose of the visual analysis was to observe firsthand the land use and general management practices of the riparian corridor, the 50- to 75-foot wide strip on each side of the stream or creek corridor. These observations were compared to the resource data and mapped.

Initial information from the resource inventory indicated that flooding, erosion and siltation are primary concerns. Two general recommendations were developed from this information: to preserve or restore vegetation, and to institute more sensitive land development practices. The visual analysis corroborated the existing data and therefore focused the recommendations.

The **Visual Analysis Map** was developed from field observations along the Neshaminy Creek and its three tributaries. A canoe trip the length of the creek in the study area took place in September 1996. The intent of the trip was to evaluate the resources from the creek itself rather than the land. An aerial fly-over took

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demographic projections. Bucks County Continuum, pp. 76-85.

place in early spring 1996 prior to vegetation leafing out. The remaining visual observations were made on foot along the creek and, when not accessible, by windshield surveys. Photographs were taken of significant sites for further study and inclusion in the map.

Common observations included: erosion, siltation, unvegetated banks, and extensive non-native species. The nature of the area immediately surrounding the creek is critical to its health. A vegetated, natural corridor will protect the creek, while a denuded corridor will permit pollutants and other materials to flow into the water. Anthropogenic impacts (man-made impacts) such as dumping, non-point pollution, visible pipes, and culverts were also noted during the field surveys.

Positive attributes within the corridor included scenic views, existing recreation access points, and potential future access points for fishing or for hiking trails. The areas are numbered and indicated on the Visual Analysis Map and on Table 2, Recommendations Based upon Visual Analysis and Land Use, with brief descriptions and recommendations.

Visual Observations

The Neshaminy Creek and its three tributaries in the study area are generally in good natural condition and exhibit several distinct physical qualities. General qualities observed along their length are:

- Vegetation anchors the creek banks, preventing soil erosion and siltation.
- Vegetation protects the banks from solar radiation by providing shade, which maintains water temperature.
- Banks are stable and stream bottoms display the underlying soil topographies and geology.
- Base flow water levels are relatively stable, supporting fish habitat in many areas of the creek.
- Water appearance is aesthetically pleasing.

2.13.1. Western Study Border to Forest Park

This segment of the Neshaminy Creek has been extensively altered from its natural state, and exhibits the symptoms of development and industrialization. There are numerous anthropogenic impacts such as dumping, poor land management practices, road runoff, and inadequate sedimentation and erosion controls during construction, resulting in siltation, scouring, slumping of banks and flooding. Discharge pipes, some of an undetermined discharge type, were observed along the creek banks.

Several bridges cross the creek at main roads, namely Route 202, Bristol Road, Upper State Road and Almshouse Road, with road runoff discharging into the creek. Some commercial land uses are located along the creeks, which in places have impacted the aesthetics of the creek, most noticeably in Chalfont Borough where the creek intersects Route 202.

The Forest Park Water Treatment plant withdraws water from the Neshaminy and from the Pine Run tributary, and discharges into Pine Run. An inflatable dam is located just north of the plant.

Like the other segments in the study area, the creek in this section runs through residential areas where the native vegetation -- woody plants and aquatic vegetation -- is picturesque. Small surface water pools are home to spatterdock and other aquatic vegetation. Typical native tree stands can be found overlooking the creek. On the north-facing slopes are hemlocks. River birch, pin oak, elm, tulip, red maple and sycamore are the predominant tree types in most other areas.

Some property owners have mowed the vegetation down to the water's edge and piled organic debris in the floodplain area. Purple loostrife, an invasive wetland species, has taken hold in several areas, choking out the native flora. If left as is, it will overtake the wetland vegetation and a monoculture of loostrife will develop quickly.

2.13.2. Bridge Point to Castle Valley

This three to four mile stretch of the Neshaminy has no significant disturbances. The land uses are primarily residential, with the exception of a few industrial or commercial uses which appeared to have little impact when viewed from the creek corridor. The beauty of the creek can best be appreciated from the water. The banks are almost entirely forested, thus enhancing the water quality and biodiversity. Several great blue herons were spotted the evening of the canoe trip.

Portions of this stream are "braided," incorporating more than one channel with an associated series of islands and multiple streambanks. There are riffles, pools and point bars in the creek channel which act as energy absorbers. The underlying sedimentary geology of the steeper stream banks is exposed, adding to scenic quality.

The only recreational land use that may pose a problem to development of a creek front trail is the gun club, whose property has water frontage. Loud gunshots can be heard for some distance beyond the area, especially on weekends. Warning signs are posted around the area in both directions.

This segment could be navigable by canoe with occasional points where the canoe may have to be carried past rocks or shallow water. Fishermen were seen along this segment. Hiking trails were not evident, but could be developed in the future if carefully planned to avoid the occasional steep slopes.

One unofficial access point exists at a dirt pull-off on Lower State Road, directly below the former mill dam. It is heavily used, as evidenced by the worn parking area and beaten path to the water. Bridge Point Park has another access point with formal parking and an easy walk down to the creek. These potential access points may be opportunities for future implementation projects.

2.13.3. Route 611 to the Eastern Border of Doylestown Township

This segment of the creek has the most varied conditions, with many anthropogenic impacts. Public creek access points are lacking. On the banks behind the Kings Plaza Shopping Center noise from Route 611 and litter make the area unattractive. The creek is difficult to access on the southern side despite the ease of parking in the shopping center lot. There are wooded, steep slopes with a faint trail probably made by fishermen, as evidenced by the fishing debris left behind.

The trail, which is elevated above the creek, presents a picturesque view down into the creek bed and through the large old trees. There are numerous islands, riffles and pools with small drainage channels entering from the steep slopes. A few invasive, non-native species are present among the native beech, birch, tulip and pin oaks. Poison ivy, a native, covers the ground in a dense mat, which may deter people from going down to the water's edge. Access is difficult until the creek passes The Greens, a townhouse complex, where the creek is at its closest point to Almshouse Road.

As the creek meanders towards Almshouse Road, there are more anthropogenic impacts including dumping of large articles of debris such as tires, mattresses and old appliances. The Kings Plaza Wastewater Treatment Plant, which discharges into the Neshaminy Creek, is odoriferous, and the discharge pipe is aesthetically unappealing, creating a break in the forest buffer. This is true even though the plant follows standard treatment practices. The rip-rap and gabions along the creek bank, and the invasive multiflora rose, make it difficult to continue on the path through the steep woods.

There is heavy siltation along the creek banks downstream of the discharge pipe. There is another area further downstream with an opening in the forest buffer for a stormwater discharge pipe. Invasive multiflora rose has also grown rampant.

The only sanitary sewer outfall pipe discharging directly in the Neshaminy Creek study area is at Kings Plaza. According to Glen Argu of the Bucks County Water and Sewer Authority (BCWSA), some of the flow at this plant will be diverted to the Green Street plant. At the time of this writing, the project is out to bid, and construction could be completed by December 1997. This may alleviate some of Green Street's excessive flows to the Neshaminy and the resulting erosion and siltation.

At The Greens complex some residents appear to have altered the creek bank. It is unclear whether this is on the township-owned portion of the creek. Some of the native understory plants along the banks have been removed and replaced with non-native plants, many of which are inappropriate for floodplain soils and shade, and are invasive in nature, such as yews and ivy. Paths have been created for individual access down to the water's edge. These appear to be in the Doylestown Township easement along the Neshaminy Creek.

A macadam walk with a pedestrian bridge connects the two residential developments, and appeared to be a well-used recreational trail. In this vicinity the bank is less steep and the floodplain fairly flat and wide. It appears healthy and contains an appropriate number of cut banks and point bars (normal deposition points), relative to its meandering. There are only a few riffles. After this point, the south bank again becomes very steep and is heavily wooded with limited development.

The floodplain on the north side of the Neshaminy Creek is wider and has dense woody vegetation, with the exception of the few residential properties close to the Route 611 bridge. Minor dumping of organic debris was observed on one property. It was difficult to determine the amount of vegetated buffer along the creek bank due to a lack of access.

The north side is primarily farmland between the creek and Pebble Hill Road and contains one of the larger farms in the vicinity. A few large farms abut the creek, with mixed agricultural uses from crop farming to cattle and sheep grazing.

Many ducks were lingering around a muddy, non-vegetated pond which flows into a tributary of the Neshaminy. Some of the farmed fields come close to the stream bank and there is evidence of siltation. At the same time, this agrarian landscape is attractive and adds to the aesthetics of the area.

2.13.4. Pine Run

This is one of the most scenic tributaries, with minimal impact from adjacent land uses, as is it is buffered by woods. However, this area has been invaded by non-native species, which look attractive but do not provide the soil stabilization or wildlife habitat provided by native plants. The several hundred acres surrounding Pine Run Reservoir are publicly owned and are managed by Bucks County Department of Parks and Recreation. There are no formal paths or access points directing the public to the reservoir area. At this time, the county intends to leave the area untouched for flood control purposes, and the area around Old Dublin Pike and Saw Mill Road is known to flood frequently. There is a visually unattractive pump sub-station located at the intersection (Point 56 on the Visual Analysis Map).

2.13.5. Cooks Run

A sewer right-of-way runs adjacent to an extensive portion of Cooks Run. Moderate quantities of natural debris such as fallen tree limbs were evident, along with smaller quantities of man-made debris such as metal pieces and concrete chunks. Siltation is evident in areas where the stream makes several turns. Moderate to heavy vegetation is present, with the exception of several areas which are mowed by homeowners. The stream's low volume restricts recreational opportunities for fishing and boating in this area.

The BCWSA Harvey Avenue Wastewater Treatment plant discharges into the Cooks Run Creek. There are no future plans to expand the plant's capacity. Water quality monitoring is not currently performed.

2.13.6. Country Club Creek

The majority of this small creek flows through the Doylestown Country Club property. Several small ponds, one with aeration jets, are found. The creek banks are almost entirely denuded of natural vegetation, which has been replaced by closely mowed grass. The exception is a small group of large trees with the natural layers intact behind the maintenance area. In several spots the banks are crumbling or slumping into the water because of the lack of vegetation anchoring the soil. The erosion is apparent and unattractive.

Country Club personnel were queried about their golf course fertilizer and herbicide regimes, and they routinely apply significant quantities and kinds of chemicals. While water quality tests have not been performed for this phase of the RCP, it is likely that these chemicals may contribute to diminished water quality downstream.

John Miziker, the golf course superintendent, said that the chemicals being used are: on the greens, fungicide and PREM; on the fairway, fungicide and pre- and post-emergent herbicide; on the roughs, herbicide. Round-up, the least harmful of the herbicides, is occasionally used on larger areas. Grey water from the nearby wastewater treatment plant is used to water the greens (personal communication with J. Miziker, Jan. 23, 1997).

After leaving the golf course, the creek flows past the Green Street Wastewater treatment plant, through residential communities and wooded areas along the Route 611 commercial corridor, and eventually into the Neshaminy creek east of Bridge Point. It was difficult to access this area due to road construction and bridge repair at the time of field work.

BCWSA confirmed that there are several sewer outfall pipes in the study area. The Green Street plant discharges into Country Club Creek. It is expected that the increased flow of the proposed project will have impacts on both Country Club Creek and Neshaminy Creek.

2.14. Water Quality

Water quality analysis was not a part of this RCP, which focuses more specifically on issues affecting the land in the creek corridor. However, one of the goals that developed from the RCP is to institute water quality study. Because specific study is recommended, a brief overview of the factors affecting water quality is outlined below.

A review of recent past studies indicates that action should be taken to preserve and improve the creek's waters. Some information about water quality is documented

in the "Neshaminy Creek Watershed Storm Management Plan" produced by the Bucks County Planning Commission and Bucks County Conservation District. The plan, published in 1992, reports that water quality within the Neshaminy Creek watershed is severely degraded, with a high nutrient level and erosion and sedimentation problems. The Watershed Storm Management Plan provides a very general description of the Neshaminy's water quality, and should be useful in identifying gaps in water quality data.

Water quality degradation is caused by many factors, which can be grouped into three types of pollution: point source pollution, non-point source pollution, and thermal pollution. Point source pollution comes from an identifiable location, or "point." It can include pollutants from industry and manufacturing processes, and landfills and other waste sites. Non-point source (NPS) pollution does not come from a single source or location but from many scattered sources. NPS pollution includes chemicals, nutrients, organic matter, and sediment. These come from agricultural fields (pesticides, fertilizers, sediment) and livestock pastures (manure, sediment), construction sites (sediment, chemicals), and urban areas such as roads, parking lots, and roofs (tar, oil, automobile chemicals).

Thermal pollution is caused by excessive warming of creek waters when shade trees are removed, and affects the dissolved oxygen capacity of the water. When creek waters become too warm, fish and other aquatic creatures are unable to obtain the oxygen they need.

Water quality degradation can cause serious damage to the ecology of the creek and can inhibit community use of the waters. Excessive pollution leads to:

- loss of aquatic habitat and fish and wildlife food sources
- loss of fishing, boating, and other recreational opportunities
- reduced aesthetic value and potential loss of property value
- risk of illness from contaminated waters and/or drinking water

2.14.1. The Neshaminy Creek Watershed

The Neshaminy Creek watershed is the land area from which water drains into the Neshaminy Creek. Instead of acting as a boundary, the creek forms the center of the watershed. Runoff from rain storms and melting snow travels over the land on its way to the creek.

Because of the way runoff travels through the watershed, it picks up non-point source pollutants that can become very harmful. The water carries with it pollutants gathered during its overland flow, which spill into the Neshaminy Creek drainage basin. It can collect pollutants from miles away. The Neshaminy Creek watershed covers about 232 square miles. It includes 26 municipalities in Bucks County and seven in Montgomery County.

The finding of the Watershed Storm Management Plan that water quality in the Neshaminy Creek watershed is degraded reflects practices and processes taking place in both counties. Although the creekside vegetative buffer is relatively intact

within the study area, damage may be caused by excessive pollution loads that can't be filtered by the current buffer width, or by pollution entering upstream from the study area, or both.

Corrective measures must take into account the fact that the creek may be degraded by practices occurring outside of the immediate vicinity of the creek. The Goals and Objectives section of this report suggests some solutions that are watershed based and some that are creek-specific. In particular, erosion and sedimentation controls and regulatory ordinances (Goals 3 and 4) can effectively improve water quality by being instituted on a watershed-wide basis.

2.15 Institutional Resources

The participating municipalities have an array of institutional resources both public and private to partner with and or receive assistance.

Federal
Bucks County Conservation District (BCCD)- technical assistance
Natural Resources and Conservation Service (NRCS)-provide soil conservation plans and services
Coastal Zone Management (CZN)-technical assistance

State
Penn State Extention Service-erosion control plans, soil testing
PA Department of Conservation and Natural Resources (PADCNR)-educational services
PA Department of Environmental Protection (PADEP)-permit information and technical assistence
PA Department of Transportation (PADOT)- development of greenways along state roads; employment of BMP's throughout watershed; coordination of the proposed 202 bypass with the goals and objectives of this plan.

County
Bucks County Agricultural Preservation Program-information on agricultural easements, soil information
Bucks County Board of Health- permits
Bucks County Parks and Recreation- information on projects in progress, links with their programs, assistance
Bucks County Planning Commission- technical planning information, water resource information/services and census, land use, environmental maps

Private
Bucks County Sewer and Water Authority-updates on proposed sewerage system and potential opportunity to use lines along the creek and tributaries as part of the green
Delaware Valley College - technical assistance in specialized science areas
Doylestown Country Club -partner on developing healthy land stewardship practices in Country Club Creek watershed
Doylestown Nature Club - volunteer assistance
Delaware Valley Regional Planning (DVRPC)-provide planning assistance, zoning maps
Heritage Conservancy -technical planning
Honey Hollow Environmental Center - education programs
New Britain Nature Preserve - education program; implementation of projects
North Penn Water - technical assistance
Peace Valley Nature Center- education programs; implementation of projects
Phila Suburban Water - technical assistance
Southeastern Pennsylvania Transportation Authority (SEPTA) -technical assistance

2.16. Summary of Resource Inventory and Analysis

The analysis was performed, in part, on a GIS system by overlaying several coverages of individual resources to develop composite maps showing multiple resources. The analysis maps reveal opportunities for developing recommendations for BMPs and recreation. Some of the more critical issues relate to the management practices along the floodplain and to recreation access.

- As noted in the survey findings, the majority of respondents endorsed preservation of open space and scenic character. They want to contribute their support to conservation efforts and local oversight.

- Most of the current land uses and zoning designations are compatible with the natural and cultural resources, especially along the floodplain.

- From field observation, only specific areas of high traffic along roadways have degraded resources.

- Most of the creek is "hidden" from public view except at brief intervals as it passes near roadways. Few recreation and parking access points exist.

- There is an existing, wooded riparian buffer along much of the creek-- about 46% of the land along the floodplain. This is a very positive indication for protection of the significant resources which are congregated along the floodplain area, particularly hydric soils and steep slopes.

- The most serious threat to the health and beauty of the Neshaminy Creek is improper stormwater management in nearby housing developments. The construction of additional houses, roads, and driveways increases the amount of impervious surfaces and directs the flow of water to the creek.

Recommendations specific to each issue or stream corridor section follow. More general recommendations, with suggestions for implementation procedures, are developed in Section 5.0 *Goals and Objectives.*

Map Location #	Location Name	Location Type	Land Use
12	Mercer Museum	Cultural Resource	parks and recreation
13	James Michener Arts Center	Cultural Resource	parks and recreation
17	Doylestown Central Library	Cultural Resource	community service
18	Fonthill/Moravian Tile Works	Cultural Resource	parks and recreation
19	Aldie Mansion	Cultural Resource	community service
20	Simon Butler Property	Cultural Resource	multi-family
21	Star Farm	Cultural Resource	multi-family
22	Bridge Point Historic District	Cultural Resource	community service
23	Turk Historic District	Cultural Resource	transportation
24	David Worthington House	Cultural Resource	single family (detached)
25	Vernacular Farmhouse	Cultural Resource	single family (detached)
26	William Heffner Farm	Cultural Resource	single family (detached)
31	Henry Farmstead	Cultural Resource	agriculture
32	Johnson House	Cultural Resource	wooded
34	McHenry Farmstead	Cultural Resource	agriculture
35	Johnson - Atkinson House	Cultural Resource	commercial services
37	Pine Valley Covered Bridge	Cultural Resource	single family (detached)
38	Chalfont Historic District	Cultural Resource	commercial services
39	New Britain Village Historic District	Cultural Resource	single family (detached)
40	Farm School Historic District	Cultural Resource	commercial services

TABLE 1.
Land Use of Cultural Resources

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3.0. RESOURCE RECOMMENDATIONS

This summary of recommendations addresses each specific resource detailed above in Section 2, Resource Inventory and Analysis (pages 5-18). In this way, management plans can be developed towards resources that may be of particular concern.

Following the summary are the goals and objectives pertaining to the entire creek corridor. They are based on observed problems and the potential for problems within the stream corridor, specifically the need for more recreational opportunities, public education, and best management practices and regulations to protect and restore the creek.

Topography
- Minimize damage from construction activities.
- Preserve vegetation to prevent erosion and mitigate flooding, and maintain scenic views.

Land Use
- Preserve vegetative coverage.
- Encourage land owners to practice conservation management on their property.

Hydrography

Floodplains
- Use appropriate development and planning techniques to limit or prevent the creation of impervious surfaces.

Wetlands
- Preserve wetlands to prevent excessive runoff and erosion, to recharge groundwater reserves, to minimize water pollution, and to preserve animal habitat.

Dams and Reservoirs
- Coordinate any proposed changes in land use by Pine Run with BCEMA and county agencies.

Soils
- Preserve hydric soils to control flooding, prevent erosions and siltation, and generally maintain local stream and ecological health.

Geology
- Develop land use policies regulating impervious surfaces and the protection of wetlands and floodplains.
- Identify and protect groundwater recharge areas.

Threatened and Endangered Species
- Preserve wetland habitats of endangered and threatened species.

Cultural and Historical Resources
- Continue to pursue the registration process for federal and state recognition of important local sites.

Recreational Resources
- Improve public access to the creek.
- Protect vegetation, habitat, and water quality by public education campaigns.

Local Ordinances
- Promote implementation of the existing Neshaminy Creek Watershed Stormwater Management Plan.
- Develop additional ordinances in those municipalities where they are lacking, particularly site capability standards, and wetlands and steep slope ordinances.

Population Profile, 1980-1990
- Protect the Neshaminy Creek watershed through appropriate ordinances and education efforts.
- Expand recreational areas and improve creek access points to serve an increasing population.

Visual Observations

Western Study Border to Forest Park
- Advise property owners and residents about appropriate stream bank management, including restricted mowing.
- Institute erosion management plantings along roads.

Bridge Point to Castle Valley

Develop boat ramps and/or hiking trails, and parking areas, to improve access.
- One unofficial access point exists at a dirt pull-off on Lower State Road, directly below the former mill dam. Improve existing informal access point to minimize erosion, and provide a small boat launch and parking area.
- At Bridge Point Park, there is already formal parking and easy access to the creek. Develop a boat ramp and minor amenities to make it more accessible.

Route 611 to Eastern Border of Doylestown Township
- Develop recreation access and trails near The Greens residential development.
- Consider establishing public access points and creating a trail along the wide, accessible floodplain next to the agricultural fields. It may be possible for the township to purchase a conservation easement from the farms, or to encourage sale of the development rights through Bucks County Agricultural Land Preservation Board.
- Institute better management practices in the agricultural fields to protect the water from siltation and chemical contamination.

- Advise business owners, farmers, and residents about appropriate management, especially to decrease dumping.
- Manage construction around the Green Street sewage treatment plant to minimize damage.

Pine Run

- Defer recreational development as long as Bucks County Emergency Management Agency restricts access to the reservoir area.
- Study the feasibility of establishing an access point to the preserve at the pump sub-station.

Cooks Run

- Advise property owners and residents about appropriate stream bank management, including restricted mowing.
- Develop walking/hiking paths, with access at New Britain Nature Preserve.

Country Club Creek

- Discuss with Doylestown Country Club the benefits of better management practices, particularly restricted mowing and creation of riparian buffers along the stream banks throughout the golf course.
- Discuss possible reduction in fertilizer and herbicide use, or other alternatives.

TABLE 2.
Recommendations Based upon Visual Analysis and Land Use

	Land Use	Municipal Location	Recommendations
il Park, approx. 10 acres	recreation	Chalfont	Potential Access
irk, approx. 5 acres	recreation	Chalfont	Potential Access
lle School, approx. 47 acres	community services	Chalfont	Potential Access
Dam, south of wastewater facility	vacant	Chalfont	Potential Access
approx. 11 acres	recreation	Chalfont	Potential Access
pprox. 11 acres	recreation	Chalfont	Potential Access
, approx. 5 acres	recreation	Chalfont	Potential Access
ark, approx. 6 acres	agriculture	Chalfont	Potential Access
Nature Preserve	recreation	New Britain	Potential Access
ed along Cooks Run	recreation	New Britain	BMP
ation along Cooks Run, north of rail line	wooded	New Britain	Potential Access
, drain pipes, and collapsing metal bridge	single family (detached)	New Britain	Needs BMP
is littering stream banks	wooded	Chalfont	Needs BMP
e Dept. along west bank	wooded	Chalfont	Potential Access
facing upstream	recreation	Chalfont	Protect Viewshed
inage pipe	wooded	Chalfont	Needs BMP
ith distinctive cool microclimate	*	*	
ry flows into Neshaminy Creek	*	*	
rainage under Bristol Road Bridge	*	*	
Bridge fishing access	*	*	
eation and access area	vacant	Chalfont	Potential Access
ong short side of oxbow in stream	wooded	New Britain	
long side of oxbow in stream channel	vacant	New Britain	Needs BMP
strife along stream channel	*	*	
area alongside stream	wooded	Doylestown Township	Potential Access
ide stream channel	agriculture	Doylestown Township	Needs BMP
er Birch overhanging stream channel	wooded	Chalfont	
nd water lillies alongside stream	*	*	
s near Bristol Road Bridge	*	*	
trian bridge over small tributary	*	*	
cutting stream bank	*	*	
trife alongside stream channel	agriculture	Doylestown Township	Needs BMP
PVC piping alongside stream channel	single family (detached)	Doylestown Township	Needs BMP
area-Informal boat launch, fishing area	wooded	Doylestown Township	Formal Access
orner of Pine Run dam	vacant	Doylestown Township	Protect Viewshed
site along creek	utility	Doylestown Township	Needs BMP
n pond- soil erosion and animal waste	agriculture	Doylestown Township	Needs BMP
rea from Pebble Hill	agriculture	Doylestown Township	Protect Viewshed
ng from poor management practices	commercial services	Doylestown Borough	BMP
Sewer Authority	utility	Doylestown Township	Potential Access
tive vegetation along stream ban	single family (detached)	Doylestown Borough	BMP
along creek from housing construction	wooded	Chalfont	BMP

* indicates point is located along portion of Neshaminy Creek outside of study area in New Britain Township

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4.0. PUBLIC COMMENT

As part of the rivers conservation planning process, two preliminary versions of the plan and management options report were presented at open meetings to the general public, to representatives of each study area municipality, and to representatives of local public agencies. Their comments were incorporated into the final plan. Minutes from the public presentation of the draft RCP are attached in the Appendix.

Few substantive comments were received from members of the public attending the first presentation workshop. Residents were generally concerned that the creek should remain in its natural state as far as possible, and remain available for public enjoyment. Representatives from several interested groups submitted written comments for inclusion into the study. These are included in the Appendix A summary of their concerns is outlined below.

P. D. Price, president of Friends of the Pine Run, expressed concern over any potential public access to the area surrounding Pine Run Reservoir. The area, currently restricted for flood control uses, is an undeveloped natural area that could otherwise be considered for recreational use. Ms. Price supports BCEMA's policy of restricting the area and would like to see it become a permanent flora and fauna conservation reserve.

Dr. Ann F. Rhoads, Director of the Pennsylvania Flora Project at the Morris Arboretum of the University of Pennsylvania, also responded to the draft RCP. She was concerned that water quality and quantity assessment be addressed in order to have a complete and accurate picture of the health of the Neshaminy Creek. The effects of reduced groundwater and increased runoff and sewage discharge should be evaluated in tandem with the characteristics discussed in the RCP. In addition, she had several comments regarding specific sites with invasive plant species that are harmful to the health of the creek corridor, sewage discharge, floodplains and zoning.

James Burke, Chief Landscape Architect for the Bucks County Department of Parks and Recreation asked that the discussion of the link park plan and several park sites in or near the study area be expanded. He also commented on specific areas of land use.

Chalfont, Doylestown and New Britain Boroughs reviewed the preliminary plan and reported that they were satisfied with the plan's analysis and conclusions. Doylestown Township requested several amendments to the preliminary plan. Members of the EAC responded to the preliminary findings report and management options report with these comments:

- The consultant, Heritage Conservancy, should review existing natural resources ordinances and suggest modifications. Doylestown Township sought

suggestions as to how the four municipalities might coordinate their policies to develop more consistent standards.

- The proposal for the recreational greenway and riparian buffer should be expanded and implementation procedures addressed.
- Heritage Conservancy should clarify management priorities for each individual municipality rather than for the study area as a whole.

5.0. GOALS AND OBJECTIVES

The goals and objectives presented in this section are based on the data obtained from public agencies and the interviews and visual analysis performed for this project. They describe a general plan of action to implement the goals based on the findings. There are six main goals that each municipality should consider implementing to a greater or lesser degree, depending on their current level of commitment. The six goals are:

- development of a recreational and protective greenway;
- development of education programs;
- implementation of best management practices to control erosion and streambank sedimentation;
- review and revision of environmental and land development ordinances and regulations;
- resource cleanup; and
- design and implementation of a water quality study.

General recommendations pertinent to all four municipalities are described first, at length. Then specific recommendations are listed for Chalfont Borough, Doylestown Borough, Doylestown Township and New Britain Borough. These are in addition to the general recommendations; the reader should refer back to the goals to develop a complete implementation plan.

These options need not be implemented in the order listed. The priority list has been developed to point out where the municipalities should focus their efforts. Many of the options are interrelated, and officials will find that a single program can bring multiple results. Public cleanup efforts and education programs can be designed together, and the development of a recreational greenway complements the adoption of a riparian buffer ordinance.

Inter-municipal cooperation should be pursued for most of these recommendations. Pooling resources and information will ease the process of implementing new strategies, and at the same time make them that much more effective. It can also be more cost-effective to share staff time and develop a single greenway plan, for instance, rather than four separate ones.

5.1. Goal 1. Develop a Greenway for Recreation and Creek Protection

Develop a greenway park that highlights significant features and allows the public to enjoy and help protect the resources.
The establishment of a continuous recreational greenway along the Neshaminy Creek, one which is properly maintained throughout the municipalities, should be a high priority. Increasing population in the boroughs and the township means there is a greater need for recreational opportunities. Not only will a greenway provide a valuable public resource, it can also serve to increase awareness of the need for open space and environmental conservation. Informational campaigns conducted for the greenway project can inspire community residents to become involved in conservation activities. Education projects can be developed on site to help promote awareness and stewardship. Some possible projects include nature trails, signs, kiosks, and printed materials, as well as periodic outdoor classes. Education programs are discussed below in Goal 2.

The 1986 Bucks County Park and Recreation Plan recommends the creation of an extensive link park or greenway connecting 23 sites around Bucks County. The parks are divided into three categories according to priority of implementation. Sections of the link park are planned for the Neshaminy Creek around Doylestown Township. These portions are second priority parks. Doylestown Township has supported implementation of the greenway concept in its 1992 Park, Recreation and Open Space Plan. Other sections of third priority are planned for the Neshaminy and the Pine Run tributary in Chalfont and New Britain Boroughs. Another third priority link is planned to eventually connect the study area to Peace Valley and Lake Galena farther north.

The impact of the proposed Route 202 bypass on the greenway will need further investigation, depending on the option PennDOT chooses to develop.

Objective 1. Establish cooperation among the boroughs and the township, to create a successful greenway and a consistent and coherent greenway development plan for the Neshaminy Creek.
Coordination with municipalities outside of, but adjacent to, the study area is also an important factor. The municipalities should focus on developing a continuous greenway trail system and standardized ordinances.

Objective 2. Develop or amend municipal ordinances to protect the greenway and the creek corridor.
Especially important will be:
- erosion and sedimentation controls,
- development restrictions in floodplains,
- specific landscape recommendations that encourage protection and restoration of native plants, and
- development of a riparian buffer zone. This will help to strengthen the greenway proposal and shape new development around the creek.

To help ensure that these measures are effective and to gain cooperation from builders and developers, supervisory boards, zoning officials, and planning commission members should give priority attention to stream corridor projects. Subdivision ordinances may need revisions to require more sensitive construction and siting practices, including density considerations. Developers might also be asked to contribute land, or provide a fee in lieu of land, toward development of the greenway trail or riparian buffer. Outreach efforts to developers should include education about the value of local resources and the municipality's plans for their preservation and use. Ordinances are discussed further in Goal 4, below.

Objective 3. Improve public access to the creeks within the study area.
Recreational opportunities are the primary tourist attraction in Bucks County. The tourism industry depends on preserving natural, scenic and cultural resources and providing access to these resources.

Despite being well-loved by nearby residents, the Neshaminy Creek and its tributaries are not well-publicized resources in the four municipalities. This may be due in part to the limited access to all areas of the Neshaminy Creek for boating, walking, fishing and other activities. Residents with frontage along the study corridor report that they like the area especially for its recreational value. (See survey findings, pp. 3-4.)

Paths are nonexistent through some of the most beautiful portions of the creek corridor. Fishermen appear to be the primary users of the creek, although the survey indicated that people do use the creek for nature walks. Undeveloped land and other municipal open spaces along the corridor should be connected by a greenway to create a continuous corridor of trails.

In particular, official public access points and controlled site recreation would encourage the public to enjoy the area in a sensitive manner. Greater control of recreation activities can be achieved by designing a greenway that will guide park users through areas that can support a higher level of use.

Some specific tasks related to the greenway will need to be undertaken after adoption of the Neshaminy Creek Watershed Rivers Conservation Plan. These include: a greenway feasibility study (required by PA DCNR), delineation of the precise locations of proposed trails or amenities, acquisition of land and/or negotiation of any necessary easements through private property, and development of a municipal trail system linking to the existing and proposed county-wide trail system. In Doylestown Borough and Doylestown Township, land or easements within the stream corridor must be acquired. In Chalfont and New Britain, much of the land is already under public ownership, making up several public parks and the New Britain Nature Preserve. For these, design will be particularly important, so as not to disrupt the sites' current use. The municipalities may wish to consider having developers dedicate to public ownership or public use a percentage of new developments in open space that fronts the creek or its tributaries.

The trail system, including overlooks, access points and amenities like boat launches, should be designed to make best use of the riparian corridor and cause minimal impact to the natural environment. Finally, education programs associated with the stream corridor, including signage, should be developed to educate visitors to the greenway.

Several potential access points have been identified. These are indicated on the Visual Analysis Map. The criteria used to identify suitable access points include: Land ownership. The site should be owned by a public agency or a community service-oriented private organization such as a nature preserve or youth center.

Safety. The site should provide off-road access to the stream, away from traffic hazards, and sufficient parking for automobiles and bicycles.

Slope degree. Slopes should be gentle enough to allow easy pedestrian access and to minimize erosion. Access for individuals with disabilities may have to be addressed under the Americans with Disabilities Act.

Zoning. Public access points should not conflict with the zoned land use.

In **Chalfont**, two sites appear to have potential for public access. The first is along the west bank by the Volunteer Fire Department (Site 19, Visual Analysis Map), and the second is an open space to the south (Site 29). In **Doylestown Borough** there is an open ponded area alongside the creek (Site 36). The Bucks County Water and Sewer Authority in **Doylestown Township** (Site 56) is also an ideal site for stream access. Further field surveys may yield additional sites suitable for public access to the creek.

In **New Britain Borough**, the New Britain Nature Preserve appears to be a good site for access. Because much of the stream corridor in New Britain Borough is managed by the Bucks County Emergency Management Agency, access points will have to be approved by the Agency. A professional consultant or municipal staff member should be retained to determine the exact locations of new access points in all municipalities, and the appropriate layout of greenway trails. Other likely participants in greenway design and implementation will include various public agencies, citizen's committees and EACs, non-profit organizations, local businesses, and interested individuals.

Each municipality will need to decide whether outright purchase of property or conservation easements are more appropriate for public rights of way within their boundaries. The county itself may also buy additional park acreage along stream corridors to implement portions of its link park plan. The greenway trail system and creek access points should be managed by a public entity to resolve liability and access issues.

Objective 4. Once the greenway land is acquired, develop promotional efforts to improve awareness of the area's natural resources and to encourage stewardship. The support of property owners is very important to this effort. Where the municipalities do not own the land within the stream corridor, property owners will be asked to support and maintain the riparian buffer. Supportive businesses and residents can also help promote awareness and stewardship, and may contribute time or services. Education and outreach programs should take advantage of this.

The Municipalities

Chalfont Borough

Despite Chalfont's small size, it is endowed with significant waterfront and stream area along the Neshaminy Creek and its tributaries. Chalfont is trying to take advantage of these natural resources by developing trails along the creek. Property acquisition and greenway development are currently in the planning stages.

Chalfont has had the foresight to purchase land along the Neshaminy Creek for public recreation purposes. Much of the land is publicly owned with good access and high rates of use. These areas can add to a greenway park and trail system. The parks with waterfront access include: Oxbow Park, Krupp Park, Kelly Park and Lenape Trail Park.

A priority for Chalfont Borough is to acquire property along the creek to protect the Neshaminy and to provide recreation. A 20-acre parcel along the creek across from Oxbow Park and next to an unnamed park is currently vacant. It is owned by Imperial Nursery, which has been unable to develop the property because it is prohibitively expensive to acquire the grade crossing over the active railroad from SEPTA. The only access to the property is from Sunset Avenue; it is bounded on the other side by the Neshaminy Creek.

Chalfont Borough would like to acquire this property for open space along the creek. Dedicating the property to recreational and open space use and taking it out of an industrial district will provide further protection for the Neshaminy Creek. Development of the parcel as a recreational site is expected to occur in stages. Ultimately the borough would like to build a bridge to the property from Oxbow Park, thus eliminating the need for a grade crossing from Sunset Avenue.

Doylestown Borough

Doylestown Borough is an old and established municipality with a stable population. There is little development occurring, and no major subdivisions planned that would upset the management of the Neshaminy Creek.

Because only small portions of tributary creeks are located in Doylestown Borough, development of a recreational greenway will be a lower priority. Much of the waterfront land is privately owned and access is restricted. Greenway development in this area should be for natural resource protection rather than public recreation.

Creating a riparian buffer and improving stream corridor management will help protect the tributaries and the main branch of the Neshaminy Creek. The headwaters of Cooks Run should be protected, since any damage that occurs in this area will affect other areas as the water travels downstream.

Doylestown Township
Doylestown Township should seek the cooperation of Doylestown Country Club when planning the greenway and buffer. The country club is a recreational amenity that could complement a greenway along Country Club Creek, while offering its members access to nature trails. The club should be approached to see if it is willing to serve as a public access point to the creek.

New Britain Borough
Only a small portion of the main branch of the Neshaminy Creek runs through New Britain Borough. Because this land is in public ownership, at the New Britain Nature Preserve, developing greenway trails should be relatively easy. The Cooks Run tributary also flows through the borough after leaving Doylestown Township. New Britain should concentrate on preserving its natural resources by creating a riparian buffer along the Neshaminy and Cooks Run, and developing a public recreation way along the Neshaminy. A third-priority section of Bucks County's proposed greenway coincides with the streamfront area of the Neshaminy in New Britain, and the municipality may wish to design the greenway in tandem with the Bucks County Planning Commission.

New Britain has an ideal opportunity to create joint programs with the New Britain Nature Preserve, located on the Neshaminy Creek. The Nature Preserve can direct educational programs about the riparian corridor and the Neshaminy Creek watershed. In addition, it may be able to serve as a public access point, or an access point could be located just adjacent to the nature preserve.

5.2. Goal 2. Establish Environmental Education Programs

Inform residents, business owners, recreational users, and others about the need for protection.
Widespread and increased awareness is one of the most important factors contributing to the success of natural resource protection programs. In order to be successful, education programs must include homeowners and residents, commercial land owners, developers, public agencies, and youth.

Objective 1. Develop land management practices tailored to the users of the land.
A set of general practices should be developed for all. However, more specific residential and agricultural recommendations should be developed for those particular users.

Objective 2. Coordinate education programs among the municipalities and school districts.
On-site programs especially should be coordinated so that the municipalities can share staff and create a suitable design for signs and other educational materials.

For school programs, a "watershed curriculum" could draw on local creeks for field work opportunities, in conformance with middle and high school requirements. Doylestown Township and Chalfont, Doylestown and New Britain Boroughs could follow the lead of other towns and townships by pursuing a curriculum that uses the Neshaminy Creek and its tributaries for comprehensive environmental education. Field trips to healthy and degraded sites along the creek can augment existing environmental education courses. The experience of other environmental programs, such as household recycling, suggests that children will teach their parents the lessons they learned in class.

At the county level, information on implementing environmental curricula is available from the Bucks County Conservation District Environmental Education Committee, a consortium of public and private agencies who meet regularly to discuss county-wide environmental education programs.

Most local nature centers and watershed associations have established programs from which to draw. These include Honey Hollow Environmental Center in Solebury and Peace Valley Park in New Britain. Area schools can also develop independent programs.

Objective 3. Hold frequent and well-advertised public meetings.
Articles and editorials in local newspapers should be developed with an eye towards public relations and public stewardship of the Neshaminy Creek streams within the study area.

Objective 4. Pursue ongoing as well as periodic educational efforts.
In addition to school curricula, ongoing efforts might include a regular environmental newsletter or a column in local newspapers. Educational signs posted along the greenway trails or the riparian buffer can enhance the experience of using the greenway while providing information about ecology, natural history, and conservation. Stewardship or stream watch programs staffed by volunteers could survey or maintain stream corridor vegetation. Education programs involving local youths could accomplish the same objective. Members of the Doylestown Garden Club, the Doylestown Nature Club, and other interested organizations can be approached to assist in conservation education efforts.

Periodic efforts might include occasional seminars on environmental topics, including practices like lawn care and composting. An educational packet can be sent to new homeowners or businesses to encourage proper practices from the start. The packet might include brochures and fact sheets on environmentally sound lawn care practices, alternatives to pesticides and herbicides which run off into the water, regulations regarding protection of riparian buffers, maintenance of vegetation along the creek corridor and placement of structures within the buffer.

Municipal parks could serve as models demonstrating land management practices which protect natural resources. The parks could distribute informational pamphlets relating to river conservation and best management practices, or set up kiosks displaying the information.

Education leads to increased awareness and awareness leads to increased involvement. Municipalities can take advantage of the interest raised through education programs by developing subsequent stewardship programs. With coordination and oversight from public agencies, land owners and other residents can be encouraged to adopt some of the tasks recommended by the Rivers Conservation Plan.

The Municipalities

Chalfont Borough, Doylestown Township, Doylestown Borough and New Britain Borough
Outreach efforts should be made to improve the practices of businesses and industry along the Route 202 and Route 611 corridors. The extensive development and amount of impervious surfaces has caused erosion damage. This can be mitigated somewhat by plantings that will slow water runoff, and by building retention basins and swales and other stormwater management techniques. Educational outreach should encourage stewardship of the Neshaminy Creek corridor. A combination of education and legal requirements is the best approach to achieving the cooperation of businesses in the area of the creek.

5.3. Goal 3. Institute Best Management Practices to Control Erosion

Minimize damaging activities and development that affect the Neshaminy stream corridor and watershed.

A best management practice (BMP) is a structural or non-structural method applied to control or prevent a specific pollution problem, most often stormwater damage and restoration of degraded areas. Structural BMPs utilize state-of-the-art construction techniques and materials and are considered the most environmentally sensitive choices among potential practices. They can also involve bioengineering approaches, including porous paving, and manufactured products made from natural materials such as coconut fiber "Biologs" or willow reeds. Another type of BMP is the creation of wetlands to control stormwater runoff. Using state-of-the-art construction techniques and choosing the best available materials help to insure the longevity and suitability of any long-term public project. Non-structural BMPs include zoning and subdivision restrictions that limit certain types of development to allow natural processes to control runoff or preserve riparian buffer zones. Subdivision restrictions may also require the use of structural BMPs in certain situations.

Establishing a riparian buffer zone and resource-protective ordinances, along with public education, are critical to this initiative. Erosion control and streambank stabilization will require legal protections and up-to-date municipal ordinances to control damaging activity. These are developed in detail in Goal 4.

The management of land in the watershed is presently fair to good. There are only a few spots, in private ownership, that would benefit from better stewardship efforts. As expected, the natural resources are more degraded along the more developed areas such as Route 202, Route 611, and at points where wastewater or stormwater pipes routinely discharge into the creeks. BMPs should be implemented in these locations to protect the natural integrity of the Neshaminy watershed and to improve it for recreation.

Streambank stabilization will require public education to curb damaging practices (Goal 2) and the development of a management approach to make best use of labor and volunteer support. Local residents and businesses should be educated as to how they can help the township protect the Neshaminy. Streambank stabilization will also demand physical commitments to repair any unnaturally eroded areas of the bank and restore native plants, and to staff clean-up and maintenance efforts. The public can be involved in stabilization efforts by volunteering, under supervision, to conduct inventories or plant vegetation. Public resource cleanup is discussed in Goal 5.

<u>Protecting the Neshaminy Creek from erosion and sedimentation may require:</u>

- problem area research
- ordinance research
- development or strengthening of ordinances

- development or utilization of existing educational materials
- cooperation and commitment from the parties involved based on land use or land ownership
- building support
- voluntary and/or paid labor
- acquisition of materials

Objective 1. Establish at least a 20-foot wide riparian buffer along the Neshaminy Creek and its tributaries to protect natural and scenic values.
A riparian buffer, as defined by the U.S. Forest Service, is an area of vegetation along a stream or river that naturally provides protection from erosion, sedimentation and pollution. Plants and trees reduce surface runoff and absorb nutrients and chemicals to minimize degradation of the water and stream ecology. A riparian buffer employs natural materials in sensitive locations, allowing the plant processes to filter out pollution and silt before they reach the water. A riparian buffer, even a narrow one, will help to repair the eroded banks and maintain the health of the creek.

Although the buffer now physically exists in many places along the creek, an ordinance defining the zone of buffer protection is necessary. This will ensure the protection of existing vegetation and promote planting in areas where the stream corridor is sparsely covered. Moreover, the establishment of a model ordinance may encourage other municipalities to pass similar protections. Recommended ordinances are presented in Goal 4.

The minimum width of a riparian buffer zone is determined by three criteria: flooding propensity, based on soil type and ground cover; the area measured in distance from the stream bank to pollutant source areas; and slope. If developing a strict buffer width based on streambank conditions, it should be recalculated from time to time as ground cover changes. However, in recognition of the difficulty of calculating specific buffers, especially over a considerable distance, and of the changing nature of the buffer over time, the Forest Service has established a recommendation for a wooded buffer with a standard width of 75 feet. This width is generally accepted as providing a sufficient level of protection. A 20 foot-wide buffer will mitigate 80% of concerns associated with erosion and pollution.

Objective 2. Use native plants and biotechnical BMPs for soil stabilization and aesthetics.
- Any commercial, municipal or residential property owners who have disturbed the twenty- foot riparian buffer should be encouraged to re-plant with only native plants in disturbed areas. This will prevent the non-native species from colonizing and further upsetting the natural ecology and beauty which is unique to the Neshaminy Watershed. Larger trees, which have the most stabilizing effect on creek banks, should not be removed.

- Points along the creek and its tributaries that are subject to erosion should be stabilized with biotechnical materials and planted with native plant species. Biotechnical methods should be encouraged, since synthetic materials tend to detract from the aesthetics of the natural environment. Biotechnical mitigation practices should be employed in lieu of conventional engineering approaches (e.g., gabions, rip-rap) as much as possible.

Other BMPs will be useful in the Neshaminy Creek watershed study area. Buffering roadways with native vegetation will help reduce runoff. Municipalities should develop ordinances regulating impervious surfaces and steep slope development where they do not already have such ordinances. Landowners should be encouraged, through education efforts, to maintain an unmowed strip at the streamside edge of their property, the wider the better. This strip will also help to keep geese away from the creek. Some planting of vegetation or stabilization efforts may be done with volunteer labor on cleanup days. Municipalities would benefit from acquiring assistance from both NRCS and PennDOT in implementing the above BMP's.

Objective 3. Develop methods of decreasing impervious surfaces to increase infiltration and minimize runoff to the creek and its tributaries.

- Use porous paving for parking lots located within a defined distance of wetlands and floodplains.
- Reduce impervious surfaces in residential developments. For example, certain roads or driveways might be narrower (consult the Fire Department to develop appropriate specifications).

Objective 4. Protect waterways and their tributaries using planning tools and legal mechanisms.

- Identify and map the significant resources deserving protection in municipal comprehensive plans.
- Institute performance zoning dependent upon the capacity and sensitivity of the land, especially adjacent to the creek and its tributaries.
- Institute or strengthen zoning regulations to prevent erosion, sedimentation, and stormwater runoff.
- Develop a steep slope ordinance that regulates development on slopes greater than fifteen percent along streams and creeks.
- Develop a wetland and floodplain buffer ordinance that extends protection an additional 100 feet beyond the currently regulated boundaries of these significant resources. (See Appendix for model ordinances recommending this type of buffer.)

Objective 5. Educate and provide technical advice to property owners and residents along the creek about proper stewardship practices in the seventy-five foot riparian buffer.

- Prepare brochures that describe techniques that property owners and residents can use to improve the creek for the benefit of everyone.

- Offer educational seminars on native plant species or practices such as composting organic debris.
- Establish a series of nature articles in local publications.
- Discourage the use of chemicals, especially herbicides, insecticides, fertilizers and other lawn or garden chemicals that could wash into the watershed.
- Store all chemicals away from the flow line of water on a site.
- Discourage removal of existing native vegetation along the creek or in the floodplain.
- Discourage alteration of the land along the floodplain.
- Limit the number and type of buildings and animals permitted in the floodplain and wetlands.
- Discourage dumping of any organic or other debris in the floodplain, wetland or riparian buffer.

Objective 6. Work with local businesses along the creek to create uniform management practices.

- Encourage businesses to adopt stewardship practices similar to those practiced by individual owners and residents.
- Encourage businesses to preserve the environment while maintaining property values, by practicing proper land management.

Objective 7. Encourage municipal, county, state, and government agencies to protect the Neshaminy Creek and its watershed by following environmentally sensitive practices throughout their jurisdictions.

- Decrease use of road salts.
- Decrease or eliminate use of pesticides or herbicides along roads.
- Plant vegetation that requires less mowing.
- Alter current mowing practices to end mowing near waterways and allow for a vegetative creek buffer.
- Plant native species to help avoid the invasion of non-natives.
- Construct stormwater systems for roads so they do not discharge directly into creeks.

The Municipalities

Chalfont Borough

The Neshaminy Creek along Route 202 in Chalfont Borough appears to have the most intensive runoff and erosion problems because of the large amount of impervious surfaces and the number of industrial uses. An old and established town, Chalfont is very densely developed. It should monitor the Route 202 area of the creek to keep it from deteriorating, and educate the property owners about best management practices to maintain the health of the resources. These activities will coincide with the efforts made to update the comprehensive plan and zoning ordinances.

Doylestown Borough
The headwaters of Cooks Run are located in Doylestown Borough. The surrounding area is occupied by an industrial district which appears to be for relatively light uses. The industrial site and neighboring commercial areas are heavily paved, with little porous area to absorb stormwater. The borough may wish to monitor water quality downstream from these areas. Because of the developed nature of lands along Cooks Run and Country Club Creek, erosion control should be a high priority.

During future upgrades to the Green Street Wastewater Treatment Plant, attention should be paid to the restoration of disturbed land by using native plants. This can help to maintain the sense of place that often is lost after reconstruction in natural areas.

Doylestown Township
The township should establish a working dialogue with Doylestown Country Club to adopt Best Management Practices for erosion, sediment, and chemical control measures. Environmentally sensitive mowing practices along the creek will help filter the runoff from the golf course and club grounds, thus minimizing the nutrient and sediment load in the creek and watershed. Vegetation should be reestablished along the banks. A riparian buffer, even a narrow one, will help to repair the eroded banks and maintain the health of the creek.

The USDA Natural Resources Conservation Services and Bucks County Conservation District can work with the grounds maintenance staff on appropriate erosion and sedimentation control techniques to manage Country Club Creek. NRCS's Wetlands Reserve Program can provide funding to address riparian area filter planting in priority areas, alothough the funding is very limited.

5.4. Goal 4. Update Existing Ordinances and Develop New Ordinances.

Institute natural resource protection ordinances to enhance, restore, and maintain Neshaminy Creek watershed.
While it is not the purpose of this plan to develop new or amended ordinances and regulations for the municipalities, existing ordinances have been reviewed and analyzed in order to suggest natural resource regulations that may be more protective of the Neshaminy Creek Watershed than those currently in place.

A variety of regulatory ordinances can be employed to protect the Neshaminy Creek watershed. These include ordinances for: erosion and sedimentation, floodplain, open space, riparian buffers, site capability standards, steep slopes, stormwater, streams and watercourses, wetlands, and woodlands.

The four municipalities will need to discuss their individual existing ordinances and implementation and enforcement policies. Currently, all four have floodplain and stormwater ordinances in place; only Doylestown Township requires site capability calculations for proposed development. None have stream corridor buffer regulations. Other ordinances vary by municipality and are discussed briefly below in the individual municipality sections.

Ordinance development may require consideration of the following:

- hiring of a planning consultant
- acquisition of labor and funding (for research)
- coordination with officials within the municipality and with officials from other municipalities in the Rivers Conservation Plan area
- working with Bucks County Planning Commission on available model ordinances

Objective 1. Create a stream corridor buffer zone along Neshaminy Creek within the study area.
A stream corridor buffer zone is a zone of protection around the creek. Special regulations apply within the zone that preserve and enhance the vegetative buffer and place limits on development and land use.

The creation of a stream corridor buffer along all areas of the stream, those within the recreational greenway and outside of it, is a critical step. The zoning is designed to regulate activity in the stream corridor in order to protect the stream and its watershed, including plant ecosystems and wildlife habitat. Restrictions on development should be based on site capability limits that consider steep slopes and the site's potential for erosion and siltation. Residential landowners should be requested to preserve stream corridor vegetation, especially trees. Stabilization or restoration practices should employ natural or biotechnical materials, for both ecological and aesthetic reasons.

Buffer ordinances can be of three types: fixed width, a separate zoning district, or an overlay district. This RCP recommends that the buffer, no matter which type is chosen, be a minimum of 20 feet, which should be adjusted outward if areas outside of the 20-foot zone require additional protection. A seventy-five foot wide buffer is the current Forest Service standard. In places where the 100 year floodplain is greater than 20 feet, the floodplain area should constitute the buffer.

The Montgomery County Planning Commission, in its 1995 publication "Riparian Corridor Conservation District," a model ordinance, recommends a riparian buffer district based on Forest Service calculations. The conservation district protects watercourses and their adjacent lands by establishing a zoning overlay. (Another good reference document is the Stony Brook-Millstone Watershed Association's "Basis and Background for the Stream Corridor Protection Ordinance" which details support for buffers in the state of New Jersey.)

The Montgomery County riparian corridor district is made up of two zones. Zone One has a minimum width of 25 feet, beginning at the edge of the water. The width may be increased if steep slopes (greater than 25%) exist within 25 feet of the water. Zone Two consists of a minimum width of 50 feet, beginning at the outside edge of Zone One. The second zone permits a greater number of uses than the first, including agriculture, timber harvesting and recreational uses. The municipalities together should determine an acceptable range of uses and develop a riparian buffer ordinance, so that it is consistent throughout the study area.

Objective 2. Develop other specific natural resource ordinances and strengthen existing ordinances to provide additional protection to the creek corridor.
The boroughs should also expand their wetlands ordinances. To expand protection, institute a buffer ordinance that extends the regulated area an additional number of feet (100 feet is suggested) beyond wetland and floodplain boundaries. Erosion and sedimentation controls should be updated and strengthened if necessary. These will contribute to protection of the watershed area and not just the creek corridor.

Model ordinances have been developed by the Bucks County Planning Commission that reflect typical ordinances in municipalities throughout the county ("Model Natural Resource Protection Standards"). These may be used to amend existing ordinances and extend protection for natural features. The Lower Delaware Wild and Scenic River Task Force is also in the process of preparing models for stormwater management and erosion and sediment control.

Objective 3. Share information on local comprehensive plans and land use regulations, and coordinate ordinances among the four study area municipalities to yield the most coherent conservation plan and better protect the creeks within the study area as a whole.
Consider how local regulations dovetail or diverge with regard to the municipalities' common concern. Development plans affecting the waterways should be reviewed. Discussion can help to identify shared visions, concerns, and

areas of potential conflict. The ultimate objective of this inter-municipal coordination would be to establish plans or land use controls with similar strategies and goals.
Following the adoption of municipal resolutions supporting the Neshaminy Creek Watershed Rivers Conservation Plan, each municipality should consider designating a representative to coordinate implementation of the plan's goals and objectives. These representatives should arrange an introductory meeting to share information, especially regarding ordinances and model regulations, and to coordinate their actions with regard to the Neshaminy Creek stream corridor and watershed.

Coordination of municipal actions in the study area with those outside the area is necessary to ensure consistent standards and practices, and to share information about creek-related issues. The effectiveness of enforcement and land development review will depend on the commitment of each municipality. Municipal EACs can assist planning staff in designing the best package of ordinances and subdivision regulations.

The Municipalities

Chalfont Borough

Chalfont's ordinances and subdivision regulations should be updated. The borough is planning to update its comprehensive plan in 1997. This is a good opportunity to also update the zoning codes and develop ordinances and subdivision regulations that will provide the best protection for natural and cultural resources.

Chalfont should continue to concentrate on updating and expanding its existing ordinances to provide better protection for the Neshaminy Creek and related natural resources. Update of the ordinances should be coordinated with the comprehensive plan to reflect Chalfont's priorities for the future.

Chalfont currently has floodplain, stormwater, and erosion ordinances in place. These may need to be revised during the comprehensive plan update to provide the best protection for the creek. As with the other municipalities, Chalfont does not have a riparian buffer ordinance and should consider instituting one. The steep slopes on the southern border along New Britain Township also should be protected by a steep slope ordinance.

Because the borough has already planned for the updating of the comprehensive plan, funds have been earmarked in the upcoming year's budget. Possible approaches to expanding the task include the use of voluntary labor to perform research.

Doylestown Borough

In addition to instituting a riparian buffer ordinance, Doylestown Borough should develop site capability restrictions. Steep slope ordinances are unnecessary because

there are no steep slopes within the riparian corridor in the borough. The existing floodplain, stormwater and open space zoning should be kept up to date to provide the best available protection.

Doylestown Township

Doylestown Township's existing ordinances are quite comprehensive and provide a significant level of protection for its natural resources. This includes site capability standards (§ 175-27), which apply to streams and watercourses; floodplains and floodplain soils; lakes, ponds and wetlands; and open space. The Doylestown Township Zoning Ordinance also restricts activities that cause soil erosion and stream sedimentation by regulating earth moving and construction, and has established standards to protect steep slopes, woodland areas and trees. Floodplain districts based on federal maps have been designated and development restrictions instituted. Requirements for percentage of open space, percentage of impervious surfaces, density, and structure size have been developed for each zoning district.

As described earlier in the Goals section for all the municipalities, Doylestown Township should consider instituting a riparian buffer ordinance to expand protection for the Neshaminy Creek stream corridor and greenway.

Because the township already has many protective ordinances in place, its priorities should lie in public environmental education and in creating and maintaining the greenway park recommended in this report. The most pressing issues of river protection policy and development have, for the most part, been addressed.

Because of Doylestown Township's ongoing commitment to keeping their ordinances complete and up to date, the Neshaminy Creek and the township's other natural resources already benefit from a high level of protection. Further commitment will be needed to monitor the existing ordinances and develop management practices to ensure that the Neshaminy is afforded the best available protection. Specific ordinances should be designed for the riparian buffer; a model has been developed by the Montgomery County Planning Commission's in the document "Riparian Corridor Conservation District, 1995."

It might also be useful for the township to share its expertise with the other municipalities as they update their own statutes for the Neshaminy. By instituting consistent ordinances the length of the creek, protection will be improved generally, and industry and developers will have a clear understanding of applicable requirements.

New Britain Borough

Erosion, steep slope, floodplain, wetlands and stormwater ordinances are in place. These are rather vague (Zoning Code, § 608(I)) and may need to be strengthened in order to provide the best protection for the riparian buffer and the creek. As in Chalfont and Doylestown Boroughs, New Britain does not have a riparian buffer or site capability standards, which should be adopted as soon as feasible.

5.5. Goal 5. Clean Up the Stream Corridors Within the Watershed

The creek corridor inventory revealed that areas within the corridor are not only eroded but are also littered with trash. The trash is immediately visible both from the creek banks and from the water. It affects the scenic appeal of the Neshaminy Creek watershed and can lessen the experience of being in a natural place. The scattered trash should be picked up on a regular basis, and prevention measures put in place.

This issue can be addressed by developing a strong public education program and cracking down on illegal dumping. Encouraging residents to use the waterways responsibly, and feel a sense of ownership, will help to prevent careless littering. Placing "No Littering" signs alongside educational signs and kiosks will remind visitors to respect the waterways. Dumping of large items may have to be addressed by fines or other regulatory measures.

Objective 1. Improve the overall quality of the watershed.
There are two reasons for routine cleanups and maintenance: aesthetic appeal and resource improvement. A clean creek corridor is aesthetically pleasing, scenic and attractive, and is more inviting to recreational users than a creek that is uncared for. Resource health, in particular streambank stability and water quality, can be expected to improve. The issue of water quality needs further study, but protective ordinances and regular maintenance are the most important requirements for clean stream waters. It should be kept in mind that maintenance of resource health takes precedence over aesthetic demands.

Objective 2. Use cleanup activities to aid educational efforts; use education programs to promote cleanup.
Cleanup efforts involve volunteers and develop public commitment, thus stimulating future stream conservation efforts. Promotional and educational projects should be undertaken before cleanup events take place. However, these events usually have an additive effect as they educate the participants and disseminate information out into the community. Regular cleanup or planting events may raise public awareness and citizen involvement. A public relations effort will be very important to the success of such activities.

The municipalities should sponsor public river corridor cleanup days, which also provide an opportunity for education. After the more extensive initial cleanups, maintenance could be provided by regular (perhaps yearly) cleanup days, or by offering sponsorships similar to roadside maintenance programs. Businesses along Route 202 should be encouraged to sponsor creek or watershed cleanup activities in their area. The business community can spearhead the regular clean-ups by donating advertising and employee time. Special events should be planned to involve large numbers of volunteers, targeting all residents and land owners in the area.

Volunteer programs should involve an element of education, so that volunteers know what plants species are appropriate to the area and what healthy native vegetation looks like. School-based education programs should be developed, in cooperation with the RCP municipalities, school officials, and non-profit educational organizations.

Cleanup efforts should also encourage joint voluntary public-private efforts for trash removal (e.g., municipalities and landowners may work together, or commercial property owners may work with residents).

The Municipalities

Chalfont Borough and Doylestown Township

The commercial corridor and traffic along Route 202 have done some damage, mostly aesthetic, where the road crosses the Neshaminy Creek in Chalfont. The same is true for the Route 611 corridor near Almshouse Road in Doylestown. The creek banks behind the Kings Plaza shopping center are littered with debris. Some of the debris is such large items as tires, mattresses and old appliances; volunteers may not be sufficient to clean up this area. These parts of the corridor should be cleaned up and the local businesses encouraged to maintain the creek and the vegetation. This may mean volunteer stewardship, or it may mean simply reporting debris to the municipality when it appears.

5.6. Goal 6. Implement Water Quality and Sustainability Studies

Water quality is an integral part of a healthy and useful creek. Water quality study was not part of the Neshaminy Creek Watershed Rivers Conservation Plan process, however, several recent studies have been performed by other agencies. These indicate that some action is warranted to improve the quality of the creek waters. Protection of the land along the stream corridor, by establishing regulatory requirements and creating a riparian buffer, will also help to improve and maintain the health of the water.

The study area municipalities should contact Bucks County Planning Commission and other agencies involved in water quality monitoring to determine if any monitoring is currently being performed. These agencies include EPA, PaDEP, Bucks County Board of Health, Bucks County Water and Sewer Authority, non-profit river and watershed organizations, area colleges such as Delaware Valley College or Widener University, and Philadelphia Suburban Water Company.

Objective 1. Obtain long-term data for the Neshaminy Creek Watershed to augment existing data and ongoing monitoring efforts.
Water quality monitoring should study the amount and effect of chemical and biological contaminants. Chemical contaminants include point and non-point source (NPS) pollution from agricultural, residential, municipal and industrial sources. In some cases the originators of non-point source pollution cannot be identified, but the pollution can be monitored as stormwater runoff. Biological contaminants include nutrient runoff from fertilizers, releases from sewage treatment plants, and coliform counts from livestock manure, wild deer and geese. Sedimentation from eroded creek banks and siltation from agricultural fields also contributes to degradation of water quality.

It is important for the water quality study to incorporate an appropriate area within the watershed and not simply within the RCP study area, because contaminants can travel a considerable distance. Cooperation among the Neshaminy Creek watershed municipalities and water quality agencies will help develop the most comprehensive information.

Objective 2. Pinpoint and address sources of pollution.
Non-point sources of pollution are likely to be the more harmful threat than point sources because they are much more widespread and difficult to identify. The pollutants tend to accumulate on land areas such as roads and agricultural fields, and travel into bodies of water as runoff during storms or snowmelt.

The composition of total pollution loads should be identified to determine whether they arise from a point source or non-point source. Once this is done, solutions can be devised to target the sources or types of pollution and minimize damage.

Several general locations within the RCP study area are likely to be sources of contaminated runoff. Shopping centers with large parking lots, such as Doylestown Center and the Kings Plaza shopping center, and residential clusters have a high percentage of paved and impervious surfaces that collect automobile contaminants. Residential developments usually have stormwater management systems, but those adjacent to the Neshaminy Creek and its tributaries probably have a moderate amount of runoff that drains directly to the creek without being filtered. These locations should be appraised to see if they are contributing significant levels of pollutants.

A common and effective solution to non-point source pollution is to maintain vegetative cover. The plants filter pollutants and sediment in runoff and trap them before they can contaminate the water. The measures recommended in Goals 1, 3, and 4 address pollution control. Strong protective ordinances, especially restrictions on steep slope development and development of a 20-foot buffer, will help keep runoff contamination to a minimum. By dedicating creek-side land to a greenway with passive recreation, more damaging uses are limited. In addition, educational efforts (Goal 2) can have some effect on the amount of pollution being generated in the first place.

5.7. Funding

Numerous sources of federal and state funding are available for environmental improvement projects. Some of those sources are discussed here to serve as a beginning point for implementing the goals in this report. Both public and private fund sources should be pursued.

Funds may be available from the Bucks County open space program if the proposed $59 million referendum is authorized as expected in May 1997. Twenty million dollars will be distributed to townships and boroughs for natural areas acquisition and other local projects. County funds will be available for the purchase of local park land and open space areas. A community open space plan will be required for funding consideration, and the municipality must provide matching funds of twenty-five percent.

Developing a Greenway: Implementation grants may be available for land acquisition from the Pennsylvania Department of Conservation and Natural Resources (DCNR). The Pennsylvania Environmental Council (PEC) also provides funding to Environmental Advisory Councils for implementation projects.

Education Programs: Funding will be needed for program materials, including design and labor. Educational grants may be available to municipal EACs from the Pennsylvania Environmental Council. EPA Section 104(B)(3) grants award funds for projects with a public participation component. Funding may also be available from Pennsylvania DEP Environmental Education Grants.

Clean up efforts that involve public education can also pursue these grants.

Instituting Best Management Practices: USDA Natural Resources Conservation Services (NRCS) and Bucks County Conservation District (BCCD) provide matching funds for joint efforts.

NRCS's Wetlands Reserve Program will provide minimal funding to address riparian area filter planting in priority areas.

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