CHESAPEAKE BAY PRESERVATION CHAPTER

TO THE TOWN OF HERNDON COMPREHENSIVE PLAN

Prepared by the Town of Herndon, Virginia

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CHESAPEAKE BAY PRESERVATION CHAPTER
TO THE TOWN OF HERNDON COMPREHENSIVE PLAN

General Policy Statement

The Town of Herndon is committed to the protection, preservation, and restoration of its natural environment and in particular, its water resources. Similarly, the Town is committed to the protection, preservation, and restoration of one of Virginia's most valuable economic and ecological resources, the Chesapeake Bay. Fairfax County, including the Town of Herndon, lies within the watershed of the Chesapeake Bay. The linkages between water quality, natural habitat, and quality of life are widely acknowledged. So too are the linkages between water quality, air quality, and land use. The major goal of this Chapter is to account for this interdependency between people and their environment and to guide the Town as it seeks not only to minimize the impacts of new development on water quality, but to improve water quality and the general environment through the redevelopment process, an examination of existing sources of pollution, and the identification of opportunities to prevent pollution before it impacts the environment.

It is the intention of the Town, using this Chapter as a tool, to:

- restore impaired streams that are capable of supporting a diverse aquatic habitat;
- protect streams which currently support aquatic life from the degradory effects of improperly planned or constructed development and other sources of pollution; and,
- expand efforts to provide residents with a wide-range of opportunities to interact with and learn about their natural environment.

Through these efforts, the Town hopes to make a meaningful contribution to the restoration of the Chesapeake Bay and to the improvement of the overall quality of life for the residents of the Town of Herndon.

Authority and Scope

Section 15.446.1 of the Code of Virginia (1950), as amended, requires that each municipality in Virginia develop its own comprehensive plan. The mandate states "The comprehensive plan shall be made with the purpose of guiding and accomplishing a coordinated, adjusted, and harmonious development of the

territory which will, in accordance with present and probable future needs and resources best promote the health, safety, morals, order, convenience, prosperity, and general welfare of the inhabitants."

In addition, the Virginia General Assembly, in response to growing citizen concern for the health of State waters and in particular the Chesapeake Bay and its tributaries, enacted the Chesapeake Bay Preservation Act of 1988 (Sections 10.1-2100, *et seq*., of the Code of Virginia (1950)). Section 10.1-2109.B of the Act states that "Counties, cities, and towns in Tidewater Virginia shall incorporate protection of the quality of State waters into each locality's comprehensive plan consistent with the provisions of this chapter."

The Chesapeake Bay Preservation Act of 1988 was a direct response to the 1983 Chesapeake Bay Agreement signed by the governors of Virginia, Maryland, and Pennsylvania, the Mayor of the District of Columbia, and the U.S. EPA. The Chesapeake Executive Council signed amendments to the original agreement in 1987 and 1992 specifying the intent to implement tributary-specific pollution reduction strategies for each of the Bay's major tributaries. In 1996, the first of the strategies was completed for the Shenandoah and Potomac river basins.

The Town of Herndon, recognizing the importance of the goals of the Act, not only for the Chesapeake Bay, but also for the integrity of its own water and natural resources, has therefore produced the following *Chesapeake Bay Preservation Chapter to the Town of Herndon Comprehensive Plan*.

ORGANIZATION

This Chapter takes the approach that in order to arrive at achievable water quality goals and strategies and in order to identify future work programs to improve water quality, it is necessary to have a detailed understanding of the Town's natural environment and its implications for future sustainable growth.

To help foster this approach, this Chapter is divided into the following sections:

I. The Existing Natural Environment
II. Constraints to Development
III. Existing and Potential Sources of Environmental Pollution
IV. Existing Programs and Regulations to Protect the Environment
V. Analysis of Program Needs and Strategic Water Quality Protection Plan
VI. Strategies and Action Statements
VII. Implementation Plan and Time-Line

The Existing Natural Environment
I

The Town of Herndon is strategically located in northwestern Fairfax County, about 20 miles northwest of Washington D.C., and occupies a land area of 4.2 square miles. Because the Town is hydrologically and economically connected to the Chesapeake Bay, the Town must be particularly diligent in its water quality protection efforts. Although the Town lies within the political boundaries of Fairfax County, it enjoys its own planning and zoning authority. Figure I.1 illustrates the location of the Town in relationship to Tidewater Virginia, i.e., coastal plain land that drains to the Chesapeake Bay.

The Town has a strong commitment to the preservation and enhancement of its natural environment. In 1989, the Town added a full-time staff position dedicated to urban forestry. In 1990, the Town adopted the Herndon 2010 Comprehensive Plan, incorporating the general principles of the State's Chesapeake Bay Preservation Act. The Comprehensive Plan contains policy about urban forestry, as well as policy to establish "Green Streets" (corridors with special landscaped buffers) and "Clean Streams" (water quality

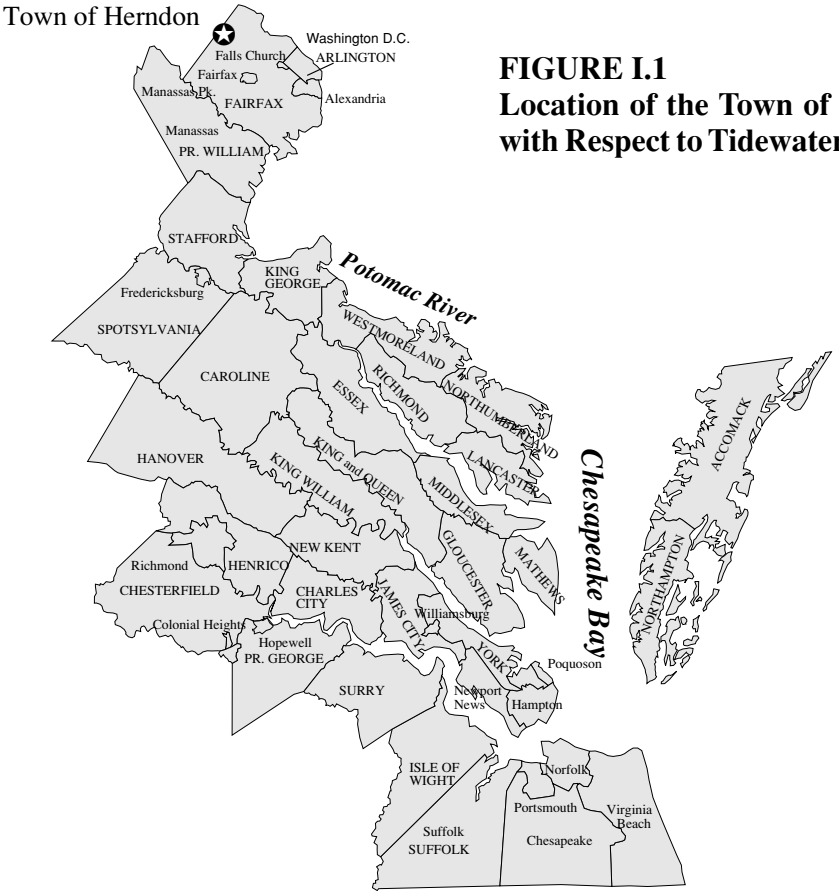


FIGURE I.1
Location of the Town of Herndon with Respect to Tidewater Virginia

I

goals). It also contains development guidelines intended to emphasize protection and integration of the natural environment on development and redevelopment sites (guidelines for "Infill and Redevelopment" and "Adaptive Areas"). During the same period, the Town adopted zoning provisions for protection of the Chesapeake Bay, and established the entire Town as a Resource Management Area with extensive Resource Protection Areas as described under State enabling legislation. Also in 1990, the Town established an aggressive recycling program supported by a staff coordinator. In 1991, the Town adopted a revised master plan for a 58 acre stream valley park named Runnymede. The park master plan envisions a natural park setting with the vast majority of the parkland set aside as a conservation area. The Town also has reviewed and strengthened its stormwater management regulations by adopting the relevant portions of the Fairfax County Public Facilities Manual.

Natural and built features that comprise the Town have experienced successive stages of alteration. Many original forested areas were converted to farmland. Farmland and forest fragments were then converted to development of homes, businesses, roadways, and public facilities. Approximately 70% of remaining forest cover was cleared from the late 1970s through the 1980s.

The Town and its environs have experienced phenomenal growth over the past several decades largely as a result of its location between Washington, D.C. and Dulles International Airport. According to U.S. Census data, the Town grew from 11,449 residents in 1980 to 16,139 in 1990 – resulting in an additional 1,396 housing units in that time period. The Town's 1997 population is estimated at 19,560. Along with growth in population, there has been similar growth in the industrial and commercial sectors as businesses have located in the area. It may be anticipated that future development will result in higher densities as developer pressure mounts on undeveloped or underdeveloped parcels that remain along the Dulles corridor.

Along with development, the Town maintains an abundance of natural resources which benefit both residents and businesses. Several habitat areas have been set aside as natural or semi-natural parks (such as Stanton, Runnymede, and Spring Street parks) while others, including stream valleys, are protected through Town regulations, including the Chesapeake Bay Preservation Ordinance and Floodplain Overlay District.

These areas must be recognized and protected to assure that Town residents continue to enjoy the benefits that these natural areas provide.

Despite the Town's recent accomplishments in protecting its natural resources, many protections were instituted after development. Development within the Town has had a significant impact on the natural environment. And, due to earlier design and construction practices, including clearing and earthwork operations, a portion of developed areas continue to create environmental impacts due to poor runoff water quality.

In order to plan for future development and redevelopment that complements the natural resources of the Town, it is necessary to identify and understand the existing natural environment, how it has changed over the past few decades, and where it will be in the future if present trends continue. The following section provides a summary of natural resources and environmental features that are unique to Herndon as well as those which are shared with its neighbors – Fairfax County and Loudoun County.

Environmental features affecting or affected by water quality that are covered in this section include the following:

- Climate and Precipitation
- Natural Habitats
- Topography
- Geology and Soil Characteristics
- Watersheds and Water Resources
- Groundwater Resources
- Wetlands

I.1 Climate and Precipitation

The climate of the Town, based on climatological data collected at nearby Dulles International Airport, is generally temperate, but relatively humid, with an average annual rainfall of approximately 40 inches per year. Precipitation is fairly well distributed throughout the year although frontal storms which may produce torrential downpours and high winds are concentrated in the warmer late-spring and summer months. Summers are warm and winters are relatively mild. The average annual temperature is 53.8° F (four degrees cooler than the average annual temperature at National Airport to the east), with a daily average high of 65.1º F and a daily average low of 42.5º F. The hottest month of the year is July (daily average high of 87.0º) while the coolest month of the year is January (daily average high of 40.1º). Snowfalls of 4 inches or more occur only twice each winter on average and accumulations of greater than 20 inches are extremely rare.

I.2 Natural Habitats

Long before Herndon experienced its most recent surge of development, much of the indigenous vegetation of the area was cleared for agricultural purposes, commercial and industrial uses within the Town, roads, and scattered homes. However, parcels of open and undeveloped land, utility line rights-of-ways, and stream valleys, in combination with suitable forms of development, have resulted in a limited, yet remarkably resilient wildlife habitat known to ecologists as "typical suburban." While the Town has maintained a good urban tree cover and enough parks and open space to provide habitat to many terrestrial animals and birds, the bulk of the Town's wildlife habitat is located along the green corridors associated with Sugarland Run, Folly Lick Branch, and their associated stream valley parks.

According to a 1997 study by the Metropolitan Washington Council of Governments (MWCOG) entitled *Rapid Stream Assessment Technique Survey of the Sugarland Run Watershed*, most of the Sugarland Run mainstem within the Town is protected by a treed buffer of over 100 feet and has a mean canopy cover (providing shade) of over 60%. This places the corridor in the "good" range for riparian habitat condition. The notable exception is that portion of Sugarland Run from the Dulles Toll Road to Elden Street. This portion of Sugarland Run has a low mean tree canopy cover (29%, or "fair") primarily due to a complete lack of canopy cover from the Dulles Toll Road to just before the W&OD Trail.

FIGURE I.2
Folly Lick Branch Habitat Corridor

A 1974 survey of the Sugarland Run/Horsepen Creek watersheds found that remaining species of flora were consistent with the local geology. Piedmont upland hardwood forests, consisting largely of oak, hickory, beech, tulip poplar, and maple, still covered 21% of the watershed at the time of the survey.

A recent floral survey of Runnymede Park by volunteers of the Maryland and Virginia Native Plant societies and the Runnymede Rangers identified

over 250 native plant species, as well as 11 exotic species. This is an ongoing survey. Runnymede Park has been nominated as a Virginia Native Plant Society (VNPS) Registry site by the Potowmack Chapter of the VNPS, due to the diversity of species and habitat types in the park area.

The park contains a diabase glade plant community that is a State endangered habitat type. The four acre meadow is an outstanding natural asset, and includes plant assemblages typical of Eastern wet meadow and prairie communities.

Records maintained by the Virginia Department of Conservation and Recreation, Division of Natural Heritage (DNH), reveal the presence of many species which still call the Sugarland Run watershed home. Among these are twenty-two different species of fish, several types of frogs, salamanders, and toads, three species of turtle, and over a dozen species and subspecies of snake (including the poisonous copperhead). Over 100 species of birds have been confirmed as breeding or courting within the Sugarland Run watershed. A publication entitled "Birds of Runnymede Park" provides information on over 116 species of birds observed by local birders in that park in 1995. "Edge" species of mammals such as deer, squirrel, beaver, muskrat, and fox also inhabit the area.

MWCOG's 1997 effort also included an assessment of Sugarland Run's macroinvertebrate (without backbone) population as a means of assessing the stream's overall ecological health. The mainstem of Sugarland Run was examined for the abundance and diversity of macroinvertebrates with particular attention given to the presence of relatively pollution-intolerant species such as flathead mayflies, stoneflies, and cased caddisflies. All portions of the Sugarland Run mainstem within the Town were found to be in the "good" range for overall community condition. However, the relatively low number of pollution-intolerant species found compared to an undisturbed watershed confirms that human activity in the Sugarland Run watershed has taken a toll even within the Town's relatively undisturbed stream valleys.

The DNH also maintains records on the general location and occurrence of endangered species of wildlife or vegetation in the Northern Virginia region. According to the DNH, there are no records of federal or State endangered species in or immediately bordering the Town. However, the presence of threatened and endangered species has been confirmed within other parts of the Sugarland Run watershed. Therefore, while DNH records do not currently contain information to document the presence of endangered or threatened species within the Town, it is possible that they reside undetected within the Town's quiet stream valley parks. Some threatened and endangered species in the Sugarland Run watershed and its environs include the Bald Eagle (federally endangered), Earleaf Foxglove (federal candidate), Wood Turtle (State threatened), Brown Creeper (State candidate), Common Moorhen (State candidate), and Yellow-Crowned Night-Heron (State candidate). Brown Creepers and Yellow-Crowned Night Herons have been observed occasionally, but regularly, in Runnymede Park, through 1996, when experienced volunteer observers were no longer available. Both species were observed during 1997, but breeding and courting has not been confirmed. The diabase plant community is an endangered State habitat type.

I.3 Topography

Most of the Town is characterized by low, gently rolling hills with elevations ranging from about 260 feet above sea-level where Folly Lick Branch and Sugarland Run exit the Town limits, to slightly more than 420 feet above sea-level in the Benicia Estates and Broad Oaks neighborhoods in western Herndon (see Figure I.3). Steeper slopes are found along many stream banks and on hillsides in some areas. Folly Lick Branch and Sugarland Run form two well defined valleys which traverse the Town roughly from the southwest to the northeast. A series of hills and ridges, which run through the center of Town (roughly mirroring Dranesville Road) separates the valleys until they converge where Folly Lick Branch empties to Sugarland Run just north of the Town. Smaller tributaries branch out from Folly Lick Branch and Sugarland

FIGURE I.3
Topographic Map of the Town of Herndon

Contour Interval = 10 feet.

SOURCE:
U.S. Geological Survey, Herndon Quadrangle Map: 1982.

Run, cutting smaller valleys and ridges into the landscape.

I.4 Geology & Soils Characteristics

Among all the natural features of the Town, none have as inherently significant an impact on development potential, natural habitat, and eventually water quality as geology and soils. Land is the foundation of most human activities, and the characteristics of the underlying geology and soils often dictate what type of activity is appropriate or feasible for a particular site. Improper development on sensitive soils can easily result in soil erosion which contributes to downstream siltation problems and creates long-term difficulties for structures built upon these soils.

GEOLOGICAL FEATURES – The Town of Herndon is within the Piedmont physiographic province of Virginia in an area known as the Piedmont Lowlands. The Piedmont was formed

by fragments of continental and oceanic crust that were pushed together by a series of tectonic plate collisions and separations.

The geology of the Piedmont is very complex. The rocks were folded, faulted, and altered. The depression where Herndon is located was a fresh water lake during the Triassic period. Most of the surface rocks were deposited in this lake and consist of conglomerate, sandstone (some quartzite), shale, and siltstone. In the north part of Herndon (Barker Hill and Dominion Ridge subdivisions), there are remnants of older metamorphic rocks (schist). A period of volcanic activity followed the sedimentation. The surficial rocks were intruded by an intricate network of diabase sills (volcanic intrusions parallel to bedding planes of sedimentary layers) and dikes (volcanic intrusions that cut across bedding planes). These intrusions baked and hardened the sedimentary rocks where the hot igneous rocks came in contact with the sediments.

The hardened sandstones (quartzites) and igneous diabase rocks are very resistant to weathering and have been the dominant factors in controlling the topography of Herndon. Differences in erosion rates of the underlying rock types have shaped the modern drainage patterns and topographic contours of the landscape.

SOIL FEATURES – Soils serve as the lifeblood of the ecology as well as the most basic of building material for roadways, embankments, and building foundations. Management of soils is important to ensure that development does not result in excessive soil erosion and sedimentation. Areas consisting of shrink-swell clays (such as the Orange soils group), highly permeable and erodible soils, hydric soils, low depth to groundwater, wetness, and a number of other sensitive soil characteristics also require special consideration in an urban environment. In addition to development considerations, soil characteristics also affect the types of indigenous vegetation that thrive in the Town.

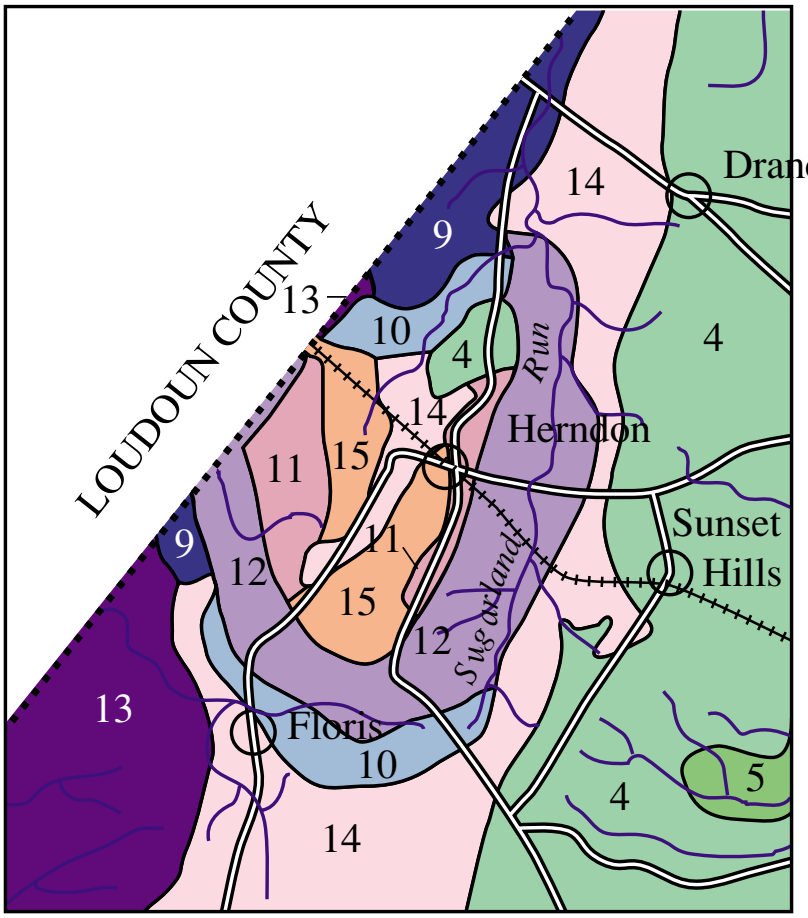
Two detailed soils maps, the *Soil Survey of Fairfax County, Virginia* (1963) and the *Soils Identification Map of Fairfax County* (1972), provide information on the types of soils found within the Town and their general characteristics. Most soils within the Town have been permanently altered or disturbed by development. Therefore, while general observations are possible, site specific soil exploration and tests are necessary for development and foundation engineering purposes.

Soils within the Town are typical of those formed from the Piedmont Lowland and the primary parent materials for most of the Town's soils are sandstone and diabase. Associations of soils found within the Town include Calverton-Brecknock-Croton, Penn-Bucks-Calverton, Kelly-Brecknock-Catlett, Brecknock-Catlett-Croton, and Glenelg-Eliok-Manor. Each of these broader soils associations are divided into more specific soils types.

The preponderance of soils within the Town are suitable to most types of development if proper soil conservation measures are implemented. However, large areas may be constrained due to high water table and rocky terrain. These features may preclude the construction of basement areas. In addition, some soils have a soft, plastic clay subsoil which requires special considerations for building footings. A local example is the Orange soils group, which is found abundantly throughout the Town. These soils, when saturated with water, become soft, plastic, and sticky and have a very low value of support. When the clay dries, it shrinks, which can cause footings to break and house walls to crack. While problems can be avoided in many instances by anchoring building footings to the underlying weathered parent rock, and excavating the shrink-swell soil within three feet of the foundation and replacing it with granular, well-drained soil, it is important that these areas are recognized for their limitations.

By steering inappropriate development away from sensitive areas, the Town can avoid future costs to taxpayers associated with property damage as well as the costs of correcting damage to the ecology and to water quality. A generalized map of soils associations found in the Herndon vicinity is presented in Figure I.4. Constraints to

FIGURE I.4
General Soils Map of the Town of Herndon



SOIL ASSOCIATIONS

Soils on Crystalline Rock in the Piedmont Upland

(4) Glenelg-Elioak-Manor
(5) Manor-Glenelg-Elioak

Soils on Sandstone, Shale, and Conglomerate of the Piedmont Lowland

(9) Penn-Calverton-Croton
(10) Brecknock-Catlett-Croton
(11) Kelly-Brecknock-Croton
(12) Irdell-Mecklenburg-Rocky Land
(13) Calverton-Readington-Croton
(14) Penn-Bucks-Calverton (Sandy)
(15) Calverton-Brecknock-Croton (Loams)

Map digitized directly from "General Soil Map of Fairfax County, Virginia." Information is for display and general reference purposes only.

SOURCE:
U.S. Department of Agriculture, Soil Conservation Service. *Soil Survey of Fairfax County*. May, 1963.

development posed by geology and soils characteristics are further discussed under II CONSTRAINTS TO DEVELOPMENT.

I.5 Watersheds & Water Resources

The watershed is the most important way of viewing the land from a water quality standpoint. Political jurisdictions do not often follow watershed boundaries and actions that negatively affect water quality in one jurisdiction will ultimately result in reduced water quality for downstream neighbors. This highlights the need for local, regional, and State coordination in the water quality planning process.

The Town is divided into two major watersheds (defined by the Virginia Division of Soil and Water Conservation) – Sugarland Run (watershed #A10) and Broad Run (watershed #A09) – both of which drain to the Potomac River and eventually the Chesapeake Bay. The Broad Run watershed covers approximately 0.6 square miles of the southwestern portion of the Town. Horsepen Creek is the tributary of Broad Run which drains this area of the Town.

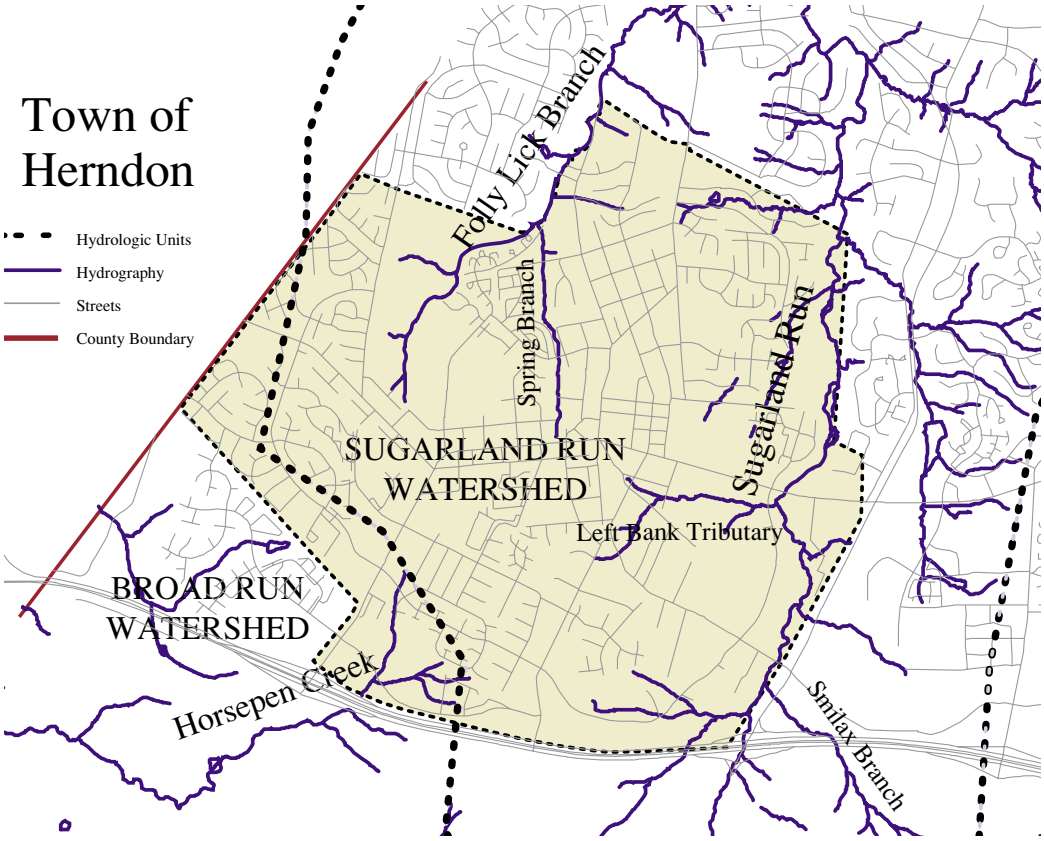
The Sugarland Run watershed drains the remaining 3.6 square miles of the Town. Sugarland Run begins in the Reston area of Fairfax County and flows approximately 9 miles, through the eastern edge of the Town, to the Potomac River in Loudoun County. The stream channel of the Town's

portion of Sugarland Run is fairly steep and very well defined, with main channel gradients averaging from 35 to 50 feet per mile. Low water stream channels have nearly vertical banks varying from 1 to 5 feet in height. Stream bed materials generally range from sand and gravel, to cobblestones and boulders, and extensive diabase outcrops in some areas. Slower reaches of the stream are particularly prone to silt deposits from upstream erosion, which smother bottom dwelling aquatic species.

Folly Lick Branch, a major tributary of Sugarland Run which has similar stream morphology, has its headwaters near Mosby Heights and drains the western portion of the Town. Folly Lick Branch empties into Sugarland Run to the northeast of the Town. Figure I.5 shows the delineation of streams and major hydrologic units within the Town.

Land use within the Sugarland Run watershed is primarily residential, with attending commercial and business sectors. Heavy and light industrial uses are also present in the watershed, which extends well beyond the Town boundary. At one time, both Sugarland Run and Folly Lick Branch were fed by a number of small tributaries cutting through the landscape. With development, however, many of these small tributaries have been bulldozed or covered and turned into storm sewers. All of these man-made structures – piped

FIGURE I.5
Streams and Hydrologic Units of Herndon and Vicinity



SOURCE:
Hydrologic Unit Maps for Fairfax County, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation. 1995

streams, swales, storm drains, and storm sewers – that are built to handle stormwater are integral to water quality protection efforts within the Town because they eventually connect to the Town's natural stream channels. Piped streams are fed by storm drains, which collect water from highly impervious, and often polluted, surfaces such as streets, parking lots, and driveways. In addition, many people carelessly use storm catch basins as a convenient way to dispose of unwanted used oil, paints, litter, antifreeze, etc. As a result, all the Town's waterways – natural and man-made – must be the subject of the Town's water quality protection efforts.

Both the Sugarland Run and Broad Run watersheds are identified as high priority by the Virginia Department of Conservation and Recreation under the *1996 Nonpoint Source Pollution Potential Priorities* guidelines.

STREAMBANK EROSION – As with many urban jurisdictions in Tidewater Virginia, streambank erosion in the Town has been identified as a major concern. High density development, both within and outside of Town, has significantly increased impervious surface areas in the watershed. These developments are connected to the nearest floodplain by storm sewers.

At the same time, the natural vegetative cover has been removed. Vegetated areas reduce the flow of surface water, encourage infiltration, and improve water quality by filtering out pollutants. The result is that peak flow during storms has increased and low flow between storms has been reduced because of the lack of adequate groundwater recharge. With the increase in peak runoff from smaller storms (two to ten year storms) the streams are out of equilibrium because the channels do not have capacity to carry the stormwater. The high velocity and turbulence of the water in the stream channel and the increased surface runoff cause several types of erosion. Types of erosion include bank undercutting and meandering, formation of gullies in tributaries, bottom scouring in the stream channels, and development of ancillary channels.

Diabase geological formations prevent significant downcutting of the major stream channels (Sugarland Run and Folly Lick Branch). The gradient of the primary stream can not change rapidly because they have downcut to the diabase intrusions that are very resistant to weathering. However, small tributaries to the major streams that flow through sedimentary rock have downcut rapidly until their gradients have adjusted to the gradients of the major streams or they have downcut to the depth of diabase rock.

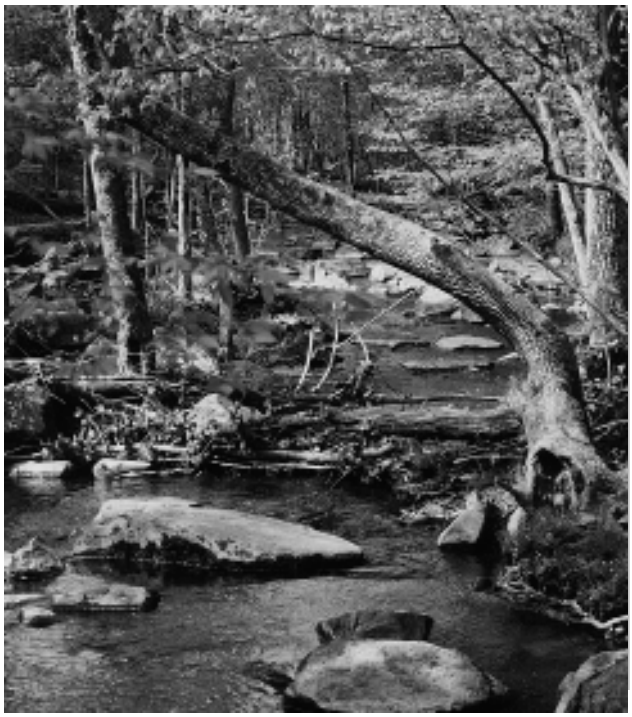
The headwaters and portions of Sugarland Run south of Herndon have been mostly confined to stormwater structures to support development in Reston. During the early 1990's the Fairfax County Parkway was constructed between the Dulles Access Road and the W&OD Trail. Part of the stream channel was confined to box culverts, all the vegetation was removed, and a three-acre beaver pond and wetland area were destroyed for construction of the Parkway. At Planning Commission public hearings in late 1990 and early 1991, promises were made by the Virginia Department of Transportation to construct detention facilities to control the additional peak runoff caused by road construction, and to replace part of the retention and water quality functions of the beaver pond and wetland.

The Department of Transportation did not construct detention facilities in the manner anticipated by the Town. Streambank erosion is also a problem in this area because most of the tree cover was removed and there is nothing to stabilize the banks. The Town is working with Colonial Pipeline Company to correct some of these problems as part of the settlement for the 1993 oil spill in Sugarland Run.

The portion of Sugarland Run between the W&OD Trail and Elden Street flows through Town-owned land. The floodplain is quite wide and forested. The stream meanders extensively through sedimentary materials, but the banks are relatively stable due to the broad floodplain which provides for water storage during peak flows. Beaver fre-

quent this location. This is also the section of stream where the 1993 oil spill entered Sugarland Run. A significant amount of the native trees, shrubs, and forbs (herbs other than grasses) were killed. These losses were documented by the Town for the Natural Resource Damage Assessment, but no replacement plantings were offered in settlement. Therefore, invasive exotic plants have colonized, replacing the more effective and useful native species and degrading the area for wildlife habitat and human recreation.

FIGURE I.6
View of Sugarland Run



Streambank stability varies along Sugarland Run between Elden Street and the north end of Stuart Woods apartments. Some erosion problems have been observed at the bridge within the Stuart Woods development and bank erosion is pronounced at the north end of the apartment complex.

Bank erosion continues north into Runnymede Park with undercut banks ranging from three to five feet in height. The stream is in the early stages of developing turns, or meanders. Sand and gravel bars are occurring on the inside of bends, and undercutting is appearing on the outside of bends. Undercutting is retarded by the clay content of the banks and tree roots, but observable widening has occurred during the past decade. Some local bottom scouring is present where temporary obstructions produce additional turbulence. Runoff from the Herndon Parkway is causing additional problems that affect Sugarland Run as well as areas between the Herndon Parkway and Sugarland Run. A pronounced gully has formed where the parkway drains into the southern end of Runnymede Park. Surface water then flows through hardwood forest by a combination of sheet flow and small newly-formed channels and reaches Sugarland Run through a series of small but expanding gullies.

The stream is controlled by a diabase intrusion through the central portion of Runnymede Park, from a point aligned with Creekbend Drive (Reston) to a little north of the Hunters Creek Clubhouse. No significant downcutting can occur in this portion of the stream or the immediate upstream portion because of the resistance of the diabase intrusion. There are, however, several places where new ancillary channels are being formed by floodwater above the primary stream channel.

Over time, the ancillary channels may deepen and provide additional conveyances for water during normal flow. An example of this process at a more advanced stage is near the Hunters Creek Clubhouse, where several channels carry water during normal flow stages of the stream. East of the Clubhouse, the floodplain was severely constricted by fill material during subdivision development. This has resulted in significantly increased water velocity during peak flows. The fill feature is prominent on the map in Figure II.1(B).

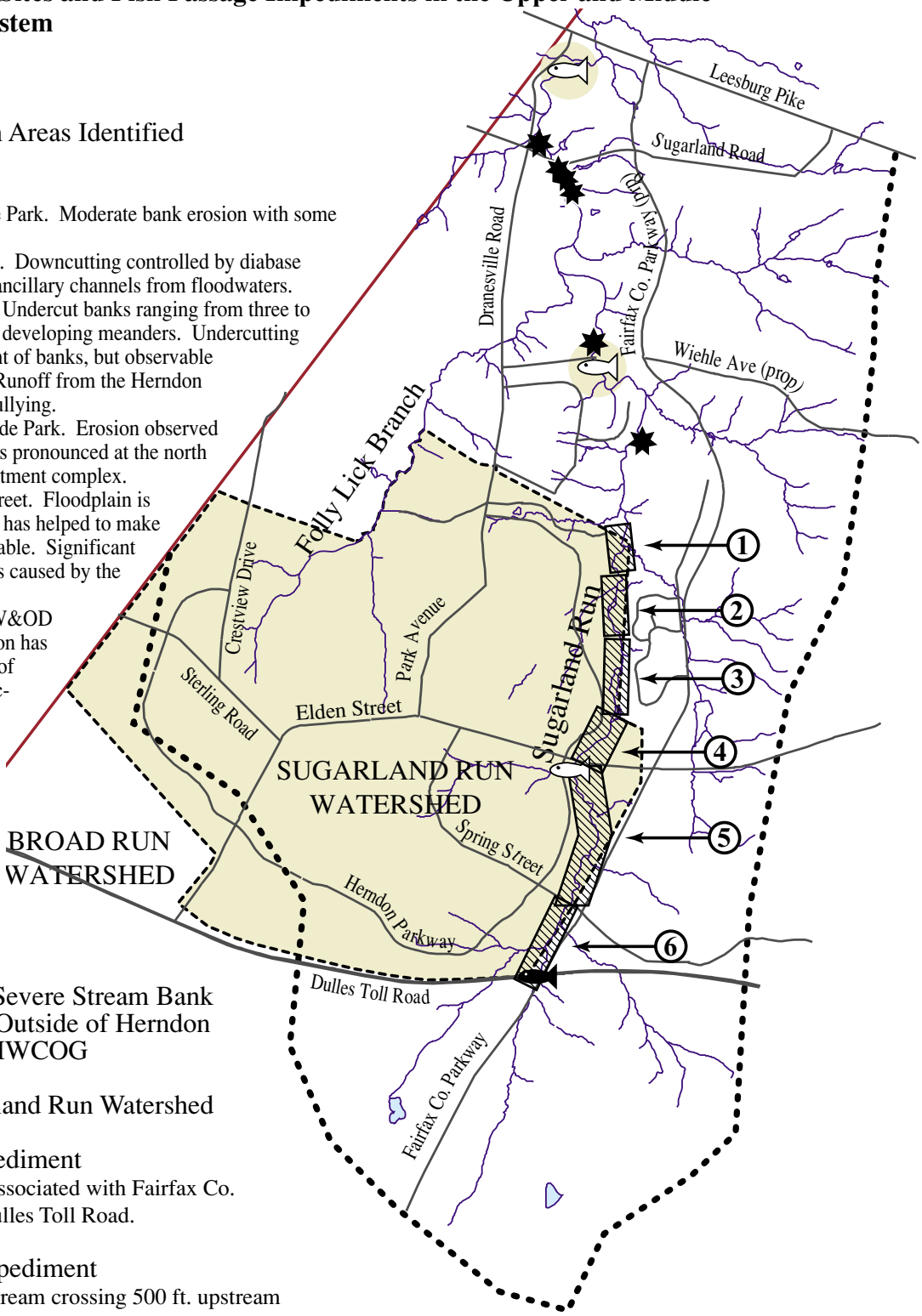
In the north end of Runnymede Park, Sugarland Run again flows through sediments. The floodplain is quite wide on both the Herndon and Reston sides of the stream. Moderate bank erosion is occurring in this area with some meandering. Wetlands consisting of a wet meadow, marsh, and

FIGURE I.7
Streambank Erosion Sites and Fish Passage Impediments in the Upper and Middle Sugarland Run Mainstem

KEY

Stream Erosion Areas Identified in Text

(1) North end of Runnymede Park. Moderate bank erosion with some meandering.
(2) Central Runnymede Park. Downcutting controlled by diabase intrusion. Formation of ancillary channels from floodwaters.
(3) South Runnymede Park. Undercut banks ranging from three to five feet. Early stages of developing meanders. Undercutting is retarded by clay content of banks, but observable widening has occurred. Runoff from the Herndon Parkway has produced gullying.
(4) Elden Street to Runnymede Park. Erosion observed at bridge. Bank erosion is pronounced at the north end of Stuart Woods apartment complex.
(5) W&OD Trail to Elden Street. Floodplain is wide and forested, which has helped to make this segment relatively stable. Significant damage to vegetation was caused by the 1993 oil spill.
(6) Dulles Toll Road to the W&OD Trail. Stream bank erosion has occurred due to removal of tree cover and the destruction of wetlands during construction of the Fairfax County Parkway.



Moderate and Severe Stream Bank Erosion Areas Outside of Herndon Identified by MWCOG

Limit of Sugarland Run Watershed

Total Fish Impediment
- Box culvert associated with Fairfax Co. Pkwy. and Dulles Toll Road.

Partial Fish Impediment
- Abandoned stream crossing 500 ft. upstream of Elden Street.
- Beaverdam located appx. 1,000 feet upstream of proposed Wiehle Ave.
- Log jam appx. 450 ft. upstream of Hughes Branch/Sugarland Run confluence.

Streambank erosion areas outside of Herndon and fish impediments identified by Metropolitan Washington Council of Governments, *Rapid Stream Assessment Technique (RSAT) of the Sugarland Run Watershed – Phase I: Sugarland Run Mainstem.* Washington, D.C.: 1997.

emerging swamp are adjacent to the stream on the west side and floodplain hardwood forest is on the east side.

Throughout Sugarland Run within the Runnymede Park sections, increasing undercutting and bank erosion are evidenced also by increasing loss of trees over the past ten years. The greater numbers of trees blocking the channel reduces the stream velocity during peak flows, but the debris also traps sediments and creates additional turbulence.

RIPARIAN BUFFER AREAS – A natural, undisturbed, mature vegetated forest buffer is among the most effective means of protecting water quality and aquatic habitats from the impacts of land use development. As noted previously, most of the Sugarland Run mainstem within the Town limits is protected by a buffer of greater than 100 feet. The notable exception is that portion of Sugarland Run from the Dulles Toll Road to the W&OD Trail where there is a complete lack of tree canopy cover. As a general rule, lack of canopy cover can result in elevated stream temperatures during the summer months that may render the stream uninhabitable by many aquatic species.

While restoration of denuded buffer areas should be a major goal of the Town's Chesapeake Bay protection efforts, much of the Town's polluted stormwater is piped directly from streets and other impervious surfaces via culverts and stormdrains. Because these stormdrains effectively bypass the benefits provided by vegetated buffers, additional water quality protection measures must be implemented to address these sources of pollution.

FISH PASSAGE IMPEDIMENTS – According to MWCOG's 1997 study of the Sugarland Run mainstem, there are a total of six identified fish passage barriers. Four of these barriers are located in the upper and middle mainstem (see Figure I.7). Only one barrier, located upstream of Elden Street, is within the Town limits. All but one of the fish impediments are classified as partial blockages. A culvert associated with the Fairfax County Parkway and Dulles Toll Road is the only blockage considered to be complete.

Addressing fish barriers is important in order to maintain and promote biological diversity and provide migratory fish with access to historic habitat and spawning grounds. Overcoming obstructions to fish passage is a long-range goal of the State's Department of Game and Inland Fisheries as outlined in "2003: A Vision for the Future" (1993).

WATER QUALITY – Protecting the quality of surface water is a major challenge for many urban jurisdictions including Herndon. The removal of tree canopy cover (which serves to cool and protect a stream) during development as well as an increase in impervious surface area draining to local streams have a generally negative effect on stream water quality. Water quality may be decreased by runoff laden with pesticides and fertilizers from adjacent lawns or by runoff from parking lots which may contain nutrients, heavy metals, pathogens (bacteria), and hydrocarbons (oil and grease). Other factors which must be taken into consideration include illegal dumping into storm drains, trash and litter, leaking above-ground and underground storage tanks, and potentially, leaking sanitary sewer lines.

Long term water quality in Sugarland Run and Folly Lick Branch is monitored by the Fairfax County Health Department. In addition, grab-sample water quality monitoring was performed by the MWCOG during late 1996 and early 1997 and specifically for fecal coliform bacteria by the Town's Department of Public Works in August and September of 1997. Water quality standards, which are used to measure the effectiveness of the Town's water quality efforts, are set under the federal Clean Water Act (CWA), which is administered in Virginia by the Department of Environmental Quality – Water Division (DEQ-WD).

The Town's two major streams, Sugarland Run and Folly Lick Branch (as well as the Town's three other named streams including Spring Branch, Left Bank Tributary, and Horsepen Creek), are classified as Class III (non-tidal streams in the Coastal and Piedmont zones) under the CWA. All State waters are expected to be maintained to support recreational use and the propagation and

TABLE I.1
Virginia Water Quality Standards for Class III Waters and Summary of 1996 Water Quality Data for Folly Lick Branch and Sugarland Run

TEST PARAMETER	FOLLY LICK BRANCH	SUGARLAND RUN	VIRGINIA WATER QUALITY STANDARD
Temperature (average)	76°F*	76°F*	Max 89.6°F
pH (average)	7.1	7.2	6.0-9.0
Fecal Coliform (geometric mean)	969fc/100ml	899fc/100ml	Max 200fc/100ml
Dissolved Oxygen (average)	8.5 mg/l	8.9 mg/l	Min Daily Avg 5.0 mg/l
Total Phosphorus (average)	0.1 mg/l	0.1 mg/l	See Notes.
Nitrate Nitrogen (average)	2.2 mg/l	1.5 mg/l	See Notes.

SOURCE:
Fairfax County Health Department, *Fairfax County 1996 Stream Water Quality Report*, 1997.
Virginia Water Control Board. Virginia Water Quality Assessment for 1996: April, 1996.

NOTES:
Temperature: Temperature data only available as County-wide annual average high.
Fecal Coliform Standards: According to the Commonwealth of Virginia State Water Control Board Regulations, "The fecal coliform bacteria shall not exceed a geometric mean of 200 fecal coliform (fc) bacteria per 100 ml of water for two or more samples over a 30 day period, or a fecal coliform bacteria level of 1,000 per 100 ml at any one time." A waterbody is considered to not support Clean Water Act (CWA) goals if more than 25% of samples exceed 1,000 fc/100 ml. A waterbody is considered to partially support CWA goals if between 10 and 25% of samples exceed 1,000 fc/ 100ml. See Figure I.8 for additional data on Sugarland Run.
Dissolved Oxygen: According to VR680-21-01.5, the minimum instantaneous DO level for a Class III stream (Sugarland Run and Folly Lick Branch) is 4.0 mg/l. The daily average minimum DO level is 5.0 mg/l.
Total Phosphorus and Nitrate Nitrogen: Virginia has not set a standard for these parameters for free flowing streams. However, unpolluted water seldom exceeds 10 mg/l for nitrate nitrogen. Variations of the phosphorus content in water may help determine possible trends and sources of pollution.

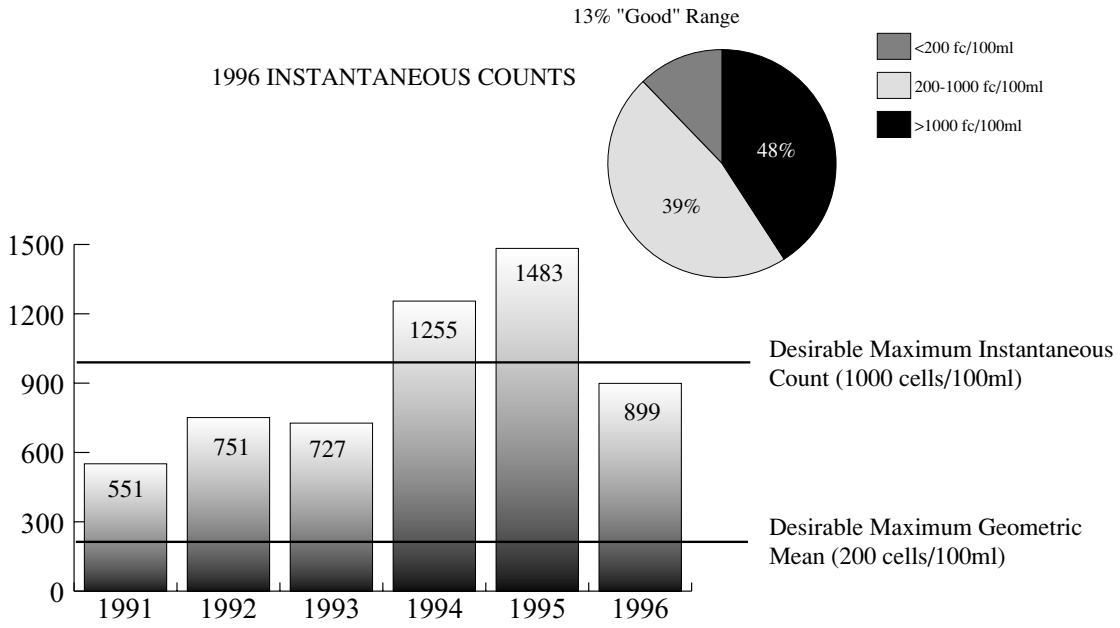
growth of all aquatic life reasonably expected to inhabit them. These are known as the CWA swimmable and fishable goals. The parameters used to determine these are minimum and daily average dissolved oxygen content (DO), $_{p}$H (alkalinity/ acidity), maximum temperature, and fecal coliform bacteria level.

Fecal coliform levels are the most important from a human health standpoint. These indicator organisms, while not necessarily harmful in themselves, are found in the intestinal tracts of warmblooded animals, including humans, and therefore can be indicative of fecal contamination and the possible presence of pathogenic organisms.

Dissolved oxygen is a primary surrogate parameter indicating the general health of an aquatic ecosystem. The presence of DO in water is essential for aquatic life and the type of aquatic community is dependent to a large extent on the concentration of DO present.

Temperature and $_{p}$H are other indicators of the health of the aquatic ecosystem. Strongly related to $_{p}$H are biological productivity, stream diversity, and the toxicity of certain chemicals, as well as important chemical and biological activity. Temperature affects feeding, reproduction, and the metabolism of aquatic animals. A week of high temperatures each year may make a stream unsuit-

FIGURE I.8
Levels of Fecal Coliforms in Sugarland Run Water Samples – 1991 through 1996



SOURCE:
1996 Stream Water Quality Report, Fairfax County Health Department, Division of Environmental Health, 1997.

able for sensitive aquatic organisms, even though temperatures are within tolerable limits throughout the rest of the year. Table I.1 presents the minimum water quality standards for Class III waters.

The Fairfax County Health Department maintains two testing sites just outside the Town limits at Folly Lick Branch near Hiddenbrook Drive (Site #02-02) and Sugarland Run at Leesburg Pike (Site #02-03). Therefore, the water quality information described below is a result of runoff from the Town, the extensive residential areas north of the Town, and the Dulles Toll Road and Fairfax County Parkway. Fairfax County's stream water quality program began in 1969 and now includes a network of 72 sampling sites throughout the County. The presence of this network is invaluable from a comparative standpoint. In 1996, 23 samples were taken of water in Folly Lick Branch and Sugarland Run. Sample parameters include those for Virginia Water Quality Standards as well as other important water quality standards including total phosphorus, nitrate nitrogen, and heavy metals.

As presented in Table I.1, pH, DO, and temperature for Sugarland Run and Folly Lick Branch generally fall within the Virginia Water Quality Standards. pH in the Sugarland Run watershed has generally been stable (1991 to 1996). Levels of nitrate nitrogen and total phosphorus, while above what is considered to be normal for unpolluted waters, have been relatively stable, indicating that long term management of these pollut-

ants may be effective. Unpolluted waters generally have a nitrate nitrogen level below 1.0 mg/l and levels above 10.0 mg/l are considered unsafe for drinking water. Phosphorus levels higher than 0.03 mg/l contribute to increased plant growth and levels higher than 0.1 mg/l may stimulate eutrophication.

Eutrophication, i.e., the excessive growth of attached and planktonic plants, is the result of too many nutrients entering the Chesapeake Bay. Excess nutrients result in massive algae blooms, which block sunlight and deplete oxygen content during decay. Because aquatic life requires dissolved oxygen and sunlight to survive, reducing the amount of phosphorus, and particularly nitrogen, entering the Chesapeake Bay has been the main focus of Bay restoration efforts.

Average fecal coliform counts, however, are well above the limits of what is considered to be in the "good" range of less than 200 cells/100ml. Fairfax County's monitoring program shows that for the monitoring year 1996, only 13% of Sugarland Run samples tested in the "good" range for fecal coliforms and another 39% of samples tested between 200 cells/100ml and 1,000 cells/100ml. 48% of samples were found to be above the 1,000 cells/100ml swimmable and fishable standards. A trends analysis shows that fecal coliform contamination in the watershed is rising, although 1996 saw a decrease from an all time high of 1,483 cells/100ml in 1995. While increases in Folly Lick Branch are less dramatic (from 533 cells/100ml in 1991 to 969 cells/100ml in 1996), the general trend remains alarming.

In August and September of 1997, the Town Department of Public Works sampled water quality for fecal coliform bacteria from several areas of Sugarland Run, Folly Lick Branch, and Spring Branch. These tests demonstrate the inherent seasonal and locational variability of fecal coliform bacteria contamination. While six samples taken from Sugarland Run and Folly Lick Branch (from the golf course south) had fecal coliform counts significantly less than 200 cells/100ml (well within the good range), one sample from Spring Branch (north of Third Street) and two samples from Folly Lick Branch (north of the Herndon Parkway to the Town line) fell within the fair to poor ranges.

In addition to indicating potential human health problems, increasing fecal coliform levels are also a concern because fecal matter contributes significantly to downstream nutrient pollution problems.

The two primary sources of fecal contamination in urban areas are leaky antiquated sewer lines and fecal matter from household pets (as a result of curbing dogs and ignoring local "pooper scooper laws). Fecal matter may also become a problem where domestic or wild fowl take up residence in large groups (such as is often the case on a golf course or in a BMP facility). Fowl can kill vegetative cover and compact the soil, leaving the local water course defenseless against animal waste laden runoff. Other sources of fecal coliforms include malfunctioning and abandoned septic systems and possibly the illegal dumping of septic waste. Spot sampling performed by the Town within Herndon's limits has been unable to confirm the extent of fecal coliform contamination developed by monitoring points taken by Fairfax County. Periodically, additional sampling will take place in order to confirm the results being received at County monitoring points.

Town sewer mains are recognized as a potential source for fecal contamination. However, other than infrequent commercial spills, Town inspection of the sewer lines has failed to reveal any overt leakage into the stream system. The Town has an extensive infiltration and inflow (I&I) program which consists of regular surveillance and repairs of the sanitary conveyance systems through the use of Insituform and other main improvement methods. Over the last 12 years, the Town has rehabilitated 22,400 feet (4.2 miles) of sewer main with Insituform. An additional 3,500 feet of main is scheduled for relining during fiscal year 1999.

It is the opinion of the Town that the most likely source of fecal coliform contamination comes from animal waste. It is either dumped or enters

the stream from surface runoff via the storm drainage system. Another potential source would be from extensive septic fields located outside of the Town's eastern boundary.

Testing for heavy metals in 1996 indicated no contamination of stream water by cadmium, mercury, or silver. Small quantities of arsenic, barium, lead, chromium, and selenium were detected; however detection levels were far below what is considered to be safe under Preliminary Maximum Concentration Levels (PMCLs) set by the U.S. EPA.

In late 1996 and early 1997, the MWCOG, as part of its Sugarland Run mainstem assessment, tested for pH, DO, turbidity, total dissolved solids, substrate fouling, nitrate, and fluoride. Results indicated that overall water quality is only in the "fair" range for most of the Sugarland Run mainstem within the Town, with the area from the Dulles Toll Road to Elden Street experiencing overall "poor" water quality (see Figure I.10). Spot fluoride tests having concentrations over 0.3 mg/l found between Creekbend Drive and Old Hunt Way may suggest the presence of sewage or treated water in the stream. This should be verified using background checks of groundwater, potable water, and sewage in the area.

In March 1998, the Town's Department of Public Works completed an extensive television inspection survey of the Folly Lick Branch and Sugarland Run sanitary trunk lines. This survey covered over 14,000 feet of sanitary main within the Town's boundaries. The results of the survey revealed no evidence of sewer main exfiltration. However, small amounts of groundwater infiltration are occurring in several areas. The Department of Public Works took immediate action and restoration work still continues on all infiltration sources.

POTABLE WATER SUPPLY AND PROTECTION – Herndon relies on the Potomac River for its municipal water supply. There is one known privately owned well within the Town, which is used for irrigation. The Town also has three wells, which are used only for irrigation at the golf course. All other existing development is connected to the municipal water system. All new development is required to be connected to the municipal water system.

The Town purchases its water from the Fairfax County Water Authority (FCWA). The FCWA maintains two water treatment plants (WTPs), one on the Potomac River in Loudoun County (Corbalis WTP) and one on the Occoquan Reservoir (Lorton WTP). It is anticipated that water from these sources will be more than adequate to meet the Town's needs in the future.

The Town's water supply is among the best protected in the Commonwealth. The Town's primary water supply is received from the Corbalis water treatment plant. This water treatment facility has been upgraded for quantity and quality during the past few years. Water treatment now includes ozonation to reduce the amount of chlorine required and carbon filters. During emergencies, such as the 1993 oil spill that caused the Corbalis plant to close for several days, the Town receives its water from the Occoquan Reservoir. By cooperative agreement under the Occoquan Basin Nonpoint Pollution Management Program (established in 1978), the entire Occoquan Reservoir watershed has been subject to Best Management Practices to control nonpoint source pollution since the early 1980s. In addition, large areas of the Occoquan Reservoir watershed have been downzoned to protect the watershed from large areas of impervious surfaces. Water quality monitoring for a wide array of parameters is conducted on a routine basis by the Occoquan Watershed Monitoring Lab to ensure that the reservoir remains safe as a drinking water supply.

I.6 Groundwater Resources

The groundwater aquifer of the Town consists of the sandstones and shales, and to a lesser extent the diabase intrusions, of the Piedmont Lowland. The Town no longer relies on groundwater for its source of potable municipal water. The Town abandoned its municipal well system and now relies on surface water withdrawals from the Poto-

mac River (primary source) and the Occoquan Reservoir (for emergency use). Groundwater protection is still important in that many of the streams of the region normally should be fed by groundwater, especially during periods of extended dryness. Groundwater is extremely dynamic, and groundwater contamination can spread rapidly. Once contamination has occurred, mitigation is very expensive and time consuming.

While groundwater is dynamic, natural groundwater characteristics are fairly stable over time because they are dictated by the chemical and structural characteristics of the local aquifer. An analysis of municipal wells dug for the Town of Herndon between 1931 and 1958 reveals that wells yielded 25 to 100 gallons per minute (gpm), which is considered to be in the "good" range. These wells (200 feet to 420 feet deep), however, were much deeper than average household wells, which on average, produced only 10 gpm or less during the same time frame. More recent studies confirm that the groundwater yield of shales and sandstones found in the Town can be expected to be within the fair to poor range (average of 11 gpm). In diabase intruded areas of the Town, yields are generally expected to be even lower.

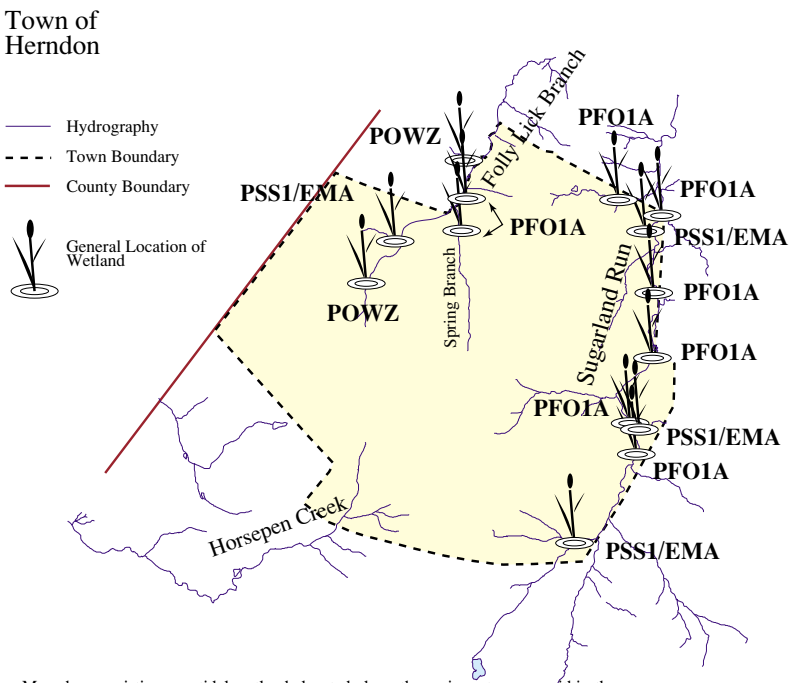
Groundwater within the Town is generally hard (hardness ≥120 mg/l) to very hard (≥180 mg/l), slightly alkaline, high in dissolved solids, and may at times exceed the limits of U.S. EPA standards (Secondary Maximum Contaminant Levels, or SMCLs) for some constituents. High concentrations of sulfate (>250 mg/l) are common problems with deeper wells and directly correspond with high concentrations of dissolved solids. Iron, which may be objectionable at levels above 0.3 mg/l, is found in most of the groundwater drawn from the Piedmont Lowlands. Excessive iron causes stains in laundry, cooking utensils, and porcelain fixtures and also may impart an objectionable taste and color to food and beverages. Excessive levels of manganese may also occur in groundwater withdrawals. It should be noted that groundwater characteristics within the Town vary depending on the location and depth of the well.

Overall, groundwater from sources in the Herndon area are suitable for domestic, public, industrial, and irrigation purposes with proper treatment.

I.7 Wetlands

The value of wetlands in urban areas has only recently become recognized. In the not too distant past, wetlands were viewed as nuisances and filling of wetlands was considered an improvement. To the contrary, wetlands serve as important habitat for a wide range of plants and animals and are vital as a means of buffering and

FIGURE I.9
Approximate Location of Herndon's Wetlands



Map shows existing non-tidal wetlands located along the main waterways within the Town. Waterways were walked over a period of two days in February, 1998. Measurements for exact boundaries were not conducted. U.S. Fish and Wildlife Service National Wetlands Inventory Maps and Wetland Identification were utilized for the map and identification. Non-tidal wetlands in other areas of the Town were not identified and are normally identified during the site plan review process.

protecting local streams from the adverse impacts of development. Wetlands also serve as areas for nutrient uptake by vegetation and for pollutants and other materials to be filtered and settled out. As a result, the preservation of remaining urban wetlands is considered essential to water quality protection efforts.

Most of the Town's remaining nontidal wetlands are concentrated along its main tributaries, including Folly Lick Branch, Spring Branch, and particularly Sugarland Run. These waterways were walked by Town staff over a period of two days in February, 1998 to identify nontidal wetland types found within Herndon. Wetlands were identified with the help of National Wetlands Inventory Maps (U.S. Fish and Wildlife Service, 1986). The results of the survey are found in Figure I.9. Measurements for exact boundaries of wetlands were not conducted, and wetlands in other areas of the Town not associated with main waterways were not identified.

All of the Town's wetlands are defined as nontidal palustrine. Nontidal wetlands are areas that are inundated or saturated by surface or groundwater at a duration and frequency sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions and not influenced by ocean-driven tides. Palustrine (identified as "P" in Figure I.9) is defined as any nontidal wetland dominated by trees, shrubs, persistent emergents, and emergent mosses or lichens.

Specific wetland classes identified within the Town include the following.

- Emergent Wetland (EM) – This class contains rooted herbaceous plants that are covered or saturated by water at the base, and are present for most of the growing season. The modifier "A" indicates that these areas are temporarily flooded. An example is a cattail marsh located in the north end of Runnymede Park.

- Scrub-Shrub Wetland (SS) – This class contains woody vegetation less than six meters (20 feet) in height. The particular sub-class (1) found in the Town contains broad-leaved deciduous plants. An example is located at the south end of Sugarland Run just north of the Dulles Toll Road.

- Forested Wetland (FO) – This class contains woody vegetation greater than six meters in height. The specific sub-class (1) found in the Town contains broad-leaved deciduous plants. An example is the forested area located in the south end of Runnymede Park.

- Open Water (OW) – This class contains small, permanently flooded open water areas that are too small to be considered lakes.

While Figure I.9 provides the general location of significant wetlands associated with the Town's main waterways, wetlands must be identified for individual development sites according to all applicable federal, State, and Town wetlands regulations, including the Town's Chesapeake Bay Preservation Ordinance. Wetlands are protected under section 404 of the federal Clean Water Act, which is administered by the U.S. Army Corps of Engineers. The U.S. Army Corps of Engineer's *Wetlands Delineation Manual* may be used for delineation purposes.

I.8 Summary and Analysis of the Existing Natural Environment

The Town of Herndon maintains a diverse and rich natural environment worthy of preservation and enhancement. The climate of the Town is generally considered to be temperate.

While natural habitats are limited to scattered open space, suitable forms of suburban development, and the Town's parks and stream valleys, the wildlife that survives in the Town is remarkably diverse, resilient, and even vibrant. A 1997 analysis of macroinvertebrates in the Sugarland Run mainstem indicates that the overall ecological health of the stream is in the "good" range. How-

ever, when compared to an unaltered watershed, it becomes apparent that suburbanization/urbanization has taken a toll on Sugarland Run.

There are federal or State threatened or endangered species that have been identified within Sugarland Run watershed, although not specifically within the Town's boundary. It is possible that endangered and/or threatened wildlife reside within the Town's quiet, and relatively undisturbed, stream valley parks. To this end, the continued preservation of the Town's stream valley parks in a natural state is essential to water quality and habitat protection in the Town.

The topography of the Town is characterized by gently rolling hills that have been cut by the Town's numerous streams and creeks.

Geologically, the Town is located within the Piedmont physiographic province of Virginia and more specifically within an area known as the Piedmont Lowlands. Rocks of the Piedmont Lowlands are siltstones, shales, and sandstones. As a result of past tectonic activity in the area, some areas of the Town have been intruded by dark, igneous rock called diabase.

Soils within the Town are typical of those formed from the rocks of the Piedmont Lowlands and are distinguished from surrounding areas by a purplish-red tint not present in other Piedmont soils. Areas of the Town intruded by diabase are easily recognized by the presence of relatively rocky terrain. Most soils in the Town are suitable to most types of development if proper soil conservation measures are implemented. Some areas, however, are constrained due to high water table, rocky terrain, and the presence of shrink-swell soils.

The Town is divided by two major watersheds, Sugarland Run and Broad Run. The Sugarland Run watershed is drained by Sugarland Run, Folly Lick Branch, and Spring Branch. The Broad Run watershed portion of the Town (which represents only 15% of the Town's land area) is drained by Horsepen Creek. Land uses which impact on these streams are primarily residential in nature; however, there exists large concentrations of industrial and commercial uses within both watersheds.

Streambank erosion levels in the Sugarland Run mainstem are generally in the low to moderate range. However, a few areas are experiencing more severe erosion problems. Because streambank erosion prevention is significantly more cost effective than correcting existing erosion problems, and given the relatively good condition of Sugarland Run, the Town must continue to find additional ways to protect local streams from excessive stormwater volumes including the provision of additional stormwater detention and the minimization of impervious surfaces.

Riparian buffer areas along Sugarland Run are generally greater than the 100 feet necessary to provide adequate buffering and to stabilize stream temperatures. A notable exception is that portion of Sugarland Run between the Dulles Toll Road and the W&OD Trail. A concerted effort to revegetate this stretch of Sugarland Run will help to improve water quality.

While riparian buffers are an effective means of protecting streams from adjacent land uses, they do not protect streams from the impacts of stormwater piped directly to the channel via the stormdrain/culvert system. Water quality in the Town's streams can be improved only if this source of pollution is adequately addressed.

Water quality for Sugarland Run and Folly Lick Branch is monitored by the Fairfax County Health Department. Testing is performed for fecal coliforms, dissolved oxygen (DO), pH, temperature, phosphorus, nitrate, and several heavy metals. Water quality in Sugarland Run and Folly Lick Branch, with the exception of fecal coliforms and nutrients, is considered to be within the acceptable range. Nutrient levels (including phosphorus and nitrate), while testing higher than that of an unpolluted stream, have been relatively stable over time – indicating that current management efforts have been successful. Grab Sample testing for pH, DO, turbidity, total dissolved solids, substrate fouling, nitrate, and fluoride in the

FIGURE I.10
Summary Results of MWCOG's Sugarland Run Mainstem Rapid Stream Assessment Technique (RSAT) Survey

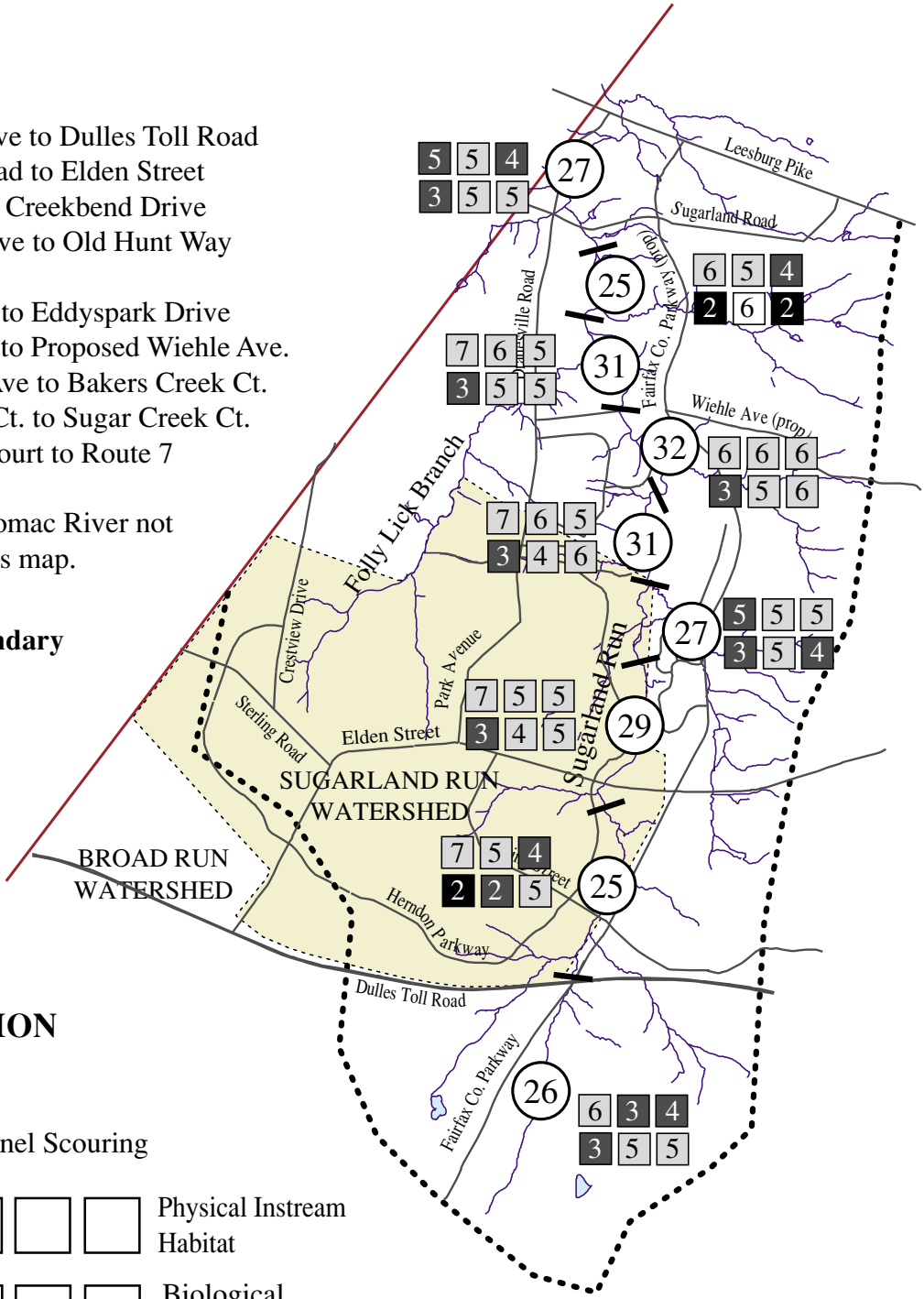
SEGMENTS

Upper Mainstem
1. Rosedown Drive to Dulles Toll Road
2. Dulles Toll Road to Elden Street
3. Elden Street to Creekbend Drive
4. Creekbend Drive to Old Hunt Way

Middle Mainstem
5. Old Hunt Way to Eddyspark Drive
6. Eddyspark Dr. to Proposed Wiehle Ave.
7. Prop. Wiehle Ave to Bakers Creek Ct.
8. Bakers Creek Ct. to Sugar Creek Ct.
9. Sugar Creek Court to Route 7

Lower Mainstem
* Route 7 to Potomac River not included on this map.

Segment Boundary



RSAT EVALUATION PARAMETERS*

Channel Scouring

Channel Stability ☐☐☐ Physical Instream Habitat

Water Quality ☐☐☐ Biological Indicators

Riparian Habitat

***See legend on next sheet.**

FIGURE I.10 (continued)
Summary Results of MWCOG's Sugarland Run Mainstem Rapid Stream Assessment Technique (RSAT) Survey

SYMBOL LEGEND

General Verbal Ranking Categories for RSAT Evaluation Parameters and Their Associated Point Ranges

	Excellent	Good	Fair	Poor
Channel Stability	9-11	6-8	3-5	0-2
Channel Scouring	7-8	5-6	3-4	0-2
Physical Instream Habitat	7-8	5-6	3-4	0-2
Water Quality	7-8	5-6	3-4	0-2
Riparian Habitat Condition	6-7	4-5	2-3	0-1
Biological Indicators	7-8	5-6	3-4	0-2

RSAT Score Per Stream Segment (Total of RSAT Evaluation Parameters

Point Range	Verbal Stream Quality Ranking
42-50	Excellent
30-41	Good
16-29	Fair
>16	Poor

SOURCE:
Metropolitan Washington Council of Governments for the Virginia Environmental Endowment. *Rapid Stream Assessment Technique (RSAT) of the Sugarland Run Watershed – Phase 1: Sugarland Run Mainstem*. Washington, D.C.: May, 1997.

Sugarland Run by MWCOG in late 1996 and early 1997 found water quality to be in the "fair" range for all areas except from the Dulles Toll Road to Elden Street. Water quality in this segment of Sugarland Run was found to be in the "poor" range.

Trend analysis of fecal coliform levels indicates the presence of a severe water quality problem. Between the period of 1991 to 1996, the level of fecal coliforms in Sugarland Run nearly doubled, with over 48% of samples falling in the unacceptable range for human health purposes. Fecal coliform levels in Folly Lick Branch are also considered unacceptable. Identification and management of the sources of fecal coliforms in the Town must be a part of the Town's water quality management efforts. High spot fluoride concentrations in the stream segment between Creekbend Drive and Old Hunt way suggests that a possible source of fecal contamination may be from a leaking sanitary sewer line. An additional source may be fecal matter from pets or local water fowl.

The Town purchases its potable water supply from the Fairfax County Water Authority. The FCWA maintains two water intakes, one on the Potomac River in Loudoun County and one on the Occoquan Reservoir. It is anticipated that water from these sources will be more than adequate to meet the Town's future needs.

Groundwater, while no longer used as a source of potable water, is still considered an important Town resource. Several wells are still maintained within the Town's boundaries. Well yields in the Piedmont Lowlands are considered to be fair and may require treatment due to high levels of iron, sulfate, and manganese.

The Town contains many small nontidal wetlands, most of which are associated with floodplain areas of Sugarland Run and Folly Lick Branch. Wetlands within the Town are generally protected under the Town's Chesapeake Bay Preservation Ordinance and Floodplain Overlay District as well as federal wetland regulations.

Figure I.10 provides a summary of the conditions of many of the Town's natural resources based on a Rapid Stream Assessment Technique (RSAT) survey of the Sugarland Run mainstem conducted by the Metropolitan Washington Council of Governments in 1996 and 1997.

CONSTRAINTS TO DEVELOPMENT
II

A basic tenet of this Supplement is that development and the protection of the natural environment are not mutually exclusive. Healthy economic growth is beneficial and desirable. In addition, Herndon's natural environment makes the Town a pleasant and healthy place to live and work. As steward of the environment, the Town has a responsibility to guide development in a manner that protects sensitive resources, that if improperly developed, could result in environmental degradation.

In order to best manage the Town's natural resources, it is necessary to identify the type, location, and extent of sensitive areas within the Town. From such an inventory, the Town may steer development to areas where natural conditions can best support development and protect resources where development may be inappropriate. The following section provides an overview of the primary growth determinants and environmental constraints within the Town of Herndon. Constraints to development include:

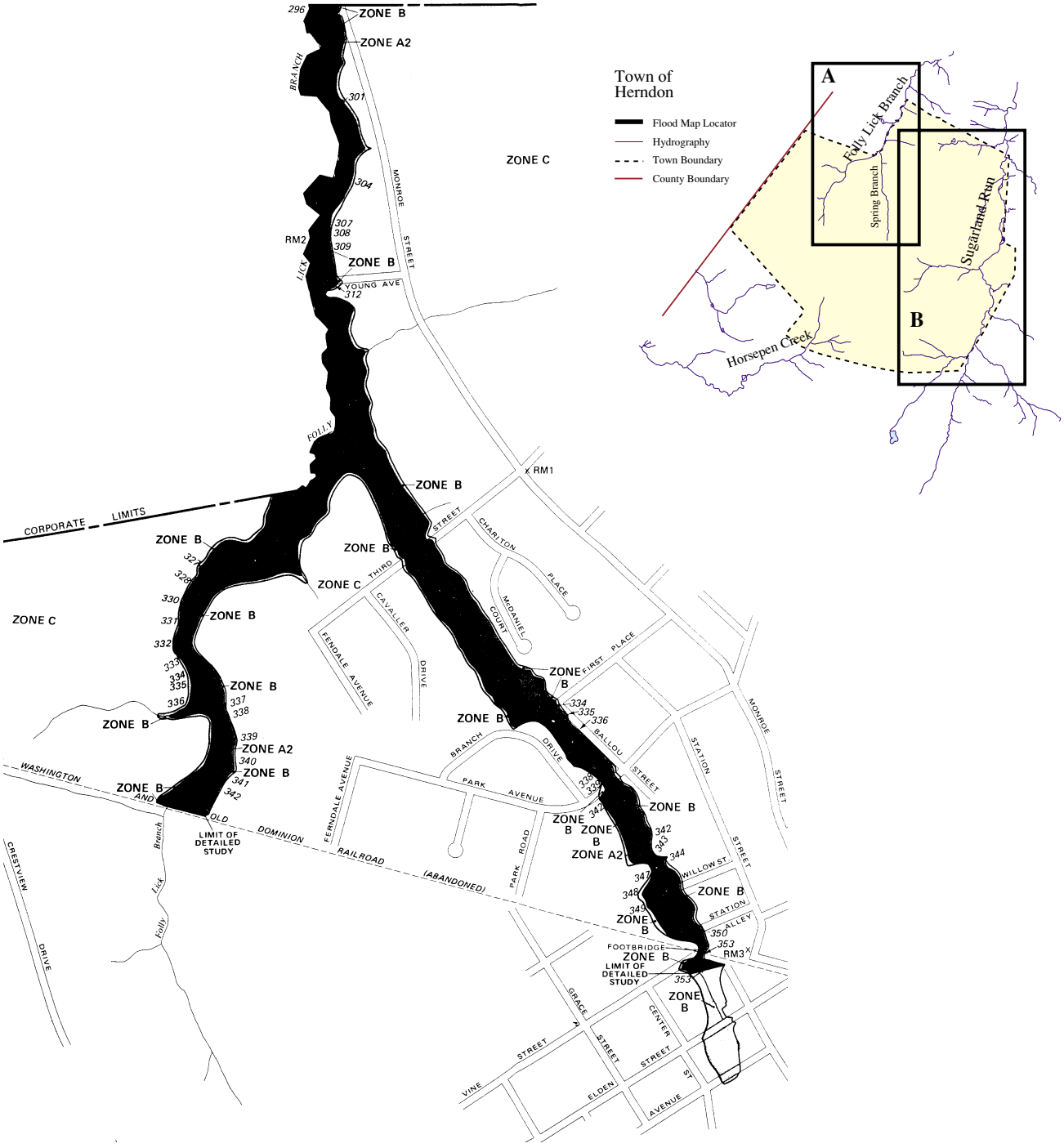
- Floodplains
- Geology and Soils
- Topography
- Wetlands
- Mature Forest Areas and Stream Valley Corridors
- Groundwater

II.1 Floodplains

Floodplains are among the most sensitive of the Town's aquatic resources due to their location adjacent to the Town's streams. In addition to providing for natural stormwater management, floodplains serve as a buffer from nonpoint sources of pollution from adjacent land uses and provide important habitat for a range of plant and animal species. While development in the floodplain must be avoided in order to allow it to perform its beneficial water quality functions, floodplain soils are often unsuitable for development anyhow due to high water table, shrink-swell soils, and highly permeable and hydric soil conditions. Encroachment on floodplains, particularly artificial fill, reduces a stream's flood-carrying capacity, increases flood heights, and can expand flood hazard areas beyond the encroachment.

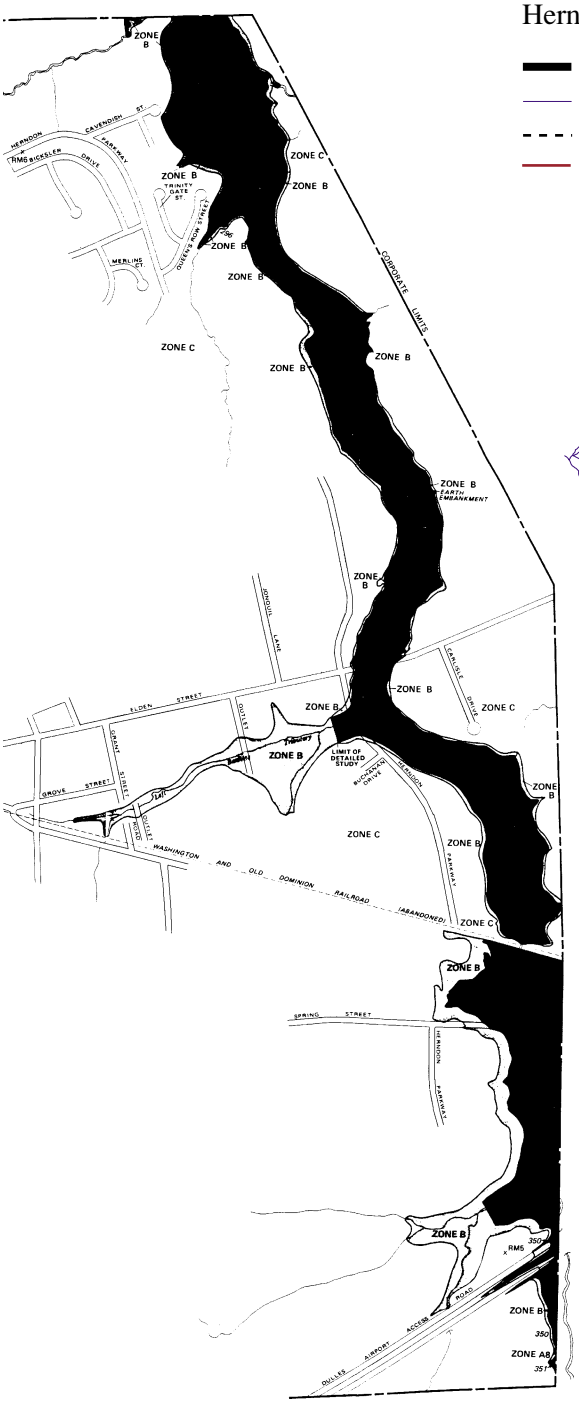
In 1979, the Federal Emergency Management Agency (FEMA) conducted a study of flooding potential and hazards in Herndon as part of its national flood insurance program. The plan was also meant to be used as a tool to assist the Town in effective floodplain management. The one-hundred year floodplain, which is the most common measure of where development is inappropriate, encompasses the entire length of Sugarland Run. In addition,

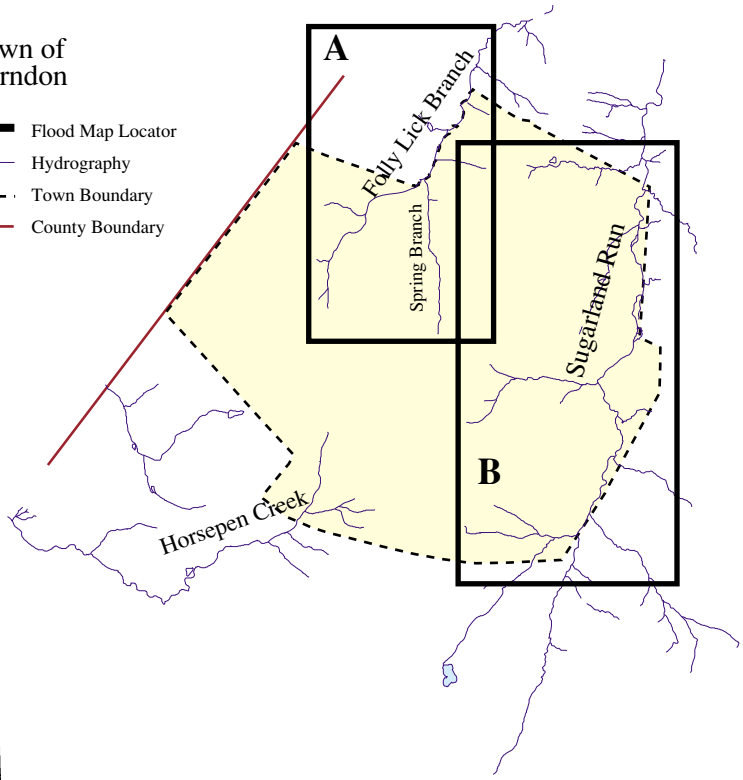
FIGURE II.1
(A) Folly Lick Branch and Spring Branch FEMA Floodplain Map



SOURCE:
Federal Emergency Management Agency, U.S. Department of Housing and Urban Development. Flood Insurance Rate Map, Town of Herndon, Virginia. August 1, 1979

FIGURE II.1
(B) Sugarland Run FEMA Floodplain Map





ZONE A: 100 Year Flood Area

ZONE B: 500 Year Flood Area

ZONE C: Areas of Minimal Flooding

Note: This map is presented for informational purposes only. It does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

The effective date of this floodplain map is August 1, 1979. Significant development pressures within the Town may have resulted in shifting floodplain designations. Changes to the floodplain in several small areas have been recognized by letters of map amendments (LOMAs). Additionally, it should be noted that Town boundaries have changed since 1979.

SOURCE:
Federal Emergency Management Agency, U.S. Department of Housing and Urban Development. Flood Insurance Rate Map, Town of Herndon, Virginia. August 1, 1979

significant reaches of Folly Lick Branch, Spring Branch, and Left Bank Tributary, along with several other smaller tributaries, are identified as having one-hundred year floodplain. Figure II.1 delineates the one-hundred year floodplain in the Town as mapped by FEMA.

Although FEMA floodplain maps are the primary legal basis for restricting encroachment into the floodplain, the actual limits of the 100-year floodplain have changed over time due to development in and around the Town, loss of wetlands, and fill. This fact must be considered during the development and redevelopment process. The Department of Public Works should initiate an update of the FEMA floodplain maps within the next five years.

II.2 Geology and Soils

It is difficult of overemphasize the importance of geology and soils characteristics when planning development and redevelopment within the Town. While taking local soil characteristics into consideration during new development will serve to protect water quality, addressing soil constraints during redevelopment can serve to improve water quality by addressing existing problems.

As previously noted, the preponderance of soils within the Town are suitable to most types of development if proper soil conservation measures are implemented. For instance, large areas of the Town are characterized by high water table, rocky terrain, and soft plastic subsoils. Some of these constraints preclude the use of basement areas (such as high water table and some shrink swell clays associated with the Orange soils group); however, most only require that extra precautions are taken during development such as proper soils management or extending building footings to rock below the subsoil.

Areas where any development is inappropriate is limited to floodplain soils (Mixed Alluvial Land and Rowland Silt Loam). Areas with slopes greater than 14% may experience rapid to very rapid runoff and should only be developed with highly restrictive property management techniques. There are no areas of the Town with slopes greater than 25%, which should be kept under permanent vegetative cover. Figure II.2 presents soils constraints and considerations for the Town.

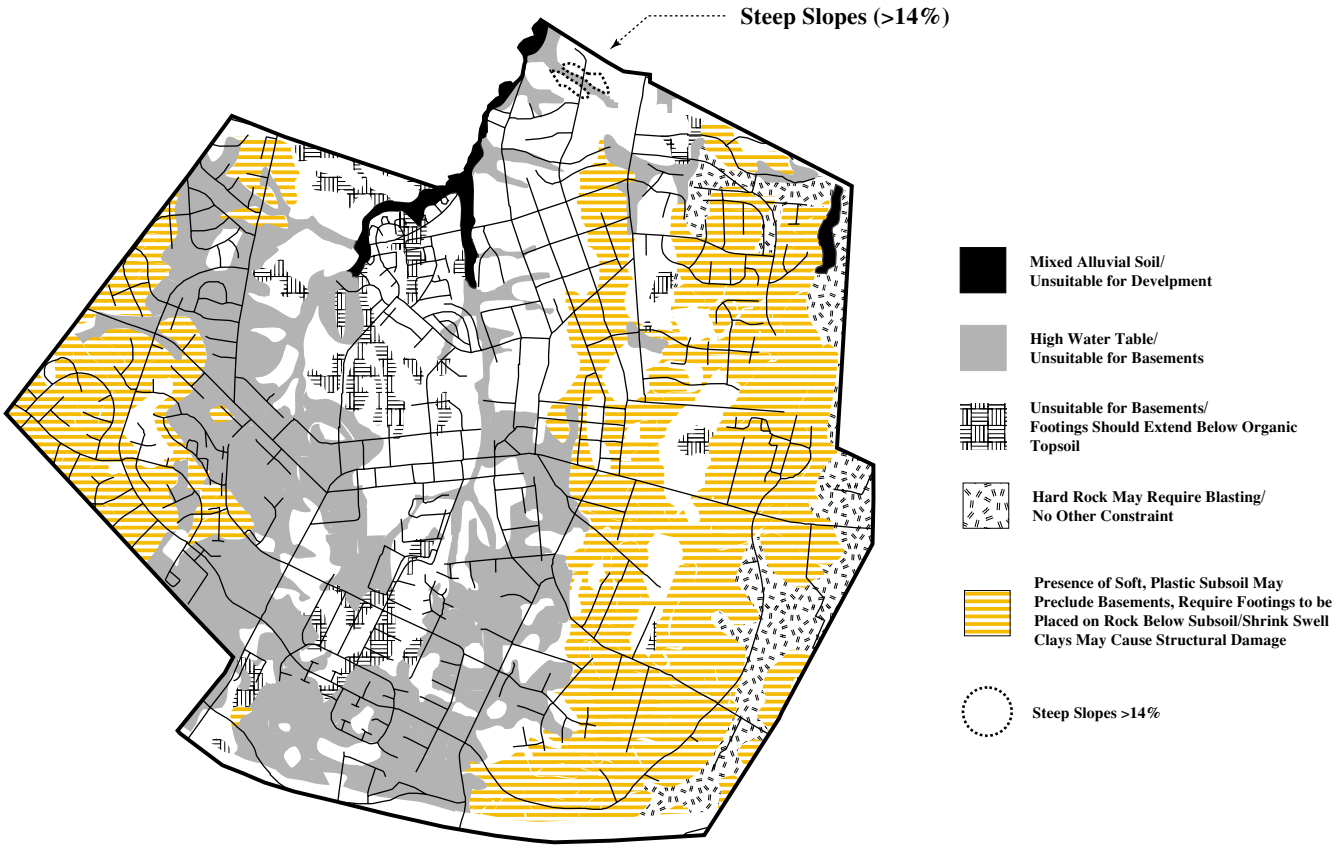
Areas characterized by highly permeable soils also require special consideration in an urban environment. Highly permeable soils transmit water quickly (six inches of movement per hour) through the soil profile. A concern with highly permeable soils is that polluted stormwater will infiltrate into the soil too fast and reach the groundwater before chemical and physical processes can clean the water. In addition, in areas with septic systems or underground storage tanks, the presence of highly permeable soils increases the likelihood for groundwater contamination. Highly permeable soils in the Town are mapped in Figure II.3.

Figure II.2 and Figure II.3 provide a general indication of the extent of sensitive soils within the Town. However, a detailed soils map, such as the *Soil Survey of Fairfax County, Virginia* (1963) or the *Soils Identification Map of Fairfax County* (1972), should be consulted for specific soils information. Many development proposals will require an onsite soil survey to be performed.

II.3 Topography

In general, slopes are characterized as steep when they exceed a 14% grade. According to the *Soils Identification Map of Fairfax County* (1972), slopes greater than 14% are concentrated near two small tributaries to Folly Lick Branch near the Oak Grove area. This area comprises less than 3% of the Town and is already developed, with steep slopes under permanent vegetation. There are no slopes identified as exceeding 25%, which is the level at which land should be kept under permanent cover of grass or forest to prevent serious erosion from occurring. Approximately 63% of the Town's land area is characterized with slopes of less than 7% where erosion potential is slight. Another 19% of the Town is characterized by slopes within the 7 to 14% range where erosion potential during development is moderate, but easily controllable with proper land management techniques.

FIGURE II.2
Soil Constraints and Considerations



SOURCE:
Fairfax County, Virginia. *Soils Identification Map of Fairfax County, Virginia*: 1972.
Refer to original document for site specific information.

While the Town contains minimal areas of excessively steep slopes, poorly designed and constructed developments on even rolling slopes can result in increased runoff and excessive levels of erosion. While the Town is largely built out, any redevelopment within the Town must take topographic constraints into consideration.

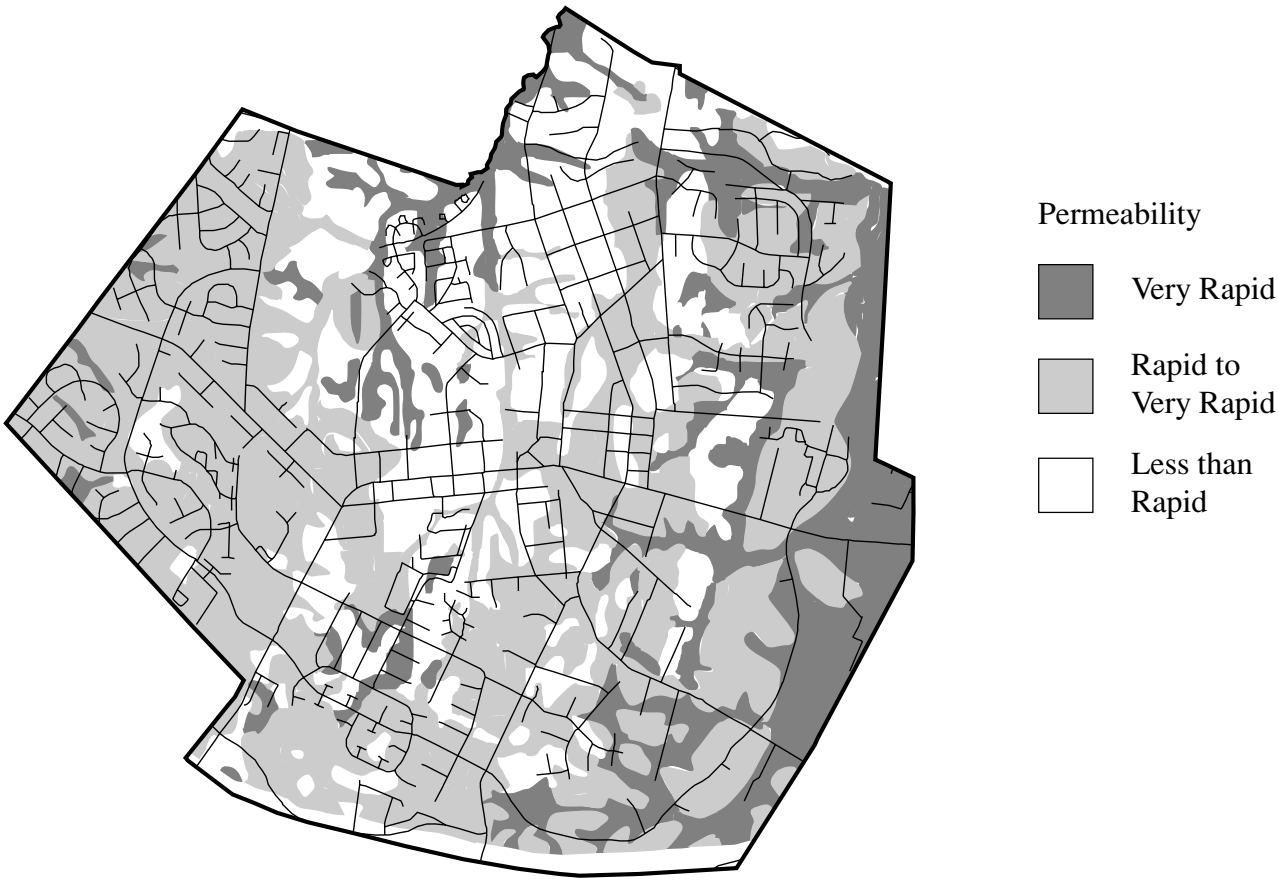
II.4 Wetlands

Wetlands, which are concentrated along the Town's main waterways, are a protected resource under Herndon's Chesapeake Bay Preservation Ordinance and Section 404 of the federal Clean Water Act. Although the Town has identified the general location of many of Herndon's wetlands (see Figure I.9), developers must identify wetlands for individual development sites and protect them according to all applicable federal, State, and Town wetlands regulations. The U.S. Army Corps of Engineer's *Wetlands Delineation Manual* may be used for delineation purposes.

II.5 Mature Forest Areas and Stream Valley Corridors

The leaves, branches, and organic leaf litter of an area of mature tree canopy cover serve to protect water quality by providing a physical barrier which softens the impact of falling rain and slows the

FIGURE II.3
Soil Permeability Map



SOURCE:
Fairfax County, Virginia. *Soils Identification Map of Fairfax County, Virginia*: 1972.
Refer to original document for site specific information.

rate of surface runoff from impervious surfaces during storm events. Tree roots hold soil particles in place and protect the ground from erosion. Preserving mature tree stands helps to protect the infiltrative capacity of the soil and the ability of the landscape to naturally filter and assimilate pollution. Tree canopy which shades a stream helps to reduce and stabilize water temperatures, which is beneficial to aquatic life and helps the water to retain essential dissolved oxygen.

Stream valleys and mature forest areas also serve as significant wildlife habitat corridors, the fragmentation of which can result in degraded habitat conditions.

Mature tree canopy within the Town is concentrated along the Sugarland Run and Folly Lick Branch stream valleys. However, there are significant areas of the Town which support individual or small groves of mature trees that afford significant environmental and water quality benefits. There is currently no comprehensive assessment or map of mature tree canopy cover within the Town of Herndon.

While much of the Town's mature tree cover is located within protected park areas, significant areas of mature tree cover should be preserved and protected where possible. Protection of existing mature tree cover along the Town's tributary streams is mandated under the Herndon's Chesapeake Bay Preservation Ordinance.

II.6 Groundwater

Although the Town now relies on a treated water supply from the Potomac River and the Occoquan Reservoir, protection of the Town's groundwater must be a consideration during development and redevelopment. When development occurs, it affects the natural balance of the groundwater flow. Increased imperviousness as a result of development reduces the potential for groundwater recharge and should be taken into consideration when designing a site plan. Generally, high topographic areas are groundwater recharge areas and impervious surface areas in defined groundwater recharge areas should be minimized. By providing recharge areas for stormwater, groundwater equilibrium can be maintained.

The protection of groundwater was recognized by the Commonwealth of Virginia when the General Assembly enacted the Groundwater Act of 1973. This legislation was enacted ". . . in order to conserve, protect, and beneficially utilize the groundwater in this State and to ensure the preservation of the public welfare, safety, and health. . ." Once contaminated, the usefulness of an aquifer as a resource may be limited or destroyed depending on the toxicity of the contamination and the effort, time and money involved in clean-up. In most cases it is impractical and sometimes impossible to restore a contaminated aquifer to its original level of purity. The time involved in restoring the damage from groundwater contamination depends on the type and severity of the contamination as well as the rate and direction of groundwater movement.

Common sources of groundwater contamination include but are not limited to leaking underground storage tanks, septic systems situated on improper soils, and improperly capped wells. In addition, improperly maintained water quality BMPs may present a groundwater threat if not properly situated or maintained.

In Herndon, the most common source of groundwater contamination on record with the Department of Environmental Quality, Water Division, is from petroleum leaks and spills, although an examination of the effects of open or improperly sealed wells has not been attempted. Contamination by leaking underground storage tanks is better documented than other types of pollution because of strict regulations governing their placement and maintenance. More stringent underground tank standards enacted in recent years should reduce the level of contamination from these sources.

Careful site planning will decrease the potential for groundwater pollution during development or the installation of underground storage tanks. Areas which are prone to potential groundwater pollution should be identified before development occurs and improper development should be steered away from such areas. For example, the potential for groundwater contamination near streams is heightened due to high water table and soils characteristics. In addition, regular maintenance and inspection of potential sources of groundwater pollution is a critical component of groundwater protection. In general, the potential for groundwater pollution in the Piedmont Lowlands is greater than that of the rest of the Piedmont physiographic province.

II.7 Summary and Analysis of Constraints to Development

The primary constraints to development within the Town are floodplains, geology and soils, topography, wetlands, mature forest areas and stream valley corridors (including areas of significant wildlife habitat), and groundwater recharge areas.

Very few areas of the Town are untouched by these constraints to development, which is the primary reason why the Town has adopted a Town-wide

Resource Management Area as part of its Chesapeake Bay Preservation Ordinance. However, most constraints to development only necessitate that the development occur in an environmentally sound manner that takes into account the potential for development to degrade local and regional water quality.

Some of the Town's most sensitive environmental features, in order to protect water quality and preserve the integrity of the Town's wildlife habitats, must remain in a natural, undeveloped state. These areas include the wildlife habitat areas surrounding the Sugarland Run and Folly Lick Branch stream valleys. These areas contain a preponderance of the Town's floodplain areas, wildlife habitat, sensitive soils, wetlands, and sensitive topography.

Sensitive environmental features of the Town that must be properly managed during and after development include several sensitive soil associations, areas with moderately steep slopes (7 to 14% grade), mature forest areas outside stream valleys, groundwater recharge areas, and areas where inappropriate uses could negatively impact groundwater resources. In particular, the Town contains a number of soils, including the Orange soils group, that if improperly developed could result not only in nonpoint source pollution but also a public safety hazard.

Existing and Potential Sources of Pollution
III

Pollution problems faced by the Town until recently were considerably different than those being faced today. Long before the Town became concerned with urban nonpoint source pollution, a myriad of human activities placed stress on the Sugarland Run and Broad Run watersheds. According to a 1974 report on the history of the Sugarland watershed, "Alterations to the environment have been caused by the copper mine at Frying Pan Branch, water powered mills at the mouth of Jefferson Branch and on Sugarland Run, a sawmill in Herndon and charcoal manufacturies in the Nichols Run watershed. Sewage input was probably minimal until the 1940s, although dairy farms near Herndon probably stressed the streams at an earlier date. Chemical pollution from the croplands has probably become significant in the last 30 years."

Today, the Town and its surrounding watersheds face a host of new challenges including pollution from chemicals used to care for urban lawns, automobiles, leaking underground storage tanks, dumping, and litter. The dramatic increase in impervious surfaces resulting from urbanization serves to exacerbate urban runoff and water quality problems. Some level of environmental pollution resulting from human activity may be inevitable. However, it is within the power of the community to maintain pollution below levels that can be readily assimilated into the environment with minimal harm. Unmanaged pollution can result in surface and groundwater contamination, poor air quality, aesthetic degradation of the landscape, and the destruction of important ecological habitats, all of which detract from the Town's basic character.

The most cost-effective approach to the problem of pollution is to prevent it at its source. A number of tools are available to the Town to aid in pollution prevention including public education and awareness programs, water conservation programs, lawn care programs, and recycling efforts, to name only a few. The cost to the Town once environmental damage is done includes not only short term clean-up costs, but long-term costs including decreased property values and loss of tax base. A number of public (Virginia Cooperative Extension, Northern Virginia Soil and Water Conservation District, etc.) and private (Friends of the Sugarland Run, etc.) organizations are available to assist the Town in implementing pollution prevention programs.

The Town also recognizes that the only way to protect local and regional water quality is through the use of an integrated watershed management plan. An integrated watershed management plan involves the strategic use of structural and nonstructural BMPs to address all sources and types of

pollutants in order to optimize water quality and resource protection.

The following section describes the Town's existing sources of pollution as well as potential sources of pollution which the Town may face as it grows and develops. This inventory, along with the various tools afforded by the State and the federal government, should be used by the Town to minimize and eliminate the impacts of pollution on the environment of Herndon. Existing and potential sources of pollution include:

- Point Source Pollution
- Nonpoint Source Pollution
- Erosion of the Land
- Underground Storage Tanks/Transmission Mains
- Above Ground Storage Tanks
- Septic Systems and Abandoned Wells
- Air Pollution

III.1 Point Source Pollution

Point source pollution is pollution which can be attributed to a specific outfall and is therefore often the most easily recognizable and regulatable form of pollution. Industries and municipalities, under the federal Clean Water Act (U.S.C. §1251 *et seq*., 1987 as amended) National Pollution Discharge Elimination System (NPDES), are required to report pollution discharges to water courses above a certain threshold, and to the maximum extent practicable, mitigate the effects of the pollution on the environment. The Virginia Department of Environmental Quality, Water Division, maintains records on these sources of pollution and is charged with ensuring that environmental regulations are enforced.

According to State records there are two industrial NPDES discharge points located within the Sugarland Run watershed. Discharges from these sources are strictly controlled and currently meet all environmental standards. There are no municipal discharges (usually in the form of wastewater treatment plant outfalls and major storm water outfalls) in Herndon that currently fall under NPDES regulations. However, future extensions of NPDES regulations may make it necessary for the Town to address the issue of its stormwater discharges into local watercourses.

III.2 Nonpoint Source Pollution

Nonpoint source pollution cannot be easily attributed to a single source but is the result of runoff from many diffuse sources. Most commonly, nonpoint source pollution is a result of pollutants accumulating on impervious surfaces which are subsequently flushed into local waterways during rainfall events.

Urbanization dramatically increases the imperviousness of the land area, thereby increasing the amount and time-of-concentration of stormwater runoff delivered to nearby streams. The effects are three-fold.

- The flash flooding of streams is increased in that stormwater reaches the local stream course faster and at the same time. This can increase the flood potential for surrounding areas since the stream course can be overwhelmed by stormwater.

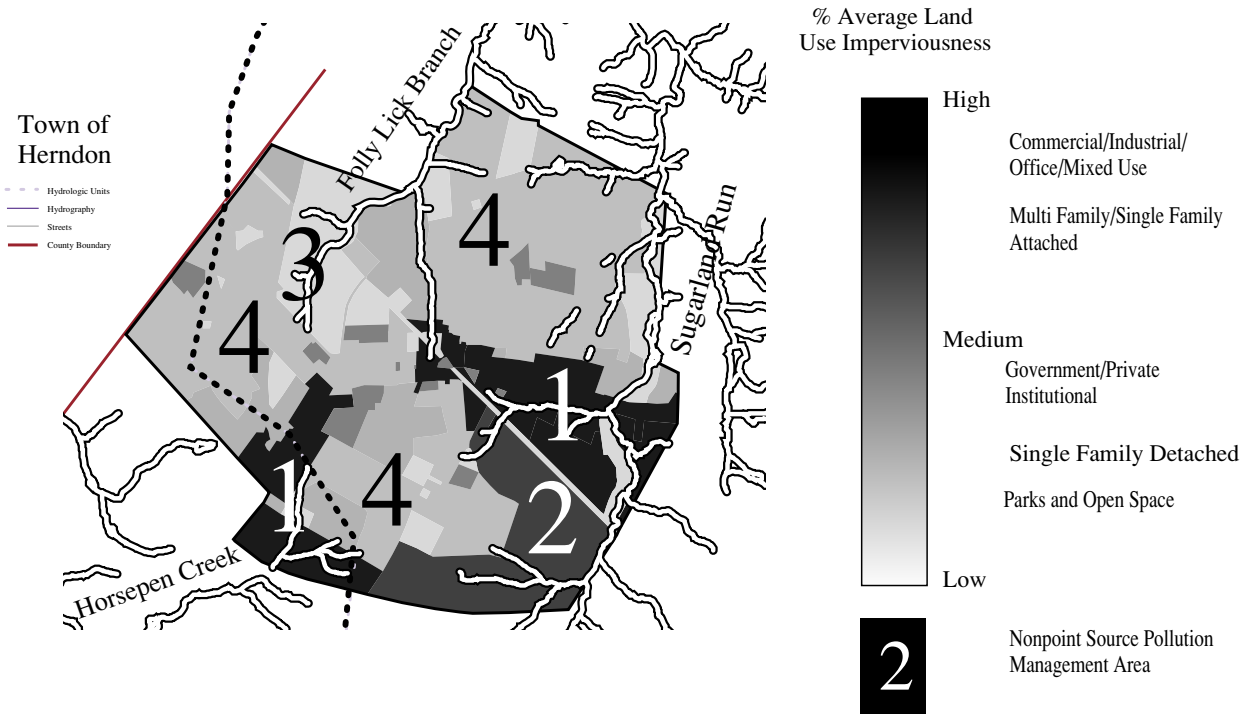
- As stormwater runs off impervious surfaces, swales and streams gain velocity, thereby increasing the probability of erosion in unprotected areas.

- Natural and man-made pollutants, which once were absorbed by vegetation or neutralized by infiltration through the soil horizon, are flushed directly into local stream courses.

On a per acre basis, urban land use in general, including residential development, produces higher annual nonpoint source pollutant loadings of nutrients, heavy metals, and oxygen-depleting substances than do rural agricultural uses. Oil contamination, sediments, pesticides, metals, and other toxic substances found in urban runoff can kill fish and destroy bottom life.

Among the most destructive, yet inconspicuous, pollutants are excess nutrients. Excess nutrients

FIGURE III.1
Town Imperviousness Map and Nonpoint Source Pollution Management Areas



can result in a phenomenon known as eutrophication, which is characterized by low dissolved oxygen levels and high algal growth. The primary detrimental effect on water resources, and particularly on large bodies of water such as the Potomac River and the Chesapeake Bay, is algal blooms, which block sunlight from aquatic life and deplete the dissolved oxygen content during decay. Eutrophication also destroys the recreational use of water resource and results in strong odor and undesirable taste.

Because nonpoint source pollution is highly correlated with impervious surface area, it is a useful exercise to identify areas of the Town that are highly impervious. Figure III.1 provides a snapshot of impervious surface areas within the Town in relation to its water resources.

Overall, as an urban area, the Town now has an impervious surface area of approximately 41%, which is considerably higher than the Tidewater average of only 16%. Therefore, a significant element of the Town's pollution prevention and control efforts must be directed towards urban nonpoint source pollution. Because the Town lies within the Chesapeake Bay drainage area, the control of nonpoint source pollution takes on an even greater urgency.

The Virginia Division of Soil and Water Conservation has designated the control of nonpoint source pollution as a high priority for the Sugarland Run and Broad Run watersheds.

NONPOINT SOURCE POLLUTION MANAGEMENT AREAS – Nonpoint source pollution from urban areas is particularly

problematic because it is generated from a wide range of sources and includes a wide range of pollutants. In general, nonpoint source pollution from urban areas can be reduced by minimizing the amount of impervious surface area as a result of urban development, utilizing open space and preserving indigenous vegetation, restoring denuded vegetative stream buffers, preventing pollution through public education, and by employing the use of structural best management practices (BMPs), which operate by trapping stormwater runoff and detaining it until unwanted nutrients, sediment, and other harmful pollutants are allowed to settle out or be filtered through the underlying soil.

However, different land uses and activities are associated with different pollution problems. Similarly, different pollution problems can be addressed most appropriately with different management techniques.

In order to facilitate nonpoint source management efforts in the Town and to provide the Town with a tool to target different nonpoint source pollution problems, the Town has been divided into four NPS pollution management areas. Nonpoint source pollution management areas identified for the Town include:

- **Area 1, High Density Commercial and Mixed Use Corridors.**

  These are areas of the Town that are commercial or mixed use in character. Impervious surface area can constitute up to 80 to 90% of the landscape, although imperviousness will often be much less. Nonpoint source pollution in these areas is best controlled through the use of stormwater management ponds and other structural BMPs, measures that reduce impervious surface coverage, and measures that reduce the introduction of litter and other pollutants such as automobile fluids and particulates onto impervious surfaces.

- **Area 2, Industrial Areas.**

  Industrial areas are characterized by highly impervious surface areas and may be subject to the use or storage of heavy equipment or chemicals. Management of nonpoint source pollution in these areas includes the use of structural BMPs, measures that reduce impervious surface coverage, and measures to ensure that industrial effluent or waste is minimized and disposed of properly.

- **Area 3, Public and Private Institutional and Recreational Uses.**

  These areas include public uses such as schools, libraries, and playing fields, and private uses such as golf courses, that may have extensive grounds that require maintenance.

  In addition to structural BMPs and minimizing impervious surfaces, management techniques that will reduce the impacts of these uses on the environment include integrated pest management and water-wise landscape management.

  The Town and Herndon Centennial Golf Course management have recognized the potential for significant environmental impact from this particular recreational use. A number of actions have been taken to minimize adverse impacts. These include:

  (1) use of organic-based slow release nitrogen sources to protect the groundwater and surface runoff by controlling the amount of soluble nitrogen present at any one time;
  (2) deep aerification of fairways and tees to four inches so that pesticides and nutrients will be absorbed before they have a chance to run off, and to ensure healthier grass and plant growth that is less subject to pests and diseases;
  (3) new spray equipment that allows staff to apply limited pesticides only to targeted areas;

(4) establishment of no-cut areas to act as filters for surface water and provide habitat for wildlife;
(5) pesticide application by two licensed applicators and one registered technician to ensure that proper practices are followed;
(6) installation of trash racks on the two main stormdrains that feed the golf course pond (nine to ten bags of trash are removed from these racks after every storm);
(7) integrated pest management combining cultural, biological, and chemical controls is used for protection of wetlands and the Chesapeake Bay; and,
(8) since 1993, golf course maintenance practices have been updated based on evaluations by an agronomist from the USGA Turf Advisory Service.

In addition, a once-severe waterfowl problem has been controlled largely by the use of noisemakers.

- **Area 4, Low and Medium Density Residential Areas.**

  This category includes the remaining residential areas of the Town. In addition to structural BMPs and minimizing impervious surface areas, public education may play an important role in the control of residentially-generated nonpoint source pollution. Yards and automobiles are major sources of nonpoint source pollution. Nonpoint source pollution enters the environment through dumping down stormdrains, runoff from the yard, or erosion of bare spots. Public education efforts will be particularly effective in these areas.

A number of resources are available that provide guidance on the prevention of nonpoint source pollution through sensitive site design and through public education. The Town should promote nonpoint source pollution reduction through its own public education programs and by encouraging the use of sensitive site design during the plan review and subdivision process.

III.3 Erosion of the Land

Soil erosion is one of the most pressing pollution problems faced by the Town. Suspended sediments choke and muddy local waterways making them uninhabitable by desirable species of aquatic life and severely disrupting the natural foodchain found in healthy streams. In addition, nutrients and other pollutants attach themselves to sediment particles and contribute to eutrophic conditions in the Potomac River and the Chesapeake Bay.

Soil erosion is most often a result of streambank erosion, improperly managed land uses, and land development. The Town has identified several areas along Sugarland Run which are experiencing erosion problems (see Figure I.7 and Section I.5). The Town's Erosion and Sediment Control Ordinance addresses soil erosion problems during the site development process.

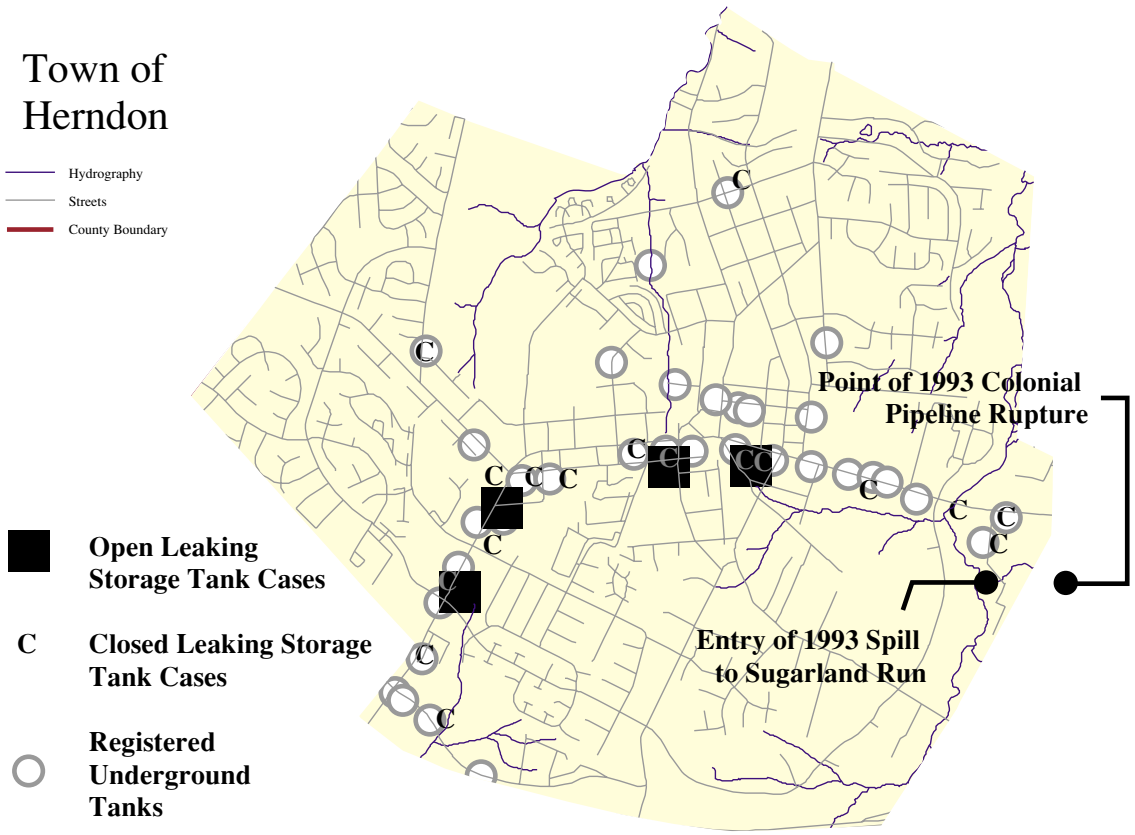
III.4 Underground Storage Tanks/ Transmission Mains

Underground storage tanks (USTs) are regulated by the federal Resource Conservation and Recovery Act of 1976. The Virginia Department of Environmental Quality, Water Division, is responsible for permitting and tracking USTs. The Virginia Water Quality Assessment for 1992 states that underground storage tanks are the primary source of groundwater contamination in Virginia. In addition, many streams are fed by groundwater and therefore leakage also may adversely impact surface water quality. In addition to gasoline, underground tanks are used for storing benzene, kerosene, diesel fuel, and fuel oil.

Underground storage tanks, while regulated through the Commonwealth, often pose a greater threat than other sources of pollution because a problem may not be detected for years after a leak has occurred.

As of July, 1996, there were 4 open cases (and 24 mitigated and closed cases) regarding leaking underground storage tanks in the Town of Herndon. Other open cases exist immediately outside the

FIGURE III.2
Location of Registered Underground Storage Tanks/Open and Closed Leaking Underground Storage Tanks and 1993 Colonial Pipeline Rupture



Town in neighboring Fairfax and Loudoun counties. Because groundwater movement follows topography and geology rather than jurisdictional boundaries, the issue of leaking underground storage tanks is a regional one requiring regional communication and coordination.

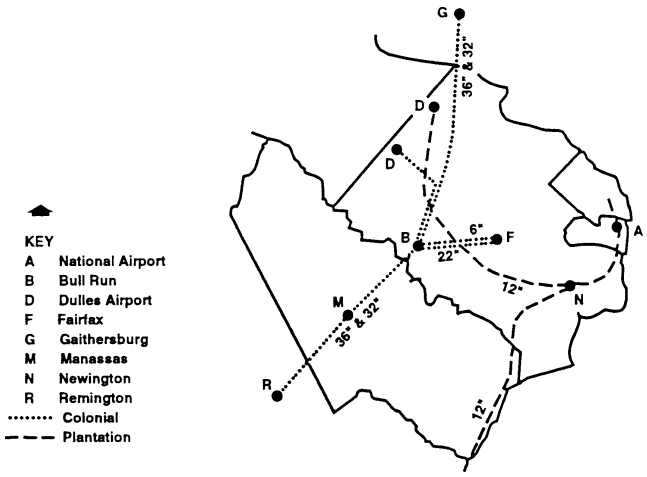
Forty-eight underground storage tanks are currently registered within the Town. Most are concentrated in the Elden Street commercial corridor, although storage tanks dot the entire landscape of the Town. While underground storage tank standards are much better than they were, there is still the potential for leakage. The Town should take due diligence in working with the DEQ-WD to prevent leakage and to ensure that any leakage into the environment is remedied. Figure III.2 provides information on the location of underground storage tanks in the Town and the location of underground storage tank spills currently under remediation.

In addition, vacant commercial and industrial properties sometimes contain leaking underground storage tanks that contaminate groundwater. These contaminants sometimes surface near residential areas in the storm sewer system or in natural streams, causing public health and safety issues and producing undesirable odors. The Town has been engaged actively, directly or indirectly, in mitigating the effects of some of these residual tanks, but the presence of others is possible.

COLONIAL PIPELINE – The presence of a major east coast transmission pipeline along the edge of the Town poses a continual threat of catastrophic spills.

On the morning of March 28, 1993, a break occurred in a 36-inch pipeline operated by Colonial Pipeline Company at the edge of a parking lot at Reston Hospital. The pipeline was shut down within 15 minutes. Approximately 407,000 gallons of number 2 fuel oil spilled through stormwater drainage structures into Sugarland Run in the Town of Herndon and progressed northward through Runnymede Park and on through Fairfax and Loudoun counties. Approximately 80% of the spilled product was recovered before it entered the Potomac River. The portion of the product that did enter the Potomac River threatened water supplies from Fairfax County's Corbalis Water Treatment Plant and caused several shut-downs to prevent petroleum-contaminated products from entering the water intake.

FIGURE III.3
Generalized Location of Petroleum Pipelines Transecting Northern Virginia



SOURCE:
Northern Virginia Planning District Commission, 1990.

A number of factors helped to mitigate the environmental damage caused by this oil spill. These factors are both natural and probabilistic. They are:

(1) The product that spilled was number 2 fuel oil and not a more toxic substance such as gasoline (gasoline was being pumped through the same pipe an hour earlier).
(2) Meteorological and hydrological conditions were optimal for reducing the environmental impact. The weather was cool, reducing vaporization; saturated soils reduced absorption; the stream was at full bank stage, which prevented stream bottom contamination; and the groundwater table was high, which resulted in groundwater flow toward the stream instead of toward the groundwater reservoir.
(3) Emergency response was rapid and efficient, maximizing recovery and minimizing escape of products into the environment.

On April 3, 1993, after repairing the break, Colonial Pipeline Company requested approval from the Office of Pipeline Safety to resume normal operations at full pressure in the pipeline. This proposal met with objections from all elected officials in Northern Virginia. On April 4, 1993, a compromise condition was agreed to where Colonial Pipeline Company could resume operations at half pressure until the pipeline had been inspected by a "smart pig" between the Chantilly Pumping Station and the Dorsey Junction Station in Maryland. All anomalies were inspected by excavation and visual inspection of the pipe.

Inspection with the smart pig resulted in 124 anomalies (indications of some defect in the pipe, or of magnetic material near the pipe).

As of October 29, 1993, 88 anomalies in Virginia and 33 anomalies in Maryland had been inspected with a schedule for completion of the inspections in mid-November. In early November, Colonial Pipeline Company requested approval to resume operations at full pressure to satisfy energy needs in the northeast coastal areas. The Fairfax County Executive formally objected to this request on be-

half of Fairfax County and other local jurisdictions that were impacted by the spill.

The initial emergency response to this oil spill was excellent. The longer term program for recovery and mitigation suffered from unnecessary delays. Five areas suffered significant environmental damage. These areas were:

(1) the immediate spill site where contaminated soils were removed;
(2) a wooded area in the future Fairfax Parkway right-of-way along the Fairfax County - Herndon boundary;
(3) the floodplain near Carlisle Drive in Herndon;
(4) an area in Runnymede Park in Herndon where a beaver dam diverted petroleum products over the floodplain with significant infiltration; and,
(5) one of the primary recovery areas in Algonkian Park in Loudoun County.

All parties agreed that bioremediation was the proper method for treating all contaminated areas except the highly contaminated areas where the soil had to be removed. (Bioremediation is a method where natural or introduced bacteria are used to decompose the petroleum products into harmless compounds such as water and carbon dioxide). Difficulties and delays occurred due to disagreements about the method of bioremediation. Colonial Pipeline Company proposed adding mulch to the soil and tilling the soil to encourage the bacterial activity. This is an appropriate technology for use in open areas where flooding is not a problem. In the Sugarland Run floodplain, tilling would destroy root systems of trees, destroy other native vegetation, and cause additional siltation problems during heavy rains. The Treatment Technologies Working Group established by the EPA insisted on approaches that would be less damaging to local environmental conditions. A compromise was reached and a consent order issued in July, 1993, four months after the oil spill, that specified:

(1) removal of highly contaminated soil at the spill and at Carlisle Drive;
(2) tilling of limited areas where all vegetation had been killed at Carlisle Drive;
(3) treatment with fertilizers to enhance bacterial growth at the Fairfax Parkway right-of-way, Carlisle Drive, and Runnymede Park; and,
(4) allowing the Algonkian Park site to recover with no additional disturbance.

The treatment program started on July 25, 1993. Time lost in initiating the bioremediation programs delayed degradation of petroleum products and recovery of the ecological systems of the stream. Bioremediation works best during warm weather and is very slow during winter months. The process could have been significantly advanced if the treatment had started in April or May to take advantage of the warm spring and summer months.

A public hearing was held on the Colonial Pipeline rupture by the Subcommittee on Investigations and Oversight of the Committee on Public Works and Transportation, House of Representatives, on May 18, 1993. A significant amount of testimony emphasized the need for improved maintenance and inspection of pipelines to reduce the probability of future ruptures.

The 1993 oil spill has had major and continuing effects on the stream and affected floodplain area in Runnymede Park, in addition to the effects south of the park. Although levels of residual oil were too low to measure in the water or the streambed a few months after the spill, the oil had killed all in-stream wildlife that were active at the time of the spill. It has taken much longer to rebuild the food chain in the stream. Although no spilled oil entered the marsh and wetland areas adjacent to the stream in the north end of the park, loss of beaver and muskrat populations resulted in significant changes in plant communities and habitat conditions.

III.5 Above Ground Storage Tanks

Above ground storage tanks are regulated by the federal government through the Clean Water Act. 40 CFR Part 112 requires owners of single tanks with a capacity greater than 660 gallons or multiple tanks with an aggregate capacity greater than 1,320 gallons to register and formulate a "Spill Prevention Control and Countermeasure Plan." The Commonwealth of Virginia, which regulates above ground storage tanks through the DEQ, Water Division, has just recently adopted requirements for tank owners to present an "Oil Discharge Contingency Plan" (ODCP) before a storage tank may be registered. The purpose of an ODCP is to have a plan of action in the event of a catastrophic release of oil from the largest tank. The plan must also identify what the impact of such a discharge will be on the environmental receptors and what will be done to mitigate those impacts in the event of a spill.

However, individual tanks with a capacity of less than 660 gallons or multiple tanks with an aggregate capacity of less than 1,320 gallons are not regulated by the State or the federal government. Most home fuel oil tanks are typically only 200 to 660 gallons and are not regulated. According to 1990 federal census data, slightly under 3 percent of Town households rely on fuel oil or kerosene for their primary source of heat – this is less than the Fairfax County average of 8 percent. Nevertheless, while not a large threat, the aggregate of tanks may pose a serious threat if small problems are not taken seriously. It is therefore the responsibility of the individual owner to ensure that leaks and spills do not occur. According to the DEQ, approximately 90 percent of releases from individual tanks are a result of overfill or the tipping over of the tank. Overfill can occur if the driver/filler is not paying attention or if the capacity of the tank is not known. To reduce the risk of an accidental spill, the homeowner or fuel oil company should inspect a tank before filling to ensure that it is sturdy and does not exhibit signs of corrosion. An owner should also have the capacity of the tank clearly marked on the tank and specifically indicate the filling cap location.

III.6 Improperly Maintained Septic Systems & Abandoned Wells

Improperly maintained septic systems contribute to water quality problems by threatening ground water quality, and in some instances, by contributing directly to surface water quality problems through overland flow of septage. Improperly abandoned wells contribute to water quality problems by providing a direct conduit for pollution to travel from the surface to groundwater.

While the Town requires that any new development connect to public sewer and water, septic systems still serve several households within the Town. According to Fairfax County Health Department records, there are between one and ten septic systems found in each of the Fairfax County Tax Map areas encompassing the Town (Tax Maps 10-3, 10-4, 11-3, 16-1, 16-2, 16-3, 17-1, 16-4, and 17-3).

When designed, sited, and maintained properly, septic systems do not pose a threat to water quality. However, several factors make it necessary for the Town to pay close attention to its existing septic systems.

- The average year of septic system installation for five of the nine Herndon Tax Map areas is before 1960. The average year of installation for two Tax Maps is 1960 to 1969, while the average year of installation for one is 1970 to 1974. Installation data is unavailable for one Tax Map.

  Septic system age is significant because flow diversion values were not required before 1974. In the upper-northwest portion of Fairfax County (including Sugarland Run, Difficult Run, and Broad Run), there were no septic tank failures reported between 1974 and 1983. The septic failure rate for this area for tanks installed after 1984 is only 0.17%. By contrast, the failure rate is 1.78% for 1969 to 1973, 1.54% for 1964 to 1968, 1.24% for 1959 to 1963, 2.40% for 1954 to 1958, and 4.05% for 1949 to 1953. Because all of Herndon's

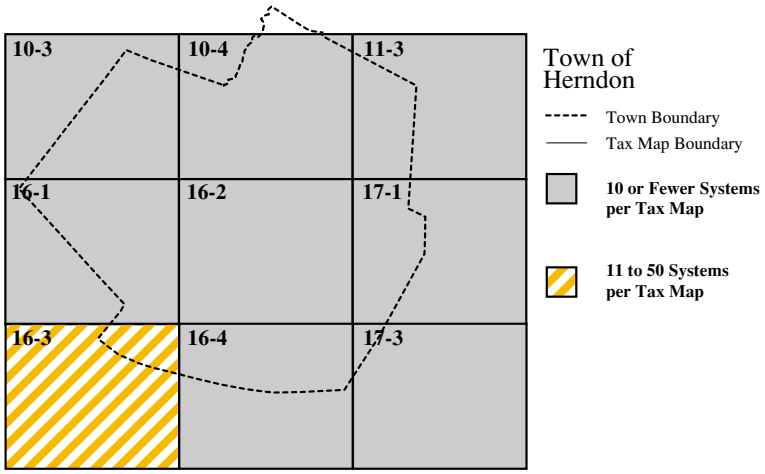
systems were installed before 1974, there is a relatively high risk of failure within the Town.

- Average soil perc rates (minutes per inch) for Herndon Tax Map areas are high (that is, it takes water longer to travel through one inch is soil). The area around Herndon contains some of the highest perc rates in northwestern Fairfax County with one Tax Map having a perc rate of over 41 minutes per inch and two having perc rates of 31 to 40 minutes per inch. High perc rates generally correspond with higher failure rates.

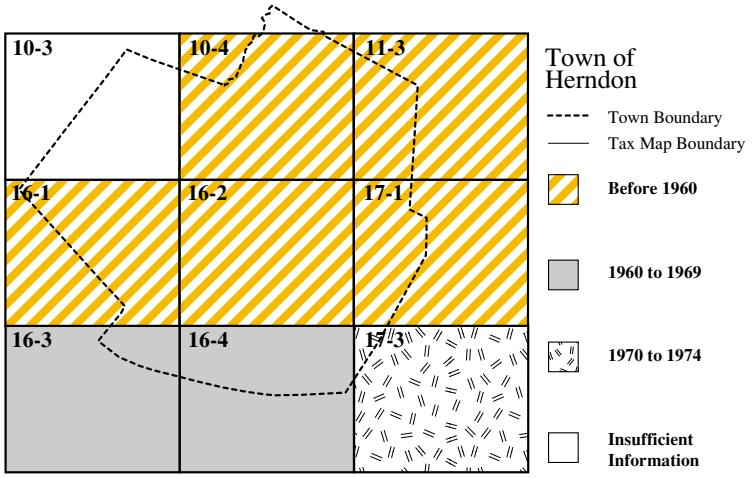
- In general, failure rates for septic systems installed in the Fairfax Piedmont Lowlands (of which the Town is situated) are higher (4.38%) than for septic systems installed in the Fairfax Piedmont (2.22%).

To date, there have been relatively few failures reported within Herndon Tax Map areas, although some instances of complete failures have been reported. While three Tax Maps are reported to have failure rates of over 10%, these Tax Maps contain fewer than 9 septic systems each. One Tax Map is reported to have a failure rate of 2.1 to

FIGURE III.4
Factors Affecting Septic System Failure Rates

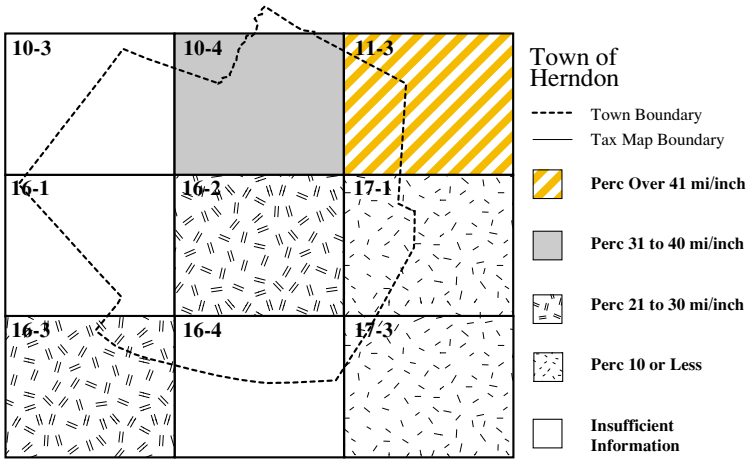


Septic System Density by Tax Map

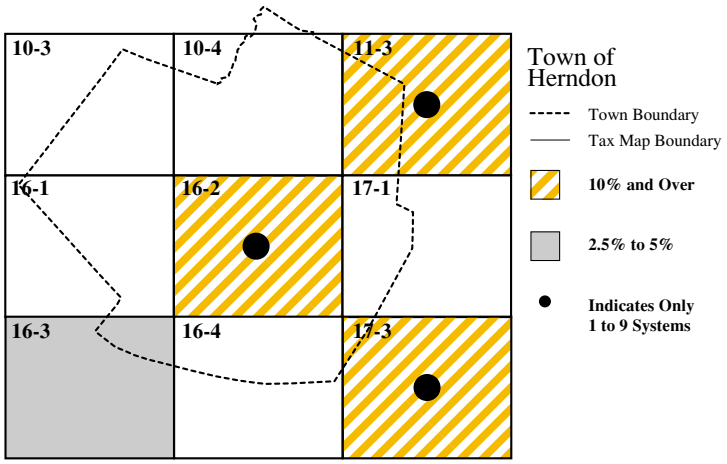


Average Age of System Installation by Tax Map

FIGURE III.4
Factors Affecting Septic System Failure Rates (continued)



Average Soil Percolation Rates by Tax Map



Septic System Failure Rates by Tax Map

5%. However, as area septic systems continue to age, the Town must pursue measures to protect local water resources from potential failures.

There are many reasons for septic failure, most of which are preventable through public education. One of the most common reasons cited for failure to the Fairfax County Health Department is failure by an owner to regularly (every three to five years) pump out the tank. Other factors contributing to septic failure include age, an unlevel distribution box, poor soils, hydraulic overload (too many users for the tank design), crushed/broken conveyance system, tree root damage to drainfield lines, and high water table.

III.7 Air Quality

Air quality is important from a water quality standpoint since, according to the Chesapeake Bay Program, approximately 27% of nitrogen reaching the Chesapeake Bay originates from atmospheric deposition of air pollution. The passage of the federal Clean Air Act Amendments of 1990 is requiring significant changes in air quality planning and implementation at local, State, and regional

levels. The legislation, which encompasses a broad range of planning and regulatory requirements, mandates specific emissions control measures and sets a target date of 1999 for the attainment of ozone and carbon monoxide health standards in the Washington metropolitan region. Northern Virginia is currently considered a "serious non-attainment" area for ozone, compared to Baltimore, which is considered a "severe non-attainment" area.

In the Washington area, the generation of ozone and carbon monoxide is largely attributable to mobile sources and in particular to the use of automobiles. Many of the most effective approaches to improving air quality from mobile source emissions will be implemented at State and regional, rather than local levels, through increased investment in public transportation and high occupancy vehicle lanes. Technological advances such as reformulated fuels, vapor-catching fuel dispensing systems, and tighter tailpipe standards are other measures whose widespread application is expected to contribute to improved air quality.

Regional air quality policies are developed through the Metropolitan Washington Air Quality Committee (MWAQC). Because Herndon does not hold separate membership on MWAQC, the Town must work through Fairfax County to ensure adequate representation. Herndon seeks to contribute to the larger effort by adopting policies which increase awareness of the environmental problems associated with increased ozone and carbon monoxide levels. Establishment of transportation policies which encourage ride-sharing, use of public transportation, and alternate forms of travel such as walking and bicycling will contribute to the effectiveness of the Clean Air Act.

III.8 Summary and Analysis of Existing and Potential Sources of Pollution

Nonpoint source pollution, underground storage tanks, petroleum pipelines, above ground storage tanks, improperly maintained septic systems, and atmospheric deposition are among the primary existing and potential sources of pollution within the Town.

Preventing and reducing pollution from underground storage tanks, petroleum pipelines, septic systems, and atmospheric deposition will require continued coordination with various State, local, and federal agencies including the Virginia Department of Environmental Quality, the Fairfax County Health Department, and the MWAQC.

Nonpoint source pollution poses the greatest threat to the Town's water resources and is also the area of pollution prevention for which the Town has primary responsibility. Because nonpoint source pollution comes from many diffuse sources, it is important for the Town to begin to identify what nonpoint source pollutants are the greatest problem and where they are coming from. The Town can then better target resources where they will have the greatest impact on reducing nonpoint source pollution.

The best resource for accomplishing this task is to reexamine the water quality data collected by the Fairfax County Health Department and MWCOG for Sugarland Run and Folly Lick Branch. These data indicate that fecal coliform pollution, which may come from animal waste as well as human waste, is of predominant concern. Possible sources include water fowl activity at the Herndon Centennial Golf Course, exfiltration from sewer lines, and pet owners who ignore local animal waste control regulations.

Elevated (but stable) nitrate nitrogen levels indicate the need to better manage this source of pollution. The three-prong approach of implementing structural BMPs to clean polluted stormwater runoff, encouraging site design that minimizes impervious surfaces, and public education is the most effective means of controlling the entry of this pollutant into local waterways. Nitrate nitrogen is most often generated from erosion of the land, overapplication or misapplication of fertilizers, fecal matter from sanitary sewers or animals, vegetative matter, and automobile exhaust.

Existing Programs and Regulations to Protect the Environment
IV

The Town of Herndon has adopted a number of important ordinances and programs to address the constraints to development, potential and existing sources of pollution, and the protection of sensitive natural features identified in the previous sections.

The Town has worked diligently with State agencies to bring its environmental and water quality protection programs into compliance with State laws and regulations and has worked to implement its own programs to address locally identified environmental and water quality needs. The Town was one of the first Tidewater jurisdictions to adopt a Chesapeake Bay Preservation Ordinance.

The following section presents an overview of existing Town ordinances and programs related to environmental protection. The purpose of this section is to provide a foundation on which to assess the effectiveness of the Town's environmental protection ordinances and programs in light of the needs identified in previous sections. The next section analyzes the potential need for the Town to increase or modify its protection efforts.

IV.1 Herndon 2010 Comprehensive Plan and Chesapeake Bay Preservation Chapter

The Town's 2010 Comprehensive Plan, together with this Chesapeake Bay Preservation Chapter, outlines the Town's long-range environmental goals and action strategies. The Comprehensive Plan is a visionary document and represents the Town's vision for what ought to be.

The Herndon 2010 Comprehensive Plan contains policy about urban forestry, as well as policy to establish "Green Streets" (corridors with special landscaped buffers) and "Clean Streams" (water quality goals). It also contains development guidelines intended to emphasize protection and integration of the natural environment with development and redevelopment sites (guidelines for "Infill and Redevelopment" and "Adaptive Areas"). The Chesapeake Bay Preservation Chapter contains additional information and recommendations for protecting stream habitats and water quality by preventing pollution and developing and redeveloping in a way that complements and protects natural resources.

The 2010 Comprehensive Plan and Chesapeake Bay Preservation Chapter should be used in conjunction with the Town's ordinances and programs to

guide the Town as it continues to grow, seeks to overcome existing problems, and faces new challenges.

IV.2 Chesapeake Bay Preservation Act

The Chesapeake Bay Preservation Act (Chapter 25, Title 10.1 of the Code of Virginia) was enacted in recognition that Virginia could no longer afford to ignore nonpoint source pollution from urban and agricultural sources. The Chesapeake Bay, one of Virginia's most important natural and economic resources, has been on the verge of becoming an ecological disaster area. However, the Chesapeake Bay is only the most visible manifestation of a larger problem. Local streams and watersheds also suffer directly from the effects of pollution. Many could no longer support aquatic life when the Chesapeake Bay Preservation Act was enacted, and, though there have been some improvements, local tributaries still require improvements in water quality in order to meet acceptable water quality standards.

The Chesapeake Bay Preservation Act establishes a program to protect environmentally sensitive features which, when disturbed or developed incorrectly, lead to reductions in water quality. The Act provides a framework for local government to identify these sensitive areas and to enact regulations to better plan land use activities on and around them. Under the regulations, the Town of Herndon is required to:

- protect existing high quality State waters and restore all other State waters to a condition or quality that will permit all reasonable public uses, and will support the propagation and growth of all aquatic life which might reasonably be expected to inhabit them;
- safeguard the clean waters of the Commonwealth from pollution;
- prevent any increase in pollution;
- reduce existing pollution; and
- conserve water resources in order to provide for the health, safety, and welfare of the present and future citizens of the Commonwealth.

In accordance with the guidelines established by the Chesapeake Bay Preservation Area Designation and Management Regulations, Chesapeake Bay Preservation Areas (CBPAs) were mapped for the Town of Herndon and the Town adopted a Chesapeake Bay Preservation Area Overlay District as part of the Town's Zoning Ordinance on January 22, 1991. The mapping of these areas, which include Resource Protection Areas (RPAs) and Resource Management Areas (RMAs), was based on a survey of existing natural resources documentation as well as field surveys.

RESOURCE PROTECTION AREAS – RPAs are lands at or near the shoreline containing components which are especially sensitive because of (1) the intrinsic value of the ecological and biological processes they perform which benefit water quality, or (2) the potential for impacts that may cause significant degradation to the quality of State waters.

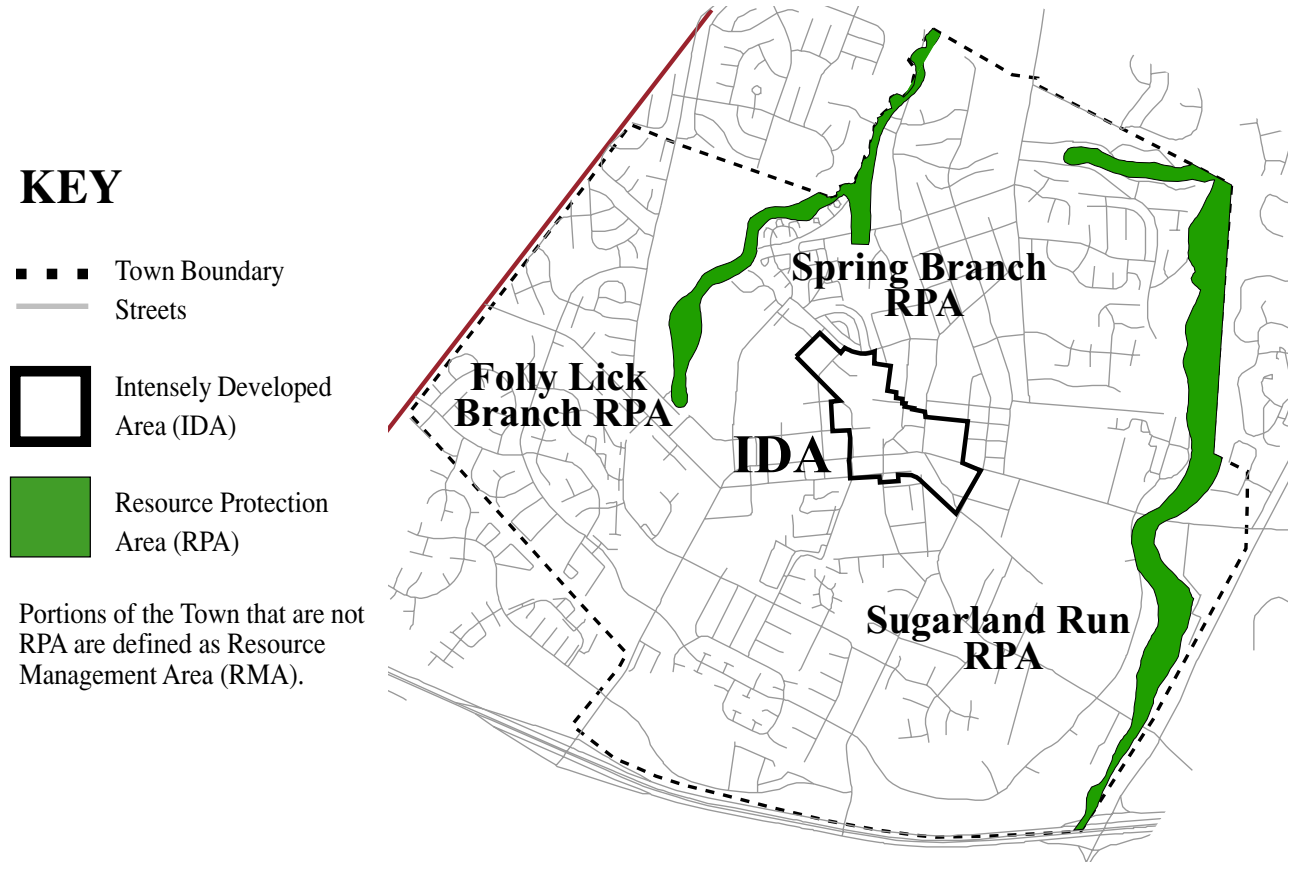
The RPA designation within the Town includes a 100-foot vegetated buffer area located adjacent to and landward of all tributary streams and nontidal wetlands connected by surface flow and contiguous to tributary streams. These lands are excluded from development in most instances.

RESOURCE MANAGEMENT AREAS – RMAs include land types that, if improperly developed, have the potential for causing significant water quality degradation or for diminishing the functional value of the RPA.

The RMA consists of all land located in the Town which is not included in the RPA. The RMA within the Town incorporates, but is not limited to concentrations of the following land categories: floodplains; wetlands; highly erodible soils; steep slopes greater than 15%; and nontidal wetlands not connected by surface flow to tributary streams.

A property may be excluded from the RMA if it can be shown that RMA performance criteria are met in an area contiguous to and within 100 feet of the boundaries of the RPA and that the property is not characterized by floodplains, wetlands,

FIGURE IV.1
Generalized Chesapeake Bay Preservation Area Map for the Town of Herndon



This map is for general informational purposes only. The designation criteria for RPAs and RMAs shall control the location and boundary of those areas. Any conflict between the boundary line as shown on this map and the actual location of the criteria shall be resolved by the location of the designation criteria as shown on the approved site plan or subdivision plat; or house location survey.

highly erodible soils, or steep slopes greater than 15%.

INTENSELY DEVELOPED AREAS – IDAs include areas in which pre-Chesapeake Bay Preservation Act development is concentrated and little of the natural environment remains. The concentrated nature of development in IDAs may not allow for the implementation of specific performance criteria identified in the Town's Ordinance. As a result, all development in the IDA is considered to be redevelopment and may be exempt from the buffer requirements of the RPA. Specific areas of the Town identified as IDA are show in Figure IV.1.

If the CBPA boundaries include a portion of a lot, parcel or development project, then only that portion must comply with the Town's Ordinance. However, the division of property does not constitute an exemption from this requirement.

The criteria are intended to establish rules that local governments can use in granting, denying

or modifying requests to rezone, subdivide, or to use and develop land in the CBPA. Implementation of the criteria is achieved through the use of performance standards, Best Management Practices, and various planning and zoning concepts.

Figure IV.1 presents a generalized view of the Town's Chesapeake Bay Preservation Area Map. It should be noted that it is the designation criteria identified in the Chesapeake Bay Preservation Ordinance which is binding, and when conflicts between the Chesapeake Bay Preservation Area Map and the designation criteria arise, the designation criteria shall prevail.

IV.3 Erosion and Sediment Control Ordinance

The purpose of the Town's Erosion and Sediment Control Ordinance is to prevent the degradation of local soil and water resources as a result of land-disturbing activities by ensuring that the owner of the property on which land disturbing activities are being carried out provides adequate controls of erosion and sedimentation. The Town's E&S Ordinance also requires the land owner to take necessary measures to preserve and protect trees and other vegetation during all phases of any land-disturbing activity. The Erosion and Sediment Control Ordinance implements the Virginia Erosion and Sediment Control Law (§§ 21-89.1 *et seq*., Code of Virginia (1950)) as well as the Chesapeake Bay Preservation Act.

Under the E&S Ordinance, land owners proposing a nonexempt regulated land disturbing activity of greater than 10,000 square feet (or 2,500 square feet in a Chesapeake Bay Preservation Area) must first submit an erosion and sediment control plan to the Town Department of Public Works. The Town's erosion and sediment control requirements are detailed in Chapter 6 of the Town Code.

The following is an abbreviated list of the basic principles of the Town's E&S Ordinance. The developer must refer to the Town Code for a complete description of requirements.

- The development plan must be fitted to the topography and soils so as to create the least erosion potential.
- Wherever feasible, allowing for development permitted in the zoning district in which the land is situated, natural vegetation shall be retained and protected.
- Provisions shall be made to effectively accommodate the increased runoff caused by changed soil and surface conditions during and after development.
- Sediment basins and similar structural measures shall be installed below high sediment-producing areas to remove sediment from runoff waters from land undergoing development.
- Timing of development will be conducted so that the smallest practicable area of land is exposed at any one time, all erosion and siltation structures are in place prior to the first step in grading, and special measures are provided to protect any disturbed areas not paved, sodded, or built upon.
- Conservation practices for erosion and sediment control are equal to or exceed the specifications of those contained in the most recent edition of the Virginia Erosion and Sediment Control Handbook.

In addition, the Town has adopted relevant portions of the Fairfax County Public Facilities Manual relating to stormwater management facilities to prevent erosion as a result of increased impervious surfaces.

IV.4 Floodplain Ordinance

The purpose of the Town's Floodplain Ordinance is to prevent the loss of life and property, the creation of health and safety hazards, the disruption of commerce and governmental services, and unnecessary expenditure of public funds for flood protection and release as a result of improper development within the floodplain. Because most land uses are inappropriate for the floodplain, the Town's ordinance also results in the protection of the floodplain as a wildlife habitat corridor.

In 1979, the Federal Emergency Management Agency investigated the existence and severity of flood hazards in the Town of Herndon to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. The study was also meant to be used by local and regional planners in their efforts to promote sound floodplain management. To these ends, the Town established a Flood Plain District to protect the 100-year flood plain as part of the Town's Zoning Ordinance (Article 48).

No development is allowed in the Flood Plain District unless the effect of such development on flood heights is fully offset by accompanying improvements which have been approved by all appropriate State and local authorities. The following uses, however, are allowed if the underlying zoning permits and given that they do not require structures, fill, or storage of materials and equipment.

- Agricultural uses such as general farming, pasture, grazing, outdoor plant nurseries, horticulture, truck farming, forestry, and sod farming and wild crop harvesting.
- Public and private recreational uses and activities such as parks, day camps, picnic grounds, golf course, boat launching and swimming areas, hiking and horseback riding trails, wildlife and nature preserves, game farms, fish hatcheries, trap and skeet ranges and hunting and fishing areas.
- Utilities and public facilities and improvements such as railroads, streets, bridges, transmission lines, pipelines, water and sewage treatment plants, and other related uses.

Figure II.1 (under CONSTRAINTS TO DEVELOPMENT) presents areas of the Town which have been designated as being floodprone (the one-hundred year floodplain) for which the Town's ordinance applies.

IV.5 Urban Forestry and Landscaping Ordinance

The purpose of the Town's Urban Forestry and Landscaping Ordinance (Article 28 of the Town Code) is to promote and protect the public health, safety, and general welfare by providing for the regulation of the planting, maintenance, preservation, and removal of trees, shrubs, and other vegetation within the Town. Among its provisions, the Ordinance requires that no healthy tree may be destroyed or removed from any parcel of land for which a subdivision plat, subdivision plan, or lot development plan has been submitted to the Department of Community Development. No healthy tree thereafter may be destroyed or removed unless it has been specifically permitted. A Landscape Mitigation Plan (LMP) must be submitted for those trees required to be preserved under the terms of the Ordinance if it is determined that trees protected under the site development plan have been destroyed or removed, or if in the opinion of the Town's Urban Forester a tree has been damaged by construction to the extent that it will lead to deterioration or death.

No subdivision plan, site plan, or lot development plan may be approved by the Zoning Administrator which provides for the destruction or removal of any existing healthy tree unless such destruction is necessary in order for development on the parcel to be accomplished in accordance with the other approved aspects of the subdivision or lot development plan, or would further the purposes of this Ordinance by allowing for a more appropriate landscape design. The Ordinance also regulates and requires vegetated buffer areas of certain sizes for various classes of land use.

IV.6 Town Pollution Prevention Programs

Pollution prevention is the most economical and environmentally friendly means of protecting local and regional water resources from pollution. By preventing pollution in the first place, damage to the environment can be avoided and expensive pollution clean-up programs and facilities will be unnecessary.

Pollution prevention covers a broad range of programs and regulations aimed at modifying the human behavior or activity that causes pollution

in the first place. Significantly, pollution prevention programs can be tailored to address specific pollution problems or specific pollution generating activities.

The Town is currently working to promote the Northern Virginia Soil and Water Conservation District's "Backyard to the Bay" watershed education program. By not reinventing a separate pollution prevention program, the Town can save money and take advantage of the NVSWCD's considerable expertise. It also allows the Town to pick and choose programs that fit the Town's pollution prevention needs. Highlights of the NVSWCD's program are included in Table IV.1.

WATERSHED AWARENESS EDUCATIONAL PROGRAMS – Runnymede Park, master-planned as a primarily natural park, is an asset with great potential for extending watershed conservation information and for citizen education in pollution prevention, stream mechanics, and aquatic life. This outdoor learning center and living laboratory offers extensive conservation areas, Sugarland Run along the eastern edge, small wetland areas and other habitat types, space for demonstration areas, and a future nature center as a focal point for educational programs and activities.

Watershed, stream, and wetland educational programs conducted by Runnymede Ranger volunteers should be promoted more widely and additional volunteers should be located and trained in park ecology and examples of processes. The Parks & Recreation naturalist and the Community Development urban forester should work closely with available volunteers to implement further educational opportunities.

COMBINING STEWARDSHIP EDUCATION AND COMMUNITY SERVICE – Well-established stream cleanups, sponsored jointly by TreeAction and the Town since 1987, have always included a public education component that could be expanded. Recent plant restoration and habitat improvement work and planned projects in

TABLE IV.1
Menu of Pollution Prevention Options – Northern Virginia Soil and Water Conservation District's "Backyard to the Bay" Program

- "Don't Dump" community education and stormdrain stenciling program.
- Nonpoint source pollution prevention programs including lawn care demonstrations and workshops and techniques for dealing with home drainage and erosion problems.
- Resource materials, interactive displays, and exhibits at special events.
- Citizens Water Quality Handbook outlining solutions to common watershed problems and suggestions for "make a difference" activities."
- Teacher training in Project WET (Water Education for Teachers).
- Youth watershed projects.
- Erosion and sediment control seminars for developers and the general public.
- Pond management and riparian restoration seminars and workshops.
- Support for citizen based watershed stewardship groups.
- Volunteer water quality monitoring projects to raise awareness, collect resource information, and encourage action.

wetlands area, by the same volunteer groups, should be continued.

The Town should work closely with the Friends of Runnymede Park and others, to extend watershed awareness information to residents in adjacent and nearby subdivisions surrounding the park. For example, stormwater from Herndon (K-Mart) Center is piped into the marsh area of Runnymede Park, and this adds an opportunity for volunteers to work with commercial center owners to reduce pollutants – especially trash carried through the storm drains. These activities are excellent opportunities to combine educational activities and community service projects for youth.

Schoolyard habitat projects, such as the Herndon Middle School and Tree-Action partnership with a strong water-and-wetlands and water conservation component, could be supported by the Town, as a means of reaching a broad audience in a dedicated setting. In addition, the Town will implement a stormdrain labeling program to warn the public about dumping materials into stormdrains. This project will be funded under the Virginia Litter Prevention and Recycling grant the Town received in 1997. The Town hopes to implement the project in the fall of 1998.

In addition to citizen and business education, the Town staff continues to work specifically with the Herndon Centennial Golf Club to mitigate water quality problems associated with that particular type of land use. Water quality management techniques identified in Section III.2, Area 3 should continue to be implemented and improved upon.

Another important form of pollution prevention is the promotion of land development that minimizes impervious areas so that the landscape can absorb and retain rainfall. There are a number of resources available that outline techniques that can be used to promote environmentally-friendly site design. The Town should strive to have a degree of flexibility in its Zoning and Subdivision Ordinances to allow creative design that minimizes the use of impervious surfaces.

Analysis of Program Needs and Strategic Water Quality Protection Plan
V

The purpose of this section is to examine the Town's environmental and water quality protection ordinances and programs in light of the Town's desire to protect its sensitive natural resources, avoid improper land uses on areas with constraints to development, and reduce or eliminate existing and potential sources of pollution. The purpose of such an examination is to identify the strengths of the Town's environmental and water quality protection programs and to develop a strategic water quality protection plan to address issues and concerns that are not adequately accounted for by existing Town programs. The results of this analysis are then used as the basis of the strategies and action statements in Section VI.

V.1 Sensitive Natural Resources

Sensitive natural resources within the Town include natural habitats, topography, geology and soils, surface water, groundwater, and wetlands. All of these sensitive resources require continued protection and often serve as constraints to development. In addition, protection of many of these sensitive natural resources (such as surface and groundwater quality and streambank erosion) can be achieved through the prevention and control of existing and potential sources of pollution.

This section focuses on actions that the Town may take to improve and enhance natural resources within the Town that are not otherwise addressed under constraints to development (Section V.2) or control of existing and potential sources of pollution (Section V.3).

Proactive environmental and water quality protection education should be undertaken to increase understanding of physical constraints and natural resources by staff members and by elected or appointed decision-makers. Seminars or workshops might be conducted, in cooperation with NVSWCD or other knowledgable entities or individuals. Benefits include less susceptibility to inappropriate choices when definition of standards are stretched or protective measures are compromised unnecessarily by development proposals.

RIPARIAN BUFFER AREAS – Riparian buffer areas in Chesapeake Bay Preservation Areas are protected under the Town's Chesapeake Bay Preservation Ordinance (CBPO). During development and redevelopment, a 100 foot vegetated buffer area must be protected, and in most cases reestablished if not present, landward of all other RPA features and all tributary streams.

In general, MWCOG's 1997 assessment of the Sugarland Run mainstem found that most of the stream is protected on both sides by a canopied buffer of greater than 100 feet. The notable exception is the stream reach from the Dulles Toll Road to the W&OD Trail where there is a complete lack of tree canopy cover. (Also see the following WETLANDS section reference.) While reforestation efforts are already underway, the long-term benefits of a mature canopy will not be fully realized if the plantings are not maintained. The Town should work with VDOT, local environmental and conservation groups, and the Virginia Department of Forestry to ensure that the tools for proper maintenance are available and utilized. Also refer to WETLANDS information. Wetlands lost during construction of the Fairfax County Parkway, should, in part, be replaced by the intended detention area in order to immediately benefit water quality downstream. This would reduce sedimentation and filter pollutants, though it would not reduce water temperature. Detention capability does not serve as well as the original retention functions of the beaver pond and natural wetland destroyed by construction, but it would help.

Reforestation of riparian buffer areas is an integral part of the health of a stream valley and serves not only to protect water quality but also provides excellent wildlife habitat. It is also a significant part of Virginia's overall Chesapeake Bay protection efforts. In order to help the Town to strategically protect existing riparian buffer areas and restore denuded riparian buffer areas, the Town should undertake an assessment of all Town streams similar to that performed by MWCOG for the Sugarland Run mainstem. The Town should utilize local environmental and conservation organizations to help perform the assessment and should approach the Northern Virginia Soil and Water Conservation District and the Virginia Department of Forestry to establish a buffer restoration plan.

FISH PASSAGE IMPEDIMENTS – There is only one partial fish barrier located within the Town on the Sugarland Run mainstem. The Town should investigate ways to reduce the impact of this impediment which is located immediately upstream of Elden Street. While the box culvert at the intersect of Sugarland Run and the Fairfax County Parkway to the north of the Town represents a complete blockage, no cost-effective remedial actions have been identified at this time.

More importantly, fish impediments are located to the north of the Town in Fairfax and Loudoun counties. These impediments, while not located in the Town, nonetheless impact the Town's natural habitats. The Town should encourage its neighbors to investigate ways to provide increased fish mobility in the Sugarland Run.

POTABLE WATER SUPPLY AND PROTECTION – It is anticipated that the Town's water supply will be adequate to serve the needs of the Town into the foreseeable future. Water conservation measures will ensure that surface water withdrawals and the generation of wastewater are minimized. The Town does not currently have a water conservation education program in place. A simple public education brochure, mailed with local water bills, can be an effective means of educating the public on water conservation techniques. The City of Fairfax has a water conservation brochure that the Town can adapt for its own purposes at minimal cost.

V.2 Constraints to Development

The primary physical constraints to development in the Town include floodplains, geology and soils, topography, wetlands, mature forest areas and stream valley corridors (including areas of significant wildlife habitat), and groundwater recharge areas.

FLOODPLAINS – Floodplain areas are protected under the Town's Floodplain Overlay District and are defined as an RMA feature under the Town's Chesapeake Bay Preservation Ordinance (CBPO). As a practical matter, most significant floodplain areas are located within the Town's designated RPA and are therefore excluded from development in most instances. In addition, the Town has set

aside significant areas of the floodplain, particularly around the Sugarland Run mainstem, as part of its municipal park and stream valley system.

Within the past few years, the Town has allowed filling of floodplain for development in one instance and development of an area adjacent to a floodplain that provided extended storage of flood waters. These incidences should not be considered as precedents for further encroachment into floodplain areas.

GEOLOGY AND SOILS – The preponderance of soils within the Town are suitable for most types of development if proper soil conservation measures are implemented, although some soil groups preclude the use of basements or require extending building footings to rock below the subsoil. The Town's Erosion and Sediment Control Ordinance (E&SC Ordinance) adequately addresses soil and water conservation as a result of general site development while the Town's CBPO addresses highly erodible soils (such as those located on slopes greater than 15%) and highly permeable soils.

The Virginia Uniform Statewide Building Code (VUSBC) provides guidance on the engineering requirements and constraints for other sensitive soil associations found within the Town. In addition, the Town's Zoning Ordinance allows cluster development in order to avoid building on particularly sensitive soil areas. The Town should promote this provision as a means of avoiding development on sensitive soil features. A site specific soils test to identify limitations is required for all development within the Town.

The only soils within the Town for which any development is inappropriate are floodplain (mixed alluvial) soils. Floodplain soils within the Town are limited to areas protected by the Floodplain Overlay District and areas defined as RPA under the CBPO where development potential is extremely limited.

TOPOGRAPHY – In general, there are few topographic constraints within the Town that cannot be adequately addressed through the Town's E&SC Ordinance. Less than 3% of the total land area is identified as having slopes in excess of 15%. Most of these areas have already been developed and are under vegetative cover. Slopes of 15% or greater are defined as RMA under the Town's CBPO.

WETLANDS – Most of the Town's wetlands are associated with Herndon's main waterways. Although many wetlands have disappeared as a result of construction and development activities, significant wetland areas still remain. Wetland areas associated with the Town's main waterways have been identified through stream walks conducted by Town staff in February of 1998 (see Figure I.9) with the help of federal National Wetland Inventory Maps. While these wetlands are defined as an RMA feature under the Town's CBPO, their location within floodplain areas, and often within the 100 foot RPA Buffer Area, in many instances protects these wetland resources from encroachment.

Currently mapped and any unidentified wetlands that may be delineated during the site planning process are also protected under Section 404 of the federal Clean Water Act (U.S.C. §1251 *et seq*., 1987 as amended). Section 404 requires anyone proposing to impact three or more acres of wetland to obtain a U.S. Army Corps of Engineers permit. A notification form and report are required for any activity affecting less than three acres. The Town's CBPO requires that all wetland permits are obtained before development may begin.

GROUNDWATER – The Virginia Groundwater Protection Act is the primary tool for protecting groundwater recharge areas within the Town. Because the Town is located completely within the Piedmont Lowlands aquifer, there are no discernible recharge areas that require special attention or delineation. Rather, the approach that the Town must take is to promote development that reduces impervious surface areas so that groundwater recharge may occur naturally. The

Town's CBPO, as well as the Town's Urban Forestry and Landscaping Ordinance, require that natural vegetated areas be preserved to the maximum extent practicable. In addition, the CBPO requires that impervious surface areas be minimized as a result of land development. The Town should encourage and promote site design techniques and other measures, where appropriate, that will reduce impervious surface areas and increase opportunities for groundwater recharge.

V.3 Existing and Potential Sources of Pollution

Identified existing and potential sources of pollution include point source pollution, nonpoint source pollution, erosion of the land, underground storage tanks, petroleum transmission mains, above ground storage tanks, failing septic systems, and air pollution.

POINT SOURCE POLLUTION – Point sources of pollution are strictly regulated through the Department of Environmental Quality. Two industrial sites within the Town have permits that meet environmental standards to discharge to Sugarland Run. There are no municipal discharges (usually in the form of wastewater or major stormwater outfalls) that are currently regulated under the federal Clean Water Act's National Pollution Discharge Elimination System (NPDES) permit program. However, the Town recognizes that municipal stormwater discharges may eventually be regulated under NPDES. Implementing the recommendations covered in this section will help the Town to comply with these regulations in the future.

NONPOINT SOURCE POLLUTION – The Town's primary nonpoint source pollution control measures include its CBPO and its E&SC Ordinance. All new development and redevelopment must implement nonpoint source pollution control measures under the Town's CBPO general performance criteria. However, the CBPO allows a developer to opt-out of the performance criteria provisions if the developer can demonstrate that the property contains none of the RMA features identified in the CBPO. Because most new development is hydrologically connected to the local stream system via stormdrain, under the opt-out provision all pollutants that collect on streets and other impervious surfaces will be flushed directly to the local stream without the benefit of treatment. To rectify this situation, the Town should extend its BMP requirements to all areas of the Town regardless of whether or not they contain RMA features. However, if there are no RMA features, the property may be exempt from performing the other requirements of the CBPO.

Since much of the Town is nearing build-out, most development in the future will take place as redevelopment. Redevelopment presents an excellent opportunity to improve local water quality by making development more water quality friendly. Under the Town's CBPO, nonpoint source pollution loads must be reduced by 10% from existing site conditions during redevelopment. Redevelopment also presents an opportunity to replace antiquated sewer lines, connect to the sanitary sewer system (as opposed to a septic field), connect to gas or electricity (instead of having an individual fuel oil tank), restore vegetated areas (including Buffer Areas required under the CBPO), and correct erosion problems.

However, because many of the features identified as RMA under the Town's CBPO have been obliterated as a result of past development within the Town, many redevelopment sites may be able to exempt themselves from the CBPO's redevelopment performance criteria. For this reason as well, the Town should extend its BMP requirements to all areas of the Town. BMPs such as sand filtration systems, which require no surface space and can be shared among many different operators, can be implemented in the more densely developed historic sections of the Town in order to minimize effects on the existing character of the Town.

The Town should also identify opportunities for retrofitting already developed areas through the strategic use of regional or shared BMPs. This approach should be coordinated with neighboring Fairfax County.

BMPs must be properly maintained in order to provide long-term protection to local water quality. The Town requires the owner of any privately maintained BMP facility to enter into a maintenance agreement with the Town. The Town must continue to monitor and enforce these BMP maintenance agreements.

Despite the effectiveness of structural BMPs, pollution prevention is the most cost effective means of controlling nonpoint source pollution. While the Town has begun to work with the Northern Virginia Soil and Water Conservation District to implement a Town pollution prevention program, few actual measures have been developed and implemented. The Town should work with the NVSWCD to establish a full range of nonpoint source pollution education programs that fit the needs of its citizens and businesses and that address the various identified sources of nonpoint source pollution. Options may include lawn management, street cleaning, hazardous waste disposal, stormdrain stenciling, and public education measures.

The Town should develop a means of assessing common sources of pollution. Citizen interviews as well as stream walks are excellent ways of identifying problem areas. For instance, discussions with Herndon Centennial Golf Course staff resulted in the construction of trash screens to aid in the removal of large amounts of trash and other contaminants that previously found their way to the irrigation pond. The primary source of these contaminants is the stormdrain system. A combination of public and business education and stormdrain stenciling may help to ameliorate this problem.

Of additional concern are highly elevated fecal coliform levels in Sugarland Run and Folly Lick Branch. As noted previously, elevated fluoride levels in grab sample water quality monitoring indicates that leaking sanitary sewer lines may be responsible for at least part of the problem. Identification and remediation of problem lines is the only means of correcting for this water quality and health factor in the long run. In addition, more stringent enforcement of local animal waste control laws can help to reduce overall fecal coliform levels. The Town should enforce Fairfax County's animal waste control ordinance. A public education campaign that links animal waste control with a public safety hazard may be an effective means of fecal coliform control and should be incorporated into the Town's overall nonpoint source pollution prevention program. Runnymede Park and Stanton Park are ideal settings for such a public education program. In addition, the Town may consider partnering with local pet stores or scout troops to distribute or provide low-cost/free scoopers to pet owners.

Another form of pollution prevention is to minimize the amount of impervious surface area associated with land development. By allowing rainwater to infiltrate naturally into the soil, less pollution is flushed to the local stream and stormwater runoff volume is decreased. The Town should encourage the use of creative site design techniques that minimize impervious surface areas such as shared parking arrangements and tree preservation. A comprehensive review of the Town's Zoning and Subdivision ordinances to identify opportunities for allowing such measures should be undertaken.

In addition to structural BMPs and pollution prevention, riparian buffers also serve to protect streams from overland runoff and nonpoint source pollution. As previously noted, much of the Sugarland Run mainstem and Folly Lick Branch are buffered by at least a 100 foot canopied riparian buffer system. However, one particular area of concern is the Sugarland Run mainstem from the Dulles Toll Road to the W&OD Trail where there is almost a complete absence of tree canopy cover. Restoration of this and other denuded riparian areas will help to protect local water quality and enhance the Sugarland Run stream valley's function as a natural wildlife habitat corridor.

The Town should seek to build upon the Metropolitan Washington Council of Government's 1997 assessment of the Sugarland Run mainstem by performing similar assessments on Folly Lick

Branch, Spring Branch, and other tributaries throughout the Town. This will allow the Town to better identify areas of denuded stream buffer and target these areas for reforestation either by public means or through the redevelopment process. Such a study will also allow the Town to better identify potential and existing sources of pollution in the Town.

Finally, public and private institutional and recreational land uses are of particular concern to the Town because they often involve the maintenance of large areas of turf and landscaping. Specifically, the Town's municipal golf course, a significant potential source of pesticides, fertilizers, and fecal coliform bacteria in Folly Lick Branch, is an example of how best management practices can be applied. The Town has worked with the course management to implement integrated pest management (IPM), fertilizer application controls, and grass filter strips in accordance with Golf Course Superintendents Association guidelines developed in association with the Audubon Society. The Town should use its public areas as a means to showcase proper environmental management techniques.

The Town should work with the Fairfax County Health Department and the Department of Environmental Quality to monitor long term trends in water quality in order to gauge the impacts of nonpoint source pollution control programs. In addition, the Town should expand upon this program in order to pinpoint specific problem areas or pollution "hot spots" and to get a more comprehensive picture of stream health. The Town should explore the use of local volunteer and environmental groups such as the Friends of Sugarland Run to perform such monitoring or the establishment of a program run by the Fairfax Health Department similar to that of the City of Fairfax.

EROSION OF THE LAND – The control of site specific soil erosion as a result of land development is adequately addressed under the Town's E&SC Ordinance. However, while there are adequate controls in place to prevent site specific erosion problems, the Town does not have an adequate mechanism to address the cumulative effects of increased runoff on downstream areas. One of the most significant sources of erosion in the Potomac River and the Chesapeake Bay is instream erosion and streambank erosion as a result of excessive volumes and velocities of runoff. While BMPs established as part of the Town's CBPO performance criteria help to alleviate this problem to a degree by providing stormwater detention, these BMPs are not specifically designed for water volume control purposes.

To address the problem of downstream scouring and erosion, the Town should proceed with its long-term goal of adopting a Stormwater Management Ordinance as is allowed under the Virginia Stormwater Management Regulations (4VAC 3-20-10 *et seq*.). In most instances, stormwater management facilities can be incorporated into water quality BMPs. Combining these practices is cost-efficient and helps to alleviate both water quality and water volume problems.

Some areas of the Sugarland Run mainstem have been identified as experiencing bank erosion. The Town should work with the Northern Virginia Soil and Water Conservation District to determine the specific causes of the erosion (if any), and seek to stabilize these areas without the use of streambank hardening. The NVSWCD and MWCOG can provide resource materials on environmentally sound streambank stabilization techniques using bioengineering. In addition, an adequately performed Resource Management Plan for Runnymede Park should address erosion problems, and coordinate planning with habitat objectives, interpretive objects, and other factors.

UNDERGROUND STORAGE TANKS – The Town has a high incidence of leaking or previously leaking underground storage tanks. While the Virginia Department of Environmental Quality is directly responsible for monitoring these tanks, the Town should continue to work closely with the DEQ to ensure compliance with all applicable laws and regulations.

ABOVE GROUND STORAGE TANKS – While the Town has less than the County-wide average for houses that rely on above ground storage tanks for fuel oil or kerosene, the potential for spillage makes these tanks a significant threat. The specific location of these tanks is not currently documented. The Town should identify homes which rely on fuel oil and kerosene (this can be accomplished by working with companies that supply fuel oil) and develop a brief information guide on above ground storage tank safety for distribution.

PIPELINES – Colonial Pipeline traverses the eastern edge of the Town, and is a potential source of extremely devastating environmental and public health and safety effects. The Town should continue to work with DEQ to ensure enforcement of inspections that assure the safety and integrity of this pipeline.

IMPROPERLY MAINTAINED SEPTIC SYSTEMS – There are only a few households in the Town that still rely on septic fields for waste disposal. However, the age of these systems and the characteristics of the local geology makes it likely that many of these will fail without proper long-term maintenance. While all new development is required to hook into public sewer, prevention is key to ensuring that existing septic systems remain in good working order. The Fairfax County Health Department sends notices to all septic tank owners informing them of their responsibility to pump a tank every five years under the Chesapeake Bay Preservation Act and how to maintain the system. The Town should work with the Health Department to bolster these efforts.

AIR QUALITY – Air quality is a regional issue that is being addressed through the Metropolitan Washington Air Quality Committee. The Town should work with MWAQC through Fairfax County to assure that the Washington area can shed its nonattainment status for ozone and carbon monoxide.

STRATEGIES AND ACTION STATEMENTS VI

The intent of the following strategies and action statements is to promote the protection of the Town's streams, and consequently the Potomac River and Chesapeake Bay, from the avoidable impacts of land use activities and restore degraded streams that are capable of supporting indigenous stream-dwelling or stream-using wildlife. These strategic action statements are the result of an exhaustive inventory and analysis of the Town's natural resources, constraints to development, existing and potential sources of pollution, and existing State, local, and federal regulations and programs aimed at protecting water quality and other natural resources.

A specific implementation plan, along with implementation responsibilities and time-lines, is presented in Section VII.

GOAL 1 **Protect the Town's streams, and consequently the Potomac River and Chesapeake Bay, from the avoidable impacts of land development and human activities.**

Integrated Watershed Management Plan

STRATEGY Optimize water quality and resource protection through the strategic use of structural and nonstructural BMPs to address all sources and types of pollutants.

STRATEGY Share information with Fairfax County and local, State, and regional organizations involved in water quality protection to avoid redundancy and to identify enforcement or programmatic gaps.

Stormwater Management

STRATEGY Ensure that there is no net increase in nonpoint source pollution destined for the Chesapeake Bay as a result of new development and reduce the impacts of existing land uses as a result of redevelopment.

ACTION Vigorously enforce the provisions of the Town's Chesapeake Bay Preservation Ordinance and Erosion and Sediment Control provisions, to ensure that they are effective stormwater management tools.

ACTION Strengthen the requirements to qualify for the Town's CBPO "opt-out" provision or eliminate the "opt-out" provision altogether to require the use of stormwater quality BMPs for all development.

ACTION Plan and implement cooperative/regional stormwater management controls, where appropriate, to improve overall water quality management and decrease the overall maintenance burden.

ACTION Encourage the use of BMPs which require no surface space (such as sand filtration systems) in densely developed sections of the Town to address water quality issues without detracting from the urban character of the area.

ACTION Continue to require and enforce a strong maintenance program for public and private BMPs to ensure the long-term effectiveness of these facilities.

ACTION Encourage site design that minimizes impervious surface areas, including the use of porous pavement, and maximizes the preservation of indigenous vegetation.

ACTION Perform a review of the Town's Zoning and Subdivision ordinances to identify opportunities for reducing impervious surface requirements during the site plan development and review process.

ACTION Ensure that all development avoids unnecessary impacts on sensitive environmental features and that development takes appropriate measures to avoid improper development on sensitive soils.

ACTION Amend the Town's Zoning Ordinance to include site design guidelines that encourage clustering in order to preserve sensitive soil areas as permanent open space.

ACTION Ensure that development and redevelopment practices for municipally-owned land are undertaken using environmentally sensitive tech-

niques. Publicize these practices in order to serve as a model for other development projects.

ACTION Work to reduce the contribution of atmospheric deposition to water quality problems by working with Fairfax County and the Metropolitan Washington Air Quality Committee.

ACTION Continue to use the redevelopment performance criteria of the Town's CBPO as an opportunity to reduce nonpoint source pollution from previously developed land.

STRATEGY Protect local streams from the adverse impacts of increased stormwater volume and velocity as a result of increased land imperviousness.

ACTION Adopt and implement a Stormwater Management Ordinance that will comprehensively regulate stormwater volume in addition to stormwater quality.

ACTION Continue to enforce the Town's Floodplain Overlay District to protect floodplain areas from encroachment and residents and businesses from potential harm.

ACTION Update FEMA floodplain maps to reflect the new development, loss of wetlands, and fill occurring in and around the Town.

ACTION Encourage the use of landscaping practices that minimize impervious areas and maximize vegetation to allow rain water to infiltrate into the soil rather than become overland stormwater runoff.

Buffer Areas and Wildlife Habitat Corridors

STRATEGY Protect existing vegetated stream buffer areas and identify opportunities to restore impaired stream buffers and wildlife habitat corridors.

ACTION Enforce and strengthen CBPO provisions to protect the 100 foot RPA Buffer Area along tributary streams.

ACTION Continue to protect the Town's stream valleys, which serve as critical habitat area, from further encroachment. Identify any additional parcels that have the potential for use as permanent Town open space along the Town's stream valleys.

ACTION Continue to enforce the Town's Urban Forestry and Landscaping Ordinance.

Point Sources of Pollution

STRATEGY Protect the Town's water resources from the avoidable impacts of existing and potential point sources of pollution including petroleum transmission mains, septic systems, sanitary sewer lines, and hazardous household materials.

ACTION Ensure that owners of pipeline transmission lines, such as Colonial Oil Pipeline, comply with all applicable laws for inspection of lines and safe operating practices.

ACTION Establish a Town Household Hazardous Materials drop-off and collection program for homeowners, to operate at specific times, such as during Fall and Spring clean-ups. Drop-off would require proof of Town residence. Town would arrange for transfer to Fairfax County facility, perhaps with special volunteer assistance.

ACTION Continue to work with the Fairfax County Health Department to ensure that the five year septic system pump out provisions of the Chesapeake Bay Preservation Act are adequately enforced. Identify Town lots with septic systems and provide information to residents on the pump out program.

ACTION Identify leaking sanitary sewer or stormsewer lines that contribute to degraded local water quality and elevated levels of fecal coliform bacteria. Develop a plan for replacing or repairing sanitary sewers that are identified as experiencing significant exfiltration.

Education Strategy

STRATEGY Educate and involve residents in environmental and water quality protection activities.

ACTION Work with and support citizen and business groups to implement environmentally beneficial projects identified above including watershed awareness, wildlife habitat gardening, rain gardens, invasive plant removal, native plant restoration projects, water quality monitoring, riparian restoration, stormdrain stenciling, and watershed assessments.

ACTION Work closely with the Northern Virginia Soil and Water Conservation District to implement a strategic nonpoint source pollution program (based on the NVSWCD's Backyard to the Bay program) for the Town that will prevent pollution at its sources.

ACTION Expand learning-and-doing stewardship activities, increasing educational component of ongoing stream clean up and wetlands habitat restoration projects that combine basic resource information with community service opportunities.

ACTION Utilize Runnymede Park natural areas, volunteers, and future nature center to expand existing watershed awareness educational programs that further public sensitivity and understanding of hydrologic systems and human interactions.

ACTION Implement a public education campaign aimed at enforcing and strengthening the Town's animal waste control laws.

ACTION Develop a database of households with above ground storage tanks and implement an education program (such as a informational mailing) aimed at preventing accidental discharges.

ACTION Continue to educate citizens and businesses on proper disposal of hazardous materials, such as paint, pesticides, and petroleum products through Town publications.

ACTION Implement a water conservation education program using water billing statements as a distribution vehicle. Use the City of Fairfax's program as a model.

ACTION Conduct seminars or workshops, in cooperation with NVSWCD and other knowledgeable entities or individuals, for staff members and elected or appointed decision-makers. This will increase understanding of physical constraints, natural and constructed water management processes and systems, and impacts of decisions on water quality.

GOAL 2 Restore degraded streams so that they are capable of supporting aquatic life.

Data and Planning Needs

STRATEGY Gather the data necessary for the Town to strategically restore its sensitive natural resources and to target public education projects.

ACTION Support the expansion of the Metropolitan Washington Council of Government's stream assessment of the Sugarland Run mainstem to include Folly Lick Branch, Spring Branch, and other tributaries. Use local volunteer organizations and other community groups in order to expand awareness of local water quality issues.

ACTION Implement a systematic, Town-wide program to update environmental and water quality baseline data (including floodplain designations and wetland identification) to ensure that incorrect or outdated information is not carried forward into future planning and assessment efforts.

ACTION Expand the Town's water quality monitoring efforts through the use of local volunteer and environmental groups or by contracting with the Fairfax County Health Department.

ACTION Map mature forest areas and groves within the Town in order to better utilize the Town's Urban Forestry and Landscaping Ordinance and to provide the Town with a better picture of

how reforestation and protection can better link existing resources.

ACTION Update the Parks and Recreation Plan and include it as part of a Town Open Space Plan that identifies passive and active recreation areas, affiliated recreational facilities, and urban public spaces. Include wildlife habitat value enhancement guidelines and natural area management guidelines. Include environmentally-sensitive management guidelines for all types of open space in the Town.

ACTION Develop and implement a Town-wide watershed restoration and protection plan in order to improve local water quality and wildlife habitat. Use water quality monitoring data in order to pinpoint potential sources of pollution and a stream reach assessment, including an inventory of denuded stream reaches, as the basis of the plan. To the extent practicable, incorporate these restoration and planning principles into the Town's Stormwater Management plan currently under development.

Habitat Enhancement

STRATEGY Reduce identified barriers to the restoration of degraded streams that are otherwise capable of supporting diverse aquatic habitats.

ACTION Help coordinate or provide proper maintenance to the newly reforested section of Sugarland Run from the Dulles Toll Road to the W&OD Trail to ensure that long term benefits of a riparian forest buffer are realized.

ACTION Investigate and implement ways to reduce the impact of fish impediments in the Sugarland Run mainstem and encourage Fairfax and Loudoun counties to find ways to provide increased fish mobility in the downstream portions of Sugarland Run.

ACTION Devise and incorporate detention capabilities in the denuded section of Sugarland Run between Dulles Toll Road and the W&OD Trail, in addition to recently planted trees, and even

in place of some seedlings, to achieve more immediate water-quality improvement, as well as other benefits, downstream.

GOAL 3 Protect the Town's groundwater resources.

STRATEGY Utilize existing Town ordinances and State programs to maximize groundwater recharge potential and to reduce the threat that underground storage facilities pose to groundwater resources.

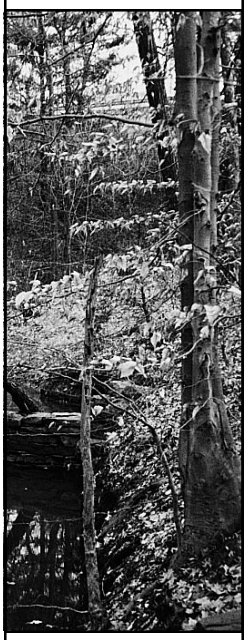
ACTION Continue to work with the Virginia Department of Environmental Quality to ensure that owners of underground storage facilities comply with all applicable laws.

ACTION Maximize groundwater recharge potential through the Town's Chesapeake Bay Preservation Ordinance by minimizing impervious surface area and promoting the use of porous pavement.

Implementation Plan and Time Line
VII

This section outlines the responsibilities and time lines for implementing the actions identified in Section VI. For each action item, information is provided on Primary Responsibility, Fiscal Impact, Capital Improvement Program (CIP) Impact, and Time Frame. Many of the action items can be implemented with negligible fiscal impact because they refer to the continuation or expansion of existing Town programs. In most cases where a fiscal impact is noted, it is in the form of staff time allocated to perform the coordination and research that is required to develop, improve, or expand environmental programs or regulations.

Each action item is scheduled to be achieved on an ongoing basis or within a time frame that is short – defined as within one year of adoption – or long – defined as over one year. Ongoing actions are those activities which should occur on a regular and continuing basis.



STRATEGY	ACTION	PRIMARY RESPONSIBILITY	FISCAL IMPACT	CIP IMPACT	TIMEFRAME COMPLETION
GOAL 1 **Protect the Town's streams, and consequently the Potomac River and Chesapeake Bay, from the avoidable impacts of land development and human activities.**					
Integrated Watershed Management Plan					
Optimize water quality and resource protection through the strategic use of structural and nonstructural BMPs to address all sources and types of pollutants.					
Share information with Fairfax County and local, State, and regional organizations involved in water quality protection to avoid redundancy and to identify enforcement or programmatic gaps.					
Stormwater Management					
Ensure that there is no net increase in nonpoint source pollution destined for the Chesapeake Bay as a result of new development and reduce the impacts of existing land uses as a result of redevelopment.	Vigorously enforce the provisions of the Town's Chesapeake Bay Preservation Ordinance and Erosion and Sediment Control provisions, to ensure that they are effective stormwater management tools.	Community Development	–	–	Ongoing
	Strengthen the requirements to qualify for the Town's CBPO "opt-out" provision or eliminate the "opt-out" provision altogether to require the use of stormwater quality BMPs for all development.	Attorney	–	–	Long

STRATEGY	ACTION	PRIMARY RESPONSIBILITY	FISCAL IMPACT	CIP IMPACT	TIMEFRAME COMPLETION
	Plan and implement cooperative/regional stormwater management controls, where appropriate, to improve overall water quality management and decrease the overall maintenance burden.	Public Works	Yes	Yes	Short
	Encourage the use of BMPs which require no surface space (such as sand filtration systems) in densely developed sections of the Town to address water quality issues without detracting from the urban character of the area.	Public Works	–	–	Long
	Continue to require and enforce a strong maintenance program for public and private BMPs to ensure the long-term effectiveness of these facilities.	Public Works	–	–	Ongoing
	Encourage site design that minimizes impervious surface areas, including the use of porous pavement, and maximizes the preservation of indigenous vegetation.	Community Development	–	–	Ongoing
	Perform a review of the Town's Zoning and Subdivision ordinances to identify opportunities for reducing impervious surface requirements during the site plan development and review process.	Community Development	Yes	–	Long
	Ensure that all development avoids unnecessary impacts on sensitive environmental features and that development takes appropriate measures to avoid improper development on sensitive soils.	Community Development	–	–	Ongoing

STRATEGY	ACTION	PRIMARY RESPONSIBILITY	FISCAL IMPACT	CIP IMPACT	TIMEFRAME COMPLETION
	Amend the Town's Zoning Ordinance to include site design guidelines that encourage clustering in order to preserve sensitive soil areas as permanent open space.	Community Development	Yes	–	Long
	Ensure that development and redevelopment practices for municipally-owned land are undertaken using environmentally sensitive techniques. Publicize these practices in order to serve as a model for other development projects.	Community Development	Yes	Yes	Ongoing
	Work to reduce the contribution of atmospheric deposition to water quality problems by working with Fairfax County and the Metropolitan Washington Air Quality Committee.	Community Development	Yes	–	Ongoing
	Continue to use the redevelopment performance criteria of the Town's CBPO as an opportunity to reduce nonpoint source pollution from previously developed land.	Community Development	–	–	Ongoing
Protect local streams from the adverse impacts of increased stormwater volume and velocity as a result of increased land imperviousness.	Adopt and implement a Stormwater Management Ordinance that will comprehensively regulate stormwater volume in addition to stormwater quality.	Public Works	Yes	–	Long
	Continue to enforce the Town's Floodplain Overlay District to protect floodplain areas from encroachment and residents and businesses from potential harm.	Community Development	–	–	Ongoing
	Update FEMA floodplain maps to reflect the new development, loss of wetlands, and fill occurring in and around the Town.	Public Works	Yes	–	Short

STRATEGY	ACTION	PRIMARY RESPONSIBILITY	FISCAL IMPACT	CIP IMPACT	TIMEFRAME COMPLETION
	Encourage the use of landscaping practices that minimize impervious areas and maximize vegetation to allow rain water to infiltrate into the soil rather than become overland stormwater runoff.	Community Development	–	–	Ongoing
Buffer Areas and Wildlife Habitat Corridors					
Protect existing vegetated stream buffer areas and identify opportunities to restore impaired stream buffers and wildlife habitat corridors.	Enforce and strengthen CBPO provisions to protect the 100 foot RPA Buffer Area along tributary streams.	Community Development	–	–	Short
	Continue to protect the Town's stream valleys, which serve as critical habitat area, from further encroachment. Identify any additional parcels that have the potential for use as permanent Town open space along the Town's stream valleys.	Community Development	Yes	Possible	Long
	Continue to enforce the Town's Urban Forestry and Landscaping Ordinance.	Community Development	–	–	Ongoing
Point Sources of Pollution					
Protect the Town's water resources from the avoidable impacts of existing and potential point sources of pollution including petroleum transmission mains, septic systems, sanitary sewer lines, and hazardous household materials.	Ensure that owners of pipeline transmission lines, such as Colonial Oil Pipeline, comply with all applicable laws for inspection of lines and safe operating practices.	Public Works	Yes	–	Ongoing

STRATEGY	ACTION	PRIMARY RESPONSIBILITY	FISCAL IMPACT	CIP IMPACT	TIMEFRAME COMPLETION
	Establish a Town Household Hazardous Materials drop-off and collection program for homeowners, to operate at specific times, such as during Fall and Spring clean-ups. Drop-off would require proof of Town residence. Town would arrange for transfer to Fairfax County facility, perhaps with special volunteer assistance.	Public Works	Yes	–	Short/Ongoing
	Continue to work with the Fairfax County Health Department to ensure that the five year septic system pump out provisions of the Chesapeake Bay Preservation Act are adequately enforced. Identify Town lots with septic systems and provide information to residents on the pump out program.	Public Works	Yes	–	Ongoing
	Identify leaking sanitary sewer or stormsewer lines that contribute to degraded local water quality and elevated levels of fecal coliform bacteria. Develop a plan for replacing or repairing sanitary sewers that are identified as experiencing significant exfiltration.	Public Works	Yes	Yes	Short/Ongoing
Education Strategy					
Educate and involve residents in environmental and water quality protection activities.	Work with and support citizen and business groups to implement environmentally beneficial projects identified above including watershed awareness, wildlife habitat gardening, rain gardens, invasive plant removal, native plant restoration projects, water quality monitoring, riparian restoration, stormdrain stenciling, and watershed assessments.	Community Development	Yes	–	Ongoing

STRATEGY	ACTION	PRIMARY RESPONSIBILITY	FISCAL IMPACT	CIP IMPACT	TIMEFRAME COMPLETION
	Work closely with the Northern Virginia Soil and Water Conservation District to implement a strategic nonpoint source pollution program (based on the NVSWCD's Backyard to the Bay program) for the Town that will prevent pollution at its sources.	Community Development	Yes	–	Ongoing
	Expand learning-and-doing stewardship activities, increasing educational component of ongoing stream clean up and wetlands habitat restoration projects that combine basic resource information with community service opportunities.	Community Development	Yes	–	Long
	Utilize Runnymede Park natural areas, volunteers, and future nature center to expand existing watershed awareness educational programs that further public sensitivity and understanding of hydrologic systems and human interactions.	Parks and Recreation	Yes	–	Ongoing
	Implement a public education campaign aimed at enforcing and strengthening the Town's animal waste control laws.	Police	Yes	–	Short/Ongoing
	Develop a database of households with above ground storage tanks and implement an education program (such as a informational mailing) aimed at preventing accidental discharges.	Public Works	Yes	–	Long
	Continue to educate citizens and businesses on proper disposal of hazardous materials, such as paint, pesticides, and petroleum products through Town publications.	Public Works	Yes	–	Long

STRATEGY	ACTION	PRIMARY RESPONSIBILITY	FISCAL IMPACT	CIP IMPACT	TIMEFRAME COMPLETION
	Implement a water conservation education program using water billing statements as a distribution vehicle. Use the City of Fairfax's program as a model.	Public Works	Yes	–	Periodic
	Conduct seminars or workshops, in cooperation with NVSWCD and other knowledgeable entities or individuals, for staff members and elected or appointed decision-makers. This will increase understanding of physical constraints, natural and constructed water management processes and systems, and impacts of decisions on water quality.	Community Development	Yes	–	Ongoing
GOAL 2 **Restore degraded streams so that they are capable of supporting aquatic life.**					
Data and Planning Needs					
Gather the data necessary for the Town to strategically restore its sensitive natural resources and to target public education projects.	Support the expansion of the Metropolitan Washington Council of Government's stream assessment of the Sugarland Run mainstem to include Folly Lick Branch, Spring Branch, and other tributaries. Use local volunteer organizations and other community groups in order to expand awareness of local water quality issues.	Community Development	Yes	–	Long
	Implement a systematic, Town-wide program to update environmental and water quality base-line data (including floodplain designations and wetland identification) to ensure that incorrect or outdated information is not carried forward into future planning and assessment efforts.	Community Development	Yes	–	Ongoing

STRATEGY	ACTION	PRIMARY RESPONSIBILITY	FISCAL IMPACT	CIP IMPACT	TIMEFRAME COMPLETION
	Expand the Town's water quality monitoring efforts through the use of local volunteer and environmental groups or by contracting with the Fairfax County Health Department.	Public Works	Yes	–	Long
	Map mature forest areas and groves within the Town in order to better utilize the Town's Urban Forestry and Landscaping Ordinance and to provide the Town with a better picture of how reforestation and protection can better link existing resources.	Community Development	Yes	Possible	Long
	Update the Parks and Recreation Plan and include it as part of a Town Open Space Plan that identifies passive and active recreation areas, affiliated recreational facilities, and urban public spaces. Include wildlife habitat value enhancement guidelines and natural area management guidelines. Include environmentally-sensitive management guidelines for all types of open space in the Town.	Community Development	Yes	Possible	Long
	Develop and implement a Town-wide watershed restoration and protection plan in order to improve local water quality and wildlife habitat. Use water quality monitoring data in order to pinpoint potential sources of pollution and a stream reach assessment, including an inventory of denuded stream reaches, as the basis of the plan. To the extent practicable, incorporate these restoration and planning principles into the Town's Stormwater Management plan currently under development.	Community Development	Yes	–	Long

STRATEGY	ACTION	PRIMARY RESPONSIBILITY	FISCAL IMPACT	CIP IMPACT	TIMEFRAME COMPLETION
Habitat Enhancement					
Reduce identified barriers to the restoration of degraded streams that are otherwise capable of supporting diverse aquatic habitats.	Help coordinate or provide proper maintenance to the newly reforested section of Sugarland Run from the Dulles Toll Road to the W&OD Trail to ensure that long term benefits of a riparian forest buffer are realized.	Community Development	Yes	–	Long
	Investigate and Implement ways to reduce the impact of fish impediments in the Sugarland Run mainstem and encourage Fairfax and Loudoun counties to find ways to provide increased fish mobility in the downstream portions of Sugarland Run.	Community Development	Yes	Possible	Long
	Devise and incorporate detention capabilities in the denuded section of Sugarland Run between Dulles Toll Road and the W&OD Trail, in addition to recently planted trees, and even in place of some seedlings, to achieve more immediate water-quality improvement, as well as other benefits, downstream.	Public Works	Yes	Yes	Long
GOAL 3 **Protect the Town's groundwater resources.**					
Utilize existing Town ordinances and State programs to maximize groundwater recharge potential and to reduce the threat that underground storage facilities pose to groundwater resources.	Continue to work with the Virginia Department of Environmental Quality to ensure that owners of underground storage facilities comply with all applicable laws.	Public works	Yes	–	Ongoing
	Maximize groundwater recharge potential through the Town's Chesapeake Bay Preservation Ordinance by minimizing impervious surface area and promoting the use of porous pavement.	Community Development	–	–	Ongoing