

# ENVIRONMENTAL ELEMENT HENRICO 2010 COMPREHENSIVE PLAN



Environmental considerations are an important factor in all land use decisions in Henrico County. The County recognizes that a loss of environmental quality does not need to follow population growth and economic development. In addition, economic prosperity doesn't automatically diminish with development practices that incorporate accountability for preservation of natural resources. In fact, the County considers that continued economic development can be enhanced and supported by the rich natural resources of the County. To this end, Henrico County has established its environmental goals, objectives and policies and has implemented measures to ensure a compatible coexistence between the natural environment and land use development.

## Chesapeake Bay Preservation Act

In July 1988, the Chesapeake Bay Preservation Act became law. The Act requires that localities protect the public interest in the Chesapeake Bay, its tributaries and other State waters, and to incorporate general water quality protection measures into comprehensive plans, zoning ordinances and subdivision ordinances. In addition, localities are also required to establish programs that (1) define and protect certain lands called Chesapeake Bay Preservation Areas which, if improperly developed, could result in substantial damage to the water quality of the Chesapeake Bay and its tributaries; (2) reduce non-point source pollution to State waters; and (3) promote and restore the high quality of State waters in order to provide for the health, safety and welfare of the present and future residents of the County and the Commonwealth of Virginia.

In September 1990, the Henrico County Board of Supervisors adopted amendments to the 2000 Land Use Plan to incorporate the requirements of the Chesapeake Bay Preservation Act. These water quality protection measures included expansion of the existing environmental protection classification of the land use plan map; related goals, objectives and policies; and new and revised definitions (i.e., Environmental Protection Area, Chesapeake Bay Preservation Area, etc.).

On November 13, 1991, the Henrico County Board of Supervisors adopted an amendment to Section 22-106.2 of the County Code to incorporate the Chesapeake Bay Preservation Area program into the Zoning Ordinance. Through this program, approximately 25% of the County was designated as Chesapeake Bay Preservation Area. The program consists of a map delineating these areas and amendments to the zoning, subdivision, landscape, controlled density, and erosion and sediment control ordinances as the means of implementing the performance criteria.

Chesapeake Bay Preservation Areas (see Map IV-I) are composed of Resource Protection Areas (RPAs) and Resource Management Areas (RMAs). Those lands which have intrinsic water quality benefit are designated as RPAs. Lands which have the potential of degrading water quality or diminishing the functional values of the Resource Protection Area, if not properly managed are designated as RMAs.

- (1) The Resource Protection Area consists of:
  - a. Tidal wetlands;
  - b. Nontidal wetlands connected by surface flow and contiguous to tidal wetlands or tributary streams;
  - c. Tidal shores;
  - d. Other lands which the Board of Supervisors may designate by ordinance;
  - e. A 100-foot buffer located contiguous to and landward of the components listed in subsection a. through d. above, and along both sides of any tributary stream.
  
- (2) The Resource Management Area consists of:
  - a. All areas specifically designated as RMAs by ordinance by the Board of Supervisors because of their potential effect on water quality;
  - b. All of the following land types which are directly contiguous to RPAs:
    1. Highly erodible soils, including steep slopes;
    2. Highly permeable soils;
    3. Nontidal wetlands not included in RPAs.
  - c. Base flood hazard areas (100-year floodplains); and
  - d. Where the land contiguous to RPAs is not a RMA as defined above, the 100-foot area contiguous to the RPA.

The 2000-scale Chesapeake Bay Preservation Areas Map (RPAs and RMAs) and individual maps showing wetlands, 100-year flood plains, highly erodible/highly permeable soils (including steep slopes), and hydric soils are on file in the Planning Office. Only the Chesapeake Bay Preservation Areas Map, a composite of these individual maps, has been included in the 2010 Land Use Plan. As time and other resources permit, the highly erodible/highly permeable soils (including steep slopes), hydric soils, wetland areas, 100-year flood plains, and soil suitability for septic tanks (where appropriate) maps will be added to the list of maps in the Environmental Element (as an appendix or separate document) with future updates of the Land Use Plan.

## **CITIZEN INVOLVEMENT**

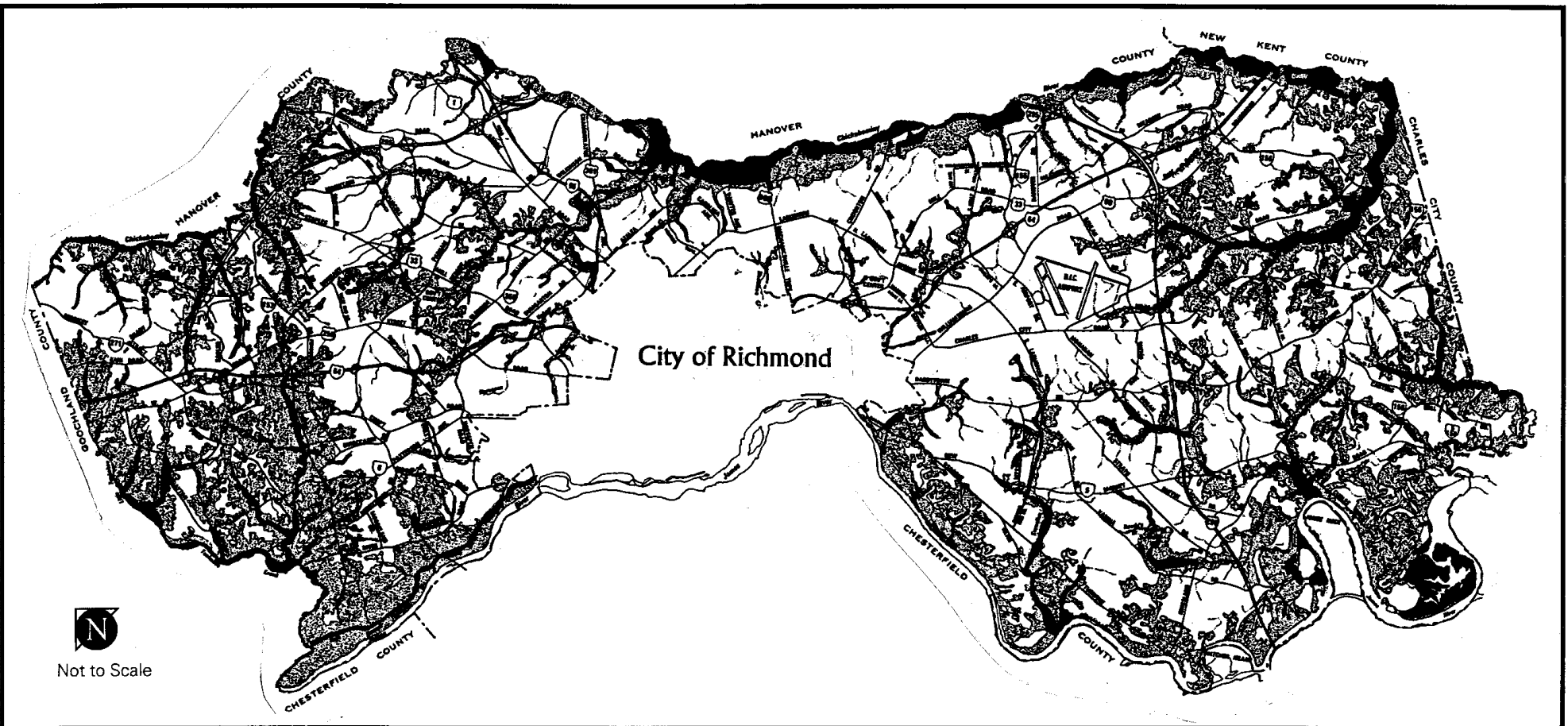
Radio, television, newspapers, posters, mailings and citizen meetings were used to stimulate public involvement in the Bay preservation process and Comprehensive Plan amendments. Public meetings were held throughout the County during the adoption process which allowed citizens and others ample opportunity to review and recommend changes to the County's Chesapeake Bay Program.

Work sessions with the Planning Commission and Board of Supervisors encouraged public participation. This gave citizens an opportunity to present their views prior to public hearings to formally consider adoption of amendments.

In addition, workshops were offered with engineers/developers to inform them of the Bay requirements. A Bay Hotline (672-4BAY) was set up temporarily during this period for public comments and questions. Details of the Bay program were sent to numerous business and civic associations and other interested parties in the Planning Office newsletter, "*The Planning Insider*."

Other public information meetings introduced proposed implementation measures, such as the National Pollution Discharge Elimination System (NPDES) program and testing requirements for shrink-swell soils.

The Henrico County Chesapeake Bay Preservation Area program, therefore, represents a concerted effort among the County's planning staff, government, business and civic groups, the public and other interested parties to develop a comprehensive program for the protection of water quality.



# MAP IV-1

## Chesapeake Bay Preservation Areas

L E G E N D

■ Resource Protection Area  
(RPA)

▨ Resource Management Area  
(RMA)

**Note:**  
Because this map is based upon map sources which are imprecise and do not reflect current conditions in every respect, this map should be considered general information only.

# County of Henrico Virginia

Prepared by The Henrico County Planning Office  
January, 1996  
JTR

## DATA COLLECTION AND ANALYSIS OF ENVIRONMENTAL FEATURES

Analysis of the County's environmental features provides a means for evaluating the development capabilities of the land. This analysis and the following goals, objectives, policies and implementation measures address the specific water quality policy areas (i.e., physical constraints to development, protection of potable water, shoreline/streambank erosion, public and private access to waterfront areas and redevelopment of intensely developed areas) identified in the Bay Regulations (i.e., Sections 10.1-2109.B of the Act and 2.2.C of the Regulations) and other issues (i.e., air and noise) necessary to protect environmental quality.

### PHYSIOGRAPHIC PROVINCES

The fall line separates Henrico County into two physiographic provinces, the Atlantic Coastal Plain to the east and the Piedmont Plateau west of the fall line (see Map IV-2). These two provinces form distinct natural features, in terms of geology, topography, soils, etc.

The fall line marks the head of navigation on major streams; there are rapids upstream and tidal waters downstream. The CSX Transportation System right-of-way (formerly, the RF&P Railroad), located approximately two miles west of U.S. Route 1, follows the approximate location of the fall line from the County's northern boundary south to Hungary Road. From that point the fall line continues in a southerly direction to cross the County line.

### PHYSICAL CONSTRAINTS TO DEVELOPMENT

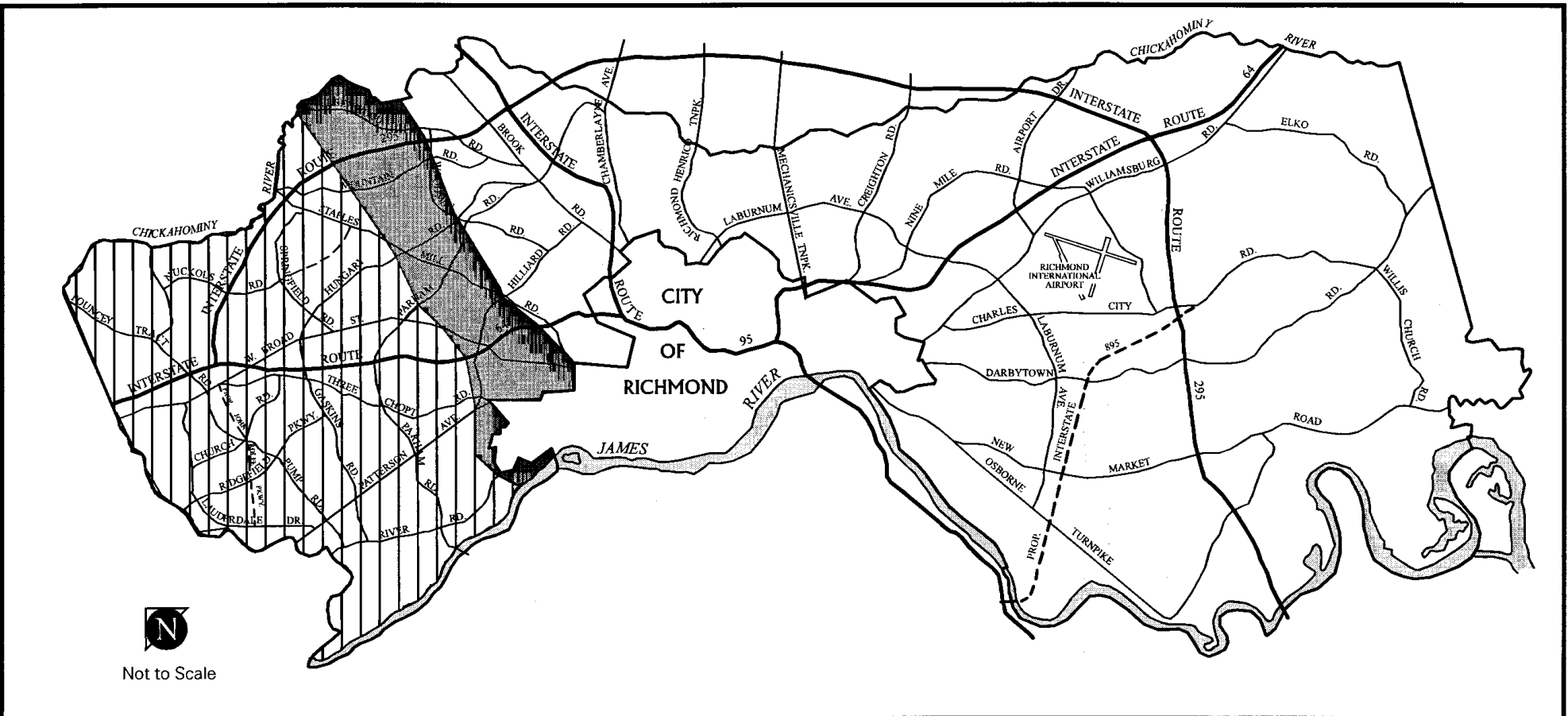
#### Flood-Prone Areas

Flood-prone areas (or floodplains), designated by the County as Chesapeake Bay Resource Management Areas, are lands that would be inundated by flood water as a result of a storm event of a 100-year return interval (that is a flood with a one percent probability of occurring within any given year). They are found mainly along shorelines, wetlands, and low-lying areas adjacent to tributary and intermittent streams.

The floodplain acts as a natural reservoir for excess water during periods of flooding. Holding excess water during floods reduces the danger to life and property. Other benefits of floodplains are that they provide areas for recreation, and they usually contain substantial groundwater.

Flood activity has a potentially detrimental effect on water quality. Soil erosion that is a result of the flood event is a source of pollution. If floodplains are developed and the natural vegetative cover removed, the natural flood controls are altered or eliminated with the possible consequence of increasing the level of soil erosion.

The primary flood-prone areas in Henrico are associated with the Chickahominy and James Rivers. The Chickahominy River originates in the Eastern Piedmont region where it flows from a relatively narrow defined valley to an approximate point where U.S. Highway 1 crosses it.



# MAP IV-2

## Physiographic Provinces

L E G E N D

-  Piedmont Province
-  Fall Zone
-  Coastal Plain Province

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From this point eastward, the channel spreads out into a wide, flat, marshy area which can be described as a flood basin. Because of this terrain, even a small rise in elevation of the water will cause the river to overflow its banks for hundreds of feet on either side. With regard to the James River, maximum accumulation of floodwaters normally occurs two to three days after the cessation of heavy rainfall over the basin.

### **Tidal/Nontidal Wetlands**

Wetlands are areas of continually wet soils, where water is normally found on, or slightly below the surface of the land. They are transition areas between drier uplands and the deep waters of streams, rivers, lake and bays. Wetlands can be either vegetated or nonvegetated.

The ecological value of wetlands has become better understood in recent years. Wetland loss can be a major contributor to water quality damage. Wetlands help purify water by filtering-out nutrients, wastes, and sediment from runoff. They absorb the energy of fast-moving erosive water (as in a flood event), and help to minimize coastal erosion from wave action. Wetlands also serve as reservoirs from which groundwater supplies can be replenished during dry seasons.

Two extensive wetland features in Henrico County are the White Oak Swamp, located in the east end of the County, and the wetlands contiguous to the Chickahominy River.

### **Topography/Steep Slopes**

Elevations in the County range from sea level along the lower James River to about 340 feet above sea level on the highest ridges in the western section of the County. Slopes in the County may be categorized into the following four groups:

1. Very steep (greater than 25 percent) - If disturbed by construction or forest removal, widespread failure is highly probable. These slopes may be better used as natural areas, trails and observation points. Least suitable for development.
2. Steep (16 to 25 percent) - If plant cover is removed, these slopes are highly susceptible to erosion and gully formation. Special design considerations are required for buildings on slopes greater than 15 percent. Suitable with restrictions.
3. Moderate (5 to 15 percent) - These slopes will support residential and agricultural land uses; if misused, they are susceptible to serious erosion. Moderately suitable.
4. Gentle (less than 5 percent) - These slopes will sustain the most intensive use with the least management. Most suitable.

Categorizing these slopes is useful for gauging the degree of caution required to evaluate and recommend a particular site for development.

Generally, the Coastal Plain consists of broad, nearly level and gently sloping ridges. Steep slopes occur more frequently in the Piedmont Plateau region than in the Coastal Plain. Areas of steep slopes may present limitations to certain types of development. The presence of steep

slopes in combination with particular soil types may have the potential for severe erosion or slope failure.

Steep slopes are located in four general areas of the County. They are scattered along the James River; in the vicinity of Horse Swamp; along bluffs adjacent to the Chickahominy flood plain; and in the southeastern corner of the County.

### **Soils**

According to the County's Soil Survey, the soils in the County were formed from a wide range of parent materials; from granite and gneiss rock in the Piedmont Plateau to clay and loam alluvium deposits (i.e., soil material, such as sand, silt, or clay, deposited on land by streams) in the Coastal Plain. Generally the soils are characterized as deep – the depth to rock level is greater than three feet – and well drained or moderately well drained. Some areas in the Coastal Plain range from excessively drained to very poorly drained and in some areas in the Piedmont Plateau drainage is poor.

The soils are classified into soil associations. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil; it is named for the major soils. The soils in one association may occur in another, but in a different pattern. The soils are named for the localities where they are found.

The soil associations in Henrico County are: (1) Colfax-Helena-Bourne; (2) Appling-Wedowee-State; (3) Kempsville-Atlee-Duplin; (4) Orchrepts and Udults-Norfolk-Caroline; (5) Lynchburg-Rains-Coxville; (6) Angie-Pamunkey-Lenoir; and (7) Chewacla-Riverview-Toccoa. See Table IV-1 for additional characteristics of each of these associations and their suitability for certain types of development.

The General Soil Map shows the general location of the soil associations in Henrico County and provides a brief description of the properties of each association (See Map IV-3). A soil associations map is useful for providing a general idea of the soils in a locality, for comparing different sections of a locality, or for identifying large tracts of land that are suitable for a particular land use. This map is not suitable for planning the land use for a specific site because the soils in the same association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management. There may also be extensive other soils in each association.

### **Sensitive Soils**

Soil characteristics affect the capacity of land to support structures, roads, foundations, and septic systems. Soil suitability is determined based upon degree of wetness, degree of slope, and size and texture of particles in the soil. Sensitive soils include those with high erodibility, low or high permeability, high water table or high shrink-swell potential.

Highly erodible soils have a high potential for erosion and sedimentation due in part to excessive steepness and length of slope. The permeability of soils is a factor regarding the rate at which water moves through the soil. Soils with extremely low permeability (i.e. soils with a high clay content) allow water to move through the soil at less than 0.6 inches per hour. Highly permeable soil, such as sand, allows water to move too rapidly through it. This type of soil does not allow



# MAP IV-3

## General Soil Map

L E G E N D



**Colfax-Helen-Borne Association:**

Deep somewhat poorly drained & moderately well drained soils; some have a fragipan & some have a clay subsoil; on uplands.



**Appling-Wedowee-State Association:**

Deep well drained soils that have a clay, clay loam, or sandy clay loam subsoil; on upland.



**Kempville-Atlee-Duplin Association:**

Deep well drained & moderately well drained soils that have a dominantly sandy clay loam or clay subsoil; some have a fragipan; on uplands.



**Öchrepts & Udults-Norfolk-Caroline Association:**

Deep moderately well drained to excessively drained soils that are dominantly sandy clay loam or clay below the surface layer; some are gravelly; on uplands



**Lynchburg-Rains-Coxville Association:**

Deep somewhat poorly drained & poorly drained soils that have a dominantly clay loam or clay subsoil; on upland flats



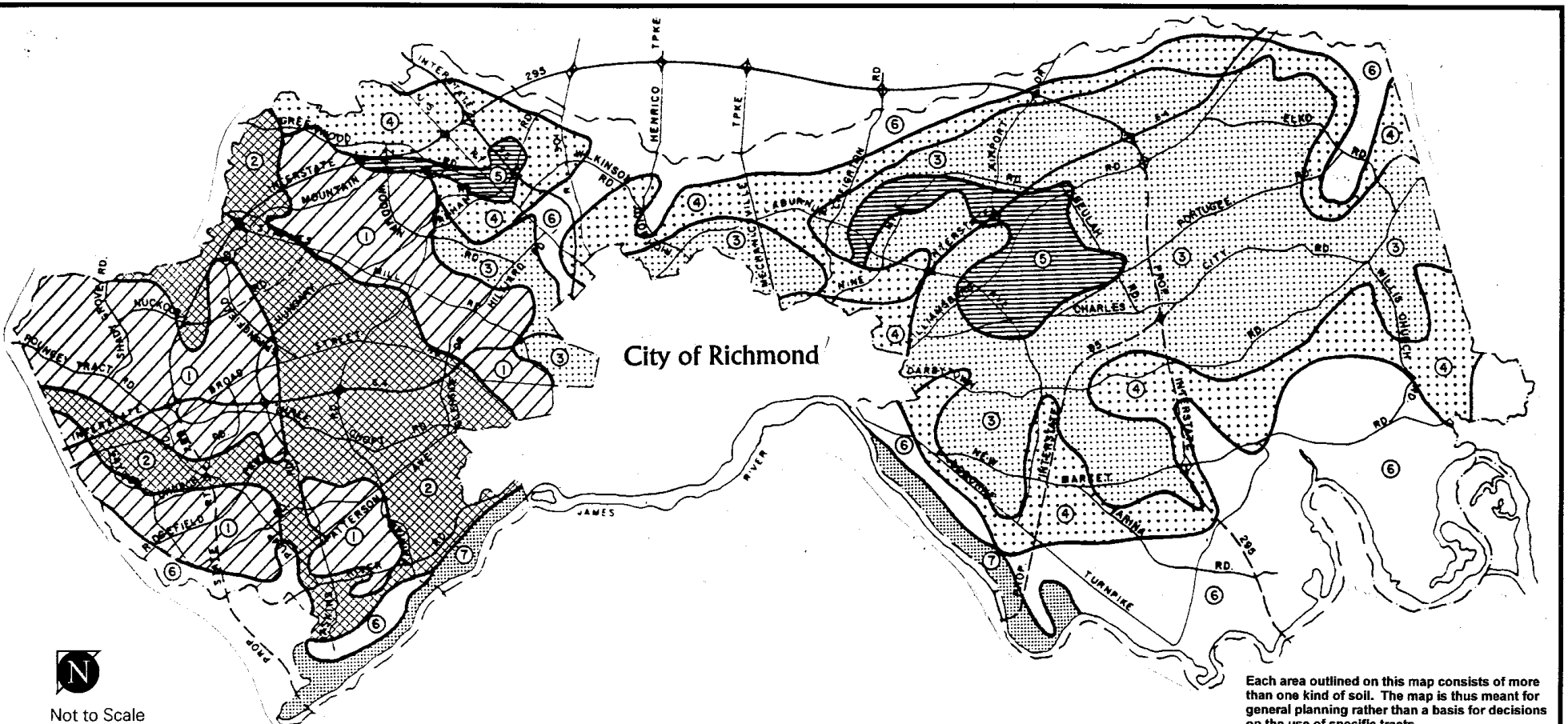
**Angle-Pamunkey-Lenoir Association**

Deep moderately well-drained, well drained or somewhat poorly drained soils that have a dominantly silty clay loam, or clay subsoil; on stream terraces.



**Chewacla-Riverview-Toccoa Association:**

Deep somewhat poorly drained & well drained soils that have dominantly silt loam; fine sandy loam, or very fine sandy loam subsoil on flood plains.



Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



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## SOIL PROPERTIES AND DEVELOPMENT LIMITATIONS

Table IV-1

Soil Associations	PROPERTIES					LIMITATIONS			
	County Percent	Slope Percent	Seasonal High Water Table(ft)	Permeability	Shrink-Swell Potential	Septic Systems	Dwellings	Shallow Excavation	Local Roads and Streets
Colfax-Helena-Bourne	18	0-6; up to 15; nearly level to gently rolling uplands	<sup>1</sup> 1½ - 3	Slow	Low to High	Severe <sup>2</sup>	Severe	Severe	Moderate to Severe
Appling-Wedowee-State	16	2-15; up to 45; gently rolling uplands, steeper slopes near larger streams	>5	Moderate	Low to Moderate	Slight to Moderate <sup>2</sup>	Slight to Moderate	Slight to Severe	Slight to Severe
Kempsville-Atlee-Duplin	21	0-15; nearly level to gently rolling uplands	1½ - >5	Moderately Slow to Moderate	Low to Moderate	Slight to Severe <sup>2</sup>	Slight to Severe	Slight to Severe	Moderate to Severe
Orchrepts and Udults-Norfolk-Caroline	18	10-25; up to 60 in some areas; rolling to hilly uplands	>5	Moderately Slow to Moderately Rapid	Low to Moderate	Moderate to Severe <sup>2</sup>	Slight to Moderate	Slight to Moderate	Moderate to Severe
Lynchburg-Rains-Coxville	4	0-2 nearly level uplands	<sup>1</sup> 0 - 1½	Moderately Slow to Moderate	Low to Moderate	Severe	Severe	Severe	Severe
Angie-Pamunkey-Lenoir	21	0-6; scattered up to 50; nearly level to gently sloping terraces	<sup>1</sup> 1->5	Slow to Moderate	Low to Moderate	Slight to Severe <sup>2</sup>	Slight to Severe	Slight to Severe	Moderate to Severe
Chewacla-Riverview-Toccoa	2	0-2; nearly level stream bottoms	<sup>1</sup> 1½ - >4	Moderate to Moderately Rapid	Low to Moderate	Severe <sup>2</sup>	Severe	Severe	Severe

<sup>1</sup> Subject to Flooding

<sup>2</sup> May be a hazard of groundwater pollution or pollution of nearby streams.

**Note:** See Map #3 for the general location of these soil associations.

**Source:** Soil Survey of Henrico County, Virginia, 1975

proper filtering or treatment of any contaminants which might be present in the soil. Areas with seasonally high water tables are those areas where the water table is less than four feet from the surface.

Shrink-swell soils are soils with horizons containing clays that excessively shrink when dry and swell when wet. Various areas of the County have soils that may have the potential to shrink and/or swell with changes in moisture content. The County's Department of Building Inspections has detailed residential soil testing requirements which are described briefly in the Implementation Measures section to follow.

#### Soil Suitability for Septic Tank Use

Suitability for septic systems is determined by degree of slope, wetness, soil erodibility and permeability. A suitable soil for a septic system should absorb all effluent, provide a high level of treatment before the effluent reaches the groundwater, and have a long useful life. Sand lets wastewater run through it too quickly, and heavy clays impede wastewater movement, allowing it to pool or pond on the surface instead of moving through the soil. ("Threats to Virginia's Groundwater," Virginia Water Resources Research Center, VPI)

The degree of limitation of the soils for septic tank absorption fields has a rating of slight, moderate and severe. A slight limitation means that soil properties are generally favorable and limitations can easily be overcome. A moderate limitation can be overcome or modified by planning, design, or by special maintenance. A severe limitation means that costly soil reclamation, special design or intense maintenance, or a combination of these is required (See Table IV-1 for limitations of each soil association in the County).

The Henrico County Code was amended in accordance with the Chesapeake Bay regulations to include the requirements for a 100% reserve drainfield area for all buildings served by on-site sewage disposal systems (septic systems) and a mandatory five-year pump out requirement for all septic tank systems. Estimates from the County's Septic Pump-out Notification Program in 1993 indicated that approximately 12,000 households in Henrico County were on septic systems. According to the Henrico County Health Department, the majority of the households on septic systems are in the east end of the County.

Approximately seven percent of recent construction in Henrico County is on septic systems (FY 1993/94). A review of the Health Department's report on Wells/Sanitary Disposal Systems for the '93-'94 fiscal year showed that of the 382 applications received for well and septic systems, a total of 86 applications (23%) were for septic system failures. The Health Department investigates reports of sewage system malfunctions and assists owners in correcting the problem consistent with State and County regulations.

The availability of public water and sewer is addressed through the Henrico 2010 Land Development Guide. Approximately 3% of the County residents live in the Outlying Area as designated on the Land Development Guide. In this area of the County, public water and sewer services generally are not available and are not planned through the year 2010. See the Land Use Plan Map and Guidelines for Growth for a detailed discussion of this element.

### **Natural Heritage Resources**

The Virginia Department of Conservation and Recreation's Division of Natural Heritage (DCR-DNH) and the Virginia Department of Game and Inland Fisheries have on file occurrences of natural heritage resources documented within Henrico County. Natural Heritage Resources are defined by the Virginia Natural Area Preserves Act as "the habitat of rare, threatened, or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest."

Map IV-4 shows "one minute geographic blocks" (approximately one square mile on the ground) of *the federally listed* sensitive areas in Henrico County. DCR-DNH states that these blocks should act as indicators for resources during land use planning so that projects can be modified to avoid impacts before they are approved. The center points of these blocks should not be interpreted as resource locations, nor should blocks be considered buffer areas for resources reported within them. The use of one minute blocks can facilitate project permitting by identifying sensitive areas before projects are submitted for approval.

### **PROTECTION OF POTABLE WATER**

Potable water (water suitable for drinking) includes both groundwater and surface water. The "hydrologic cycle" describes the interaction among groundwater, surface water and atmospheric water vapor. Precipitation and surface runoff supply most of the water that feeds streams, lakes, rivers, and oceans. This water is then returned to the atmosphere through evaporation from the earth's surface or transpiration by the roots and leaves of plants.

Surface water is also fed by groundwater through what is called baseflow. The U.S. Geological Survey estimates that 30 percent of the annual average flow of streams in Virginia is derived from groundwater ("Threats To Virginia's Groundwater"). Most perennial streams occur where the groundwater table is exposed to the surface. The groundwater table, or water table aquifer, is a common term used to describe the level of water trapped within the soil just beneath the surface. The water table aquifer is replenished by water which infiltrates the ground's surface through permeable soils, wetlands, and other groundwater recharge areas.

Because of the interdependence of the hydrologic cycle, anything that affects one part of the system (e.g., water withdrawals, introducing pollutants) has the potential to affect other parts of the system. Understanding the hydrologic cycle, therefore, explains how pollutants introduced into the water table aquifer in a distant area of the Chesapeake Bay basin can be transported to one of its tributaries (surface water) and eventually end up in the Bay.

Proper planning can ensure an adequate supply of drinking water by protecting the quantity and quality of water. Proper planning also can minimize costs for providing drinking water. Henrico County is involved in many programs for the purposes of improving water quality and water conservation. These programs are discussed in the Implementation Measures section.

# MAP IV-4

## General Location Areas for Natural Heritage Resources

L E G E N D

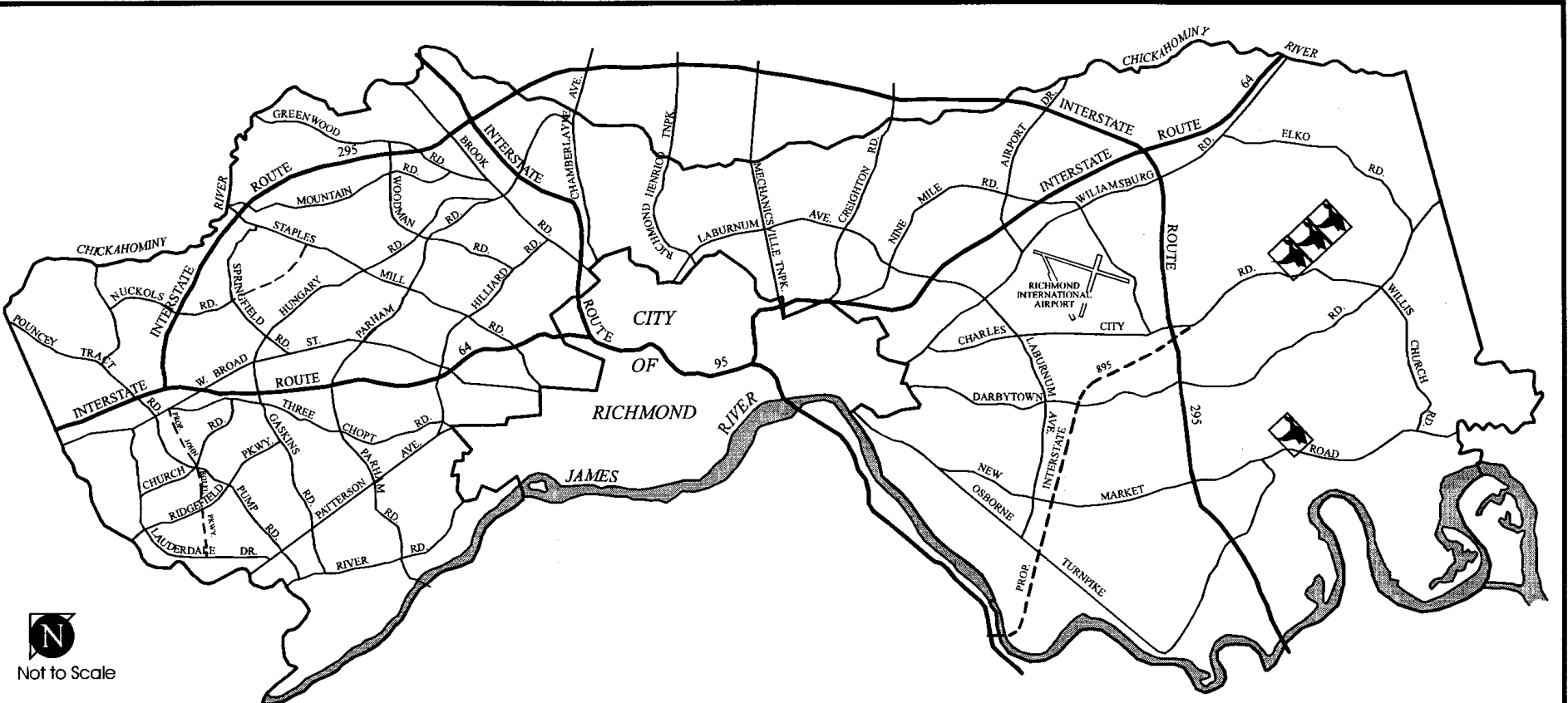


One Minute Blocks  
of Federally Listed  
Natural Heritage Areas  
(as of 7/20/95)

### DISCLAIMER:

This map summarizes the existing information on occurrences of natural heritage resources (Federally listed only) in Henrico known to DCR-DNH as of July 1995, and is provided for illustrative purposes only. Most natural areas in Virginia have not been thoroughly surveyed, and new occurrences of rare plants and animals and rare and significant communities continue to be discovered and documented by DCR-DNH. For this reason, no map can be considered a definitive statement on the presence, absence or condition of biological elements on a particular site, nor should information from this map be substituted for on-site surveys required for environmental assessments. Please contact DCR-DNH directly for updated information.

Department of Conservation,  
Division of Natural Heritage  
1500 East Main Street Suite 312  
Richmond, Virginia 23219  
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### Surface and Groundwater Withdrawals

Information on water withdrawals is useful for determining existing demand on water supply systems. Approximately 92 percent of Henrico County's water supply is surface water withdrawals from the James River, purchased from the City of Richmond; 8 percent is supplied from groundwater resources. The greatest use of the water supply is for residential development followed by commercial and industrial development. Table IV-2 shows the average daily supply from both surface water and County wells for fiscal years ending 1990 to 1994.

TABLE IV-2

Fiscal Year (ending June 30)	Avg Daily Supply City Purchase + County Wells (mgd)
1990	24.15
1991	28.55
1992	28.85
1993	29.08
1994	30.52

*Source: Henrico County Department of Public Utilities*

Although most of Henrico County is served by public water lines distributing purchased surface water, there are a number of public water supply wells in use. Fifty-seven public water supply wells provide water to citizens, businesses, and public facilities. The majority of these wells are privately owned. The County owns seventeen wells, and state and federal agencies also own wells in the County. Because all of these wells, despite their ownership, provide water to the public, they are all considered public supply wells. Private ownership makes it more difficult to control the protection of these wells. The Department of Public Utilities plans to cease operation of its public wells by approximately 1997.

In addition to the public supply wells, two fresh water springs, located off of Turner Road in the east end of the County, provide commercial bottled water (see Maps V and VIII for the general location of these springs). According to Camp Holly Springs, Inc., water from Camp Holly Springs and Diamond Springs is distributed to thousands of consumers daily in Virginia, North Carolina, South Carolina, Maryland, Pennsylvania, West Virginia and the District of Columbia.

Camp Holly Springs and Diamond Springs appear to originate in separate shallow aquifers or distinct horizons within a single aquifer. Recharge for the springs is basically from surface water infiltration (e.g., ponds, creeks and precipitation).

### **Aquifers**

Aquifers are areas within the earth or bedrock where potable water is stored. According to the Wellhead Protection Pilot Study (see discussion of this study in the Implementation Measures section), groundwater in Henrico County is found in two different types of aquifers – surface and confined (or artesian) aquifers. The study describes the recommended method for protecting the water supplied from each of these aquifers.

The surface aquifers (not deep enough to be protected by layers of clay) are particularly vulnerable to contamination from any pollutants introduced at the land's surface. To protect this type of aquifer, the recharge area (i.e., areas where groundwater flow replenishes the aquifer) around the well needs to be protected.

Beneath the surface aquifer and below thick layers of marine clay are the confined or artesian aquifers known as the Middle and Lower Potomac. Most of the public water supply wells in the eastern portion of the County draw water from these aquifers. Rather than protecting the recharge area around individual wells that draw from the confined aquifer, protecting the entire recharge area of the aquifer is more effective. The confined aquifers are especially important to protect because they recharge regional flow systems. Map IV-5 shows the active public water supply wells and the boundary of the confined aquifer recharge area where the aquifer may rise within fifty feet of the surface. This portion of the aquifer recharge area was targeted by the Pilot Study for protection. (See Table IV-3 for information on the active wells).

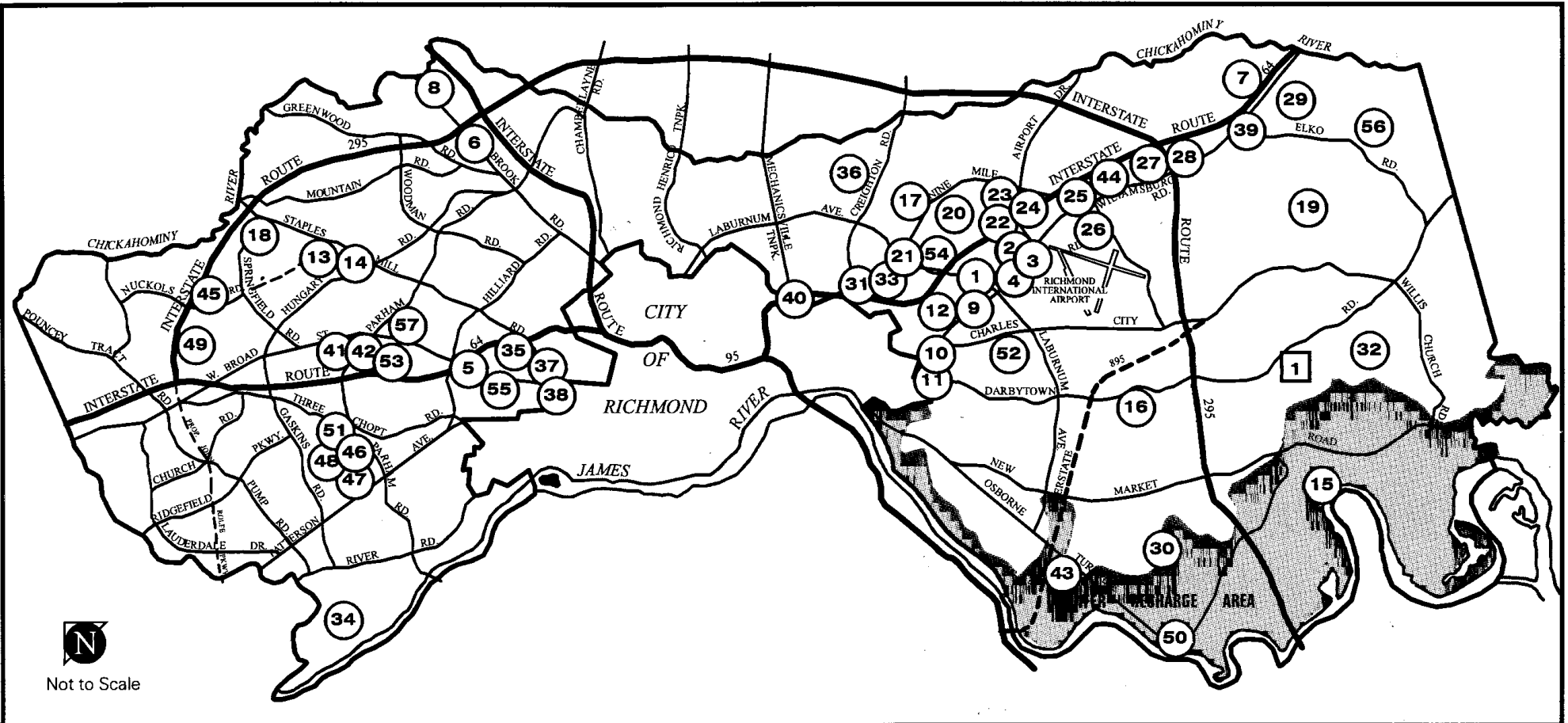
No contamination of the public water supply wells has occurred to date. Preventive measures should help to maintain this situation.

### **Water Quality Assessment**

For water quality assessment and reporting, the Commonwealth of Virginia is subdivided into hydrologic river basins, which are further subdivided into smaller watersheds called "waterbodies." Henrico County is included in portions of the five waterbodies listed below (see Map IV-6):

- (1) VAP-GO6-R - CHICKAHOMINY RIVER/WHITE OAK SWAMP/BEVERDAM CREEK
- (2) VAP-G05R - UPPER CHICKAHOMINY RIVER/UPHAM BROOK/LICKINGHOLE CREEK
- (3) VAP-GO2R,E - JAMES RIVER/TURKEY ISLAND CREEK/FOURMILE CREEK
- (4) VAP-GO1R,E - JAMES RIVER/FALLING CREEK/PROCTORS CREEK
- (5) VAP-H39R - JAMES RIVER/TUCKAHOE CREEK/NORWOOD CREEK


The "Virginia Water Quality Assessment, 1994 305(b) Report" (Department of Environmental Quality) indicates that, overall, the water quality standards are being met in most streams throughout Henrico County. There are some problem areas subject to non-point source urban runoff associated with development. These areas are mainly noted in the James River/Tuckahoe Creek/Norwood Creek waterbody. Low dissolved oxygen (DO) in Tuckahoe Creek is attributed to both its natural swampy conditions and non-point source urban runoff. Additionally, there are several areas, most notably in the Chickahominy River watershed, where low DO and acidic conditions were attributed to natural swamp waters. The acid condition of the water is caused by the PH of the surrounding soil.



# MAP IV-5

## Active Water Supply Wells

L E G E N D

-  See Table 3 for detailed information.
-  Aquifer Recharge Area
-  Diamond Springs & Camp Holly Springs

**Note:**  
 This map should be considered for general information only. Refer to the Property Identification Maps located in the Planning Office for more specific information on the location of these wells & springs.

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ACTIVE PUBLIC WATER SUPPLY WELLS

Table IV-3

Well	Well Name	Owner	Area	Well	Well Name	Owner	Area	Well#	Well Name	Owner	Area
1	AT&T 1	priv.	conf.	20	Colwyck	cnty	conf.	39	Meadowland Day Care	priv.	whp
2	AT&T 2	priv.	conf.	21	Thornhurst	cnty	conf.	40	Mechanicsville Gardens	priv.	conf.
3	AT&T 3	priv.	conf.	22	Gillies Creek	cnty	conf.	41	Mimosa Park #1	priv.	whp
4	AT&T 4	priv.	conf.	23	Oak Street	cnty	conf.	42	Mimosa Park #2	priv.	whp
5	Bethlehem Little League	priv.	whpa	24	Jennings Road	cnty	conf.	43	Palisades Club Lake	priv.	whp
6	Biltmore Subdivision	priv.	whpa	25	Bond Street	cnty	conf.	44	Pine Heights	priv.	conf.
7	Bradley Acres	cnty	conf.	26	Huger	cnty	conf.	45	Elks Lodge	priv.	whp
8	Brookfield Home	priv.	whpa	27	Sandston Woods	cnty	conf.	46	Ridgecrest Subdivision #1	priv.	whp
9	Bubba's Restaurant	priv.	whpa	28	Old Williamsburg	cnty	conf.	47	Ridgecrest Subdivision #2	priv.	whp
10	Colonial Court	priv.	conf.	29	Elko Road	cnty	conf.	48	Ridgecrest Subdivision #3	priv.	whp
11	National Heights	priv.	conf.	30	Fort Harrison	USA	conf.	49	St. Anthony's Church	priv.	whp
12	Eastover Gardens	priv.	conf.	31	Glenwood Gardens	priv.	conf.	50	Kingsland Reach Marina	priv.	whp
13	Courtney Subdivision #1	priv.	whpa	32	Gravel Hill Community	cnty	whpa	51	Tuckaway Day Nursery	priv.	whp
14	Courtney Subdivision #2	priv.	whpa	33	Police Emergency Center	cnty	conf.	52	Wedgewood Farms	priv.	conf.
15	Deep Bottom Boat Ramp	cnty	whpa	34	James River Golf Course	priv.	whpa	53	West Wistar Subdivision	priv.	whp
16	Dorey Park	cnty	conf.	35	Kildare Subdivision	priv.	whpa	54	Parker Interstate Chevron	priv.	conf.
17	C&P	priv.	conf.	36	Landmark Christian School	priv.	conf.	55	Westwood Manor	priv.	whp
18	Echo Lake	cnty	whpa	37	Mayfield Subdivision #1	priv.	whpa	56	White Oak Hills	cnty	conf.
19	Elko Tract-VDOT Lab	VA	conf.	38	Mayfield Subdivision #2	priv.	whpa	57	Woodlawn Farms	priv.	whp

conf. - well withdrawing from the confined aquifer

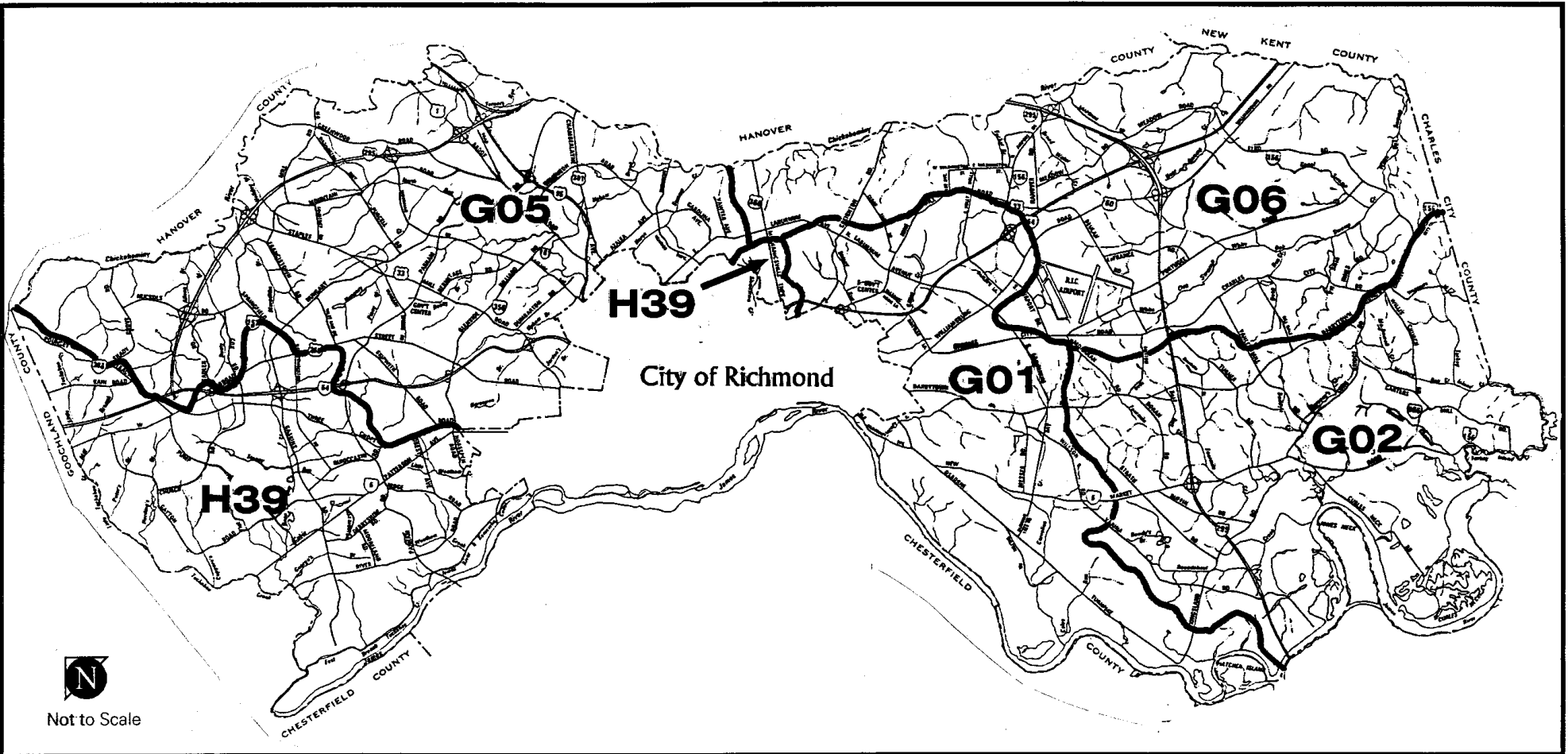
whpa - wellhead protection area; well withdrawing from the surface aquifer

Owner: cnty - Henrico County priv. - Private VA - State

USA - Federal

Source: Wellhead Protection Pilot Study, Henrico County, Dept. of Public Utilities, Fall 1993

NOTE: Location of the well can be found referenced by its number on Map #5



# MAP IV-6

## Hydrologic Unit Boundaries (Watersheds)

L E G E N D

- Hydrologic Unit Boundaries
- H39 Hydrologic Unit Codes

**Source:**  
 Map Prepared by Department  
 of Conservation & Recreation  
 March 2, 1995

County of Henrico  
 Virginia

Prepared by The Henrico County Planning Office  
 January, 1996  
 JTR

### **Point and Non-point Sources of Pollution**

DRASTIC is the acronym for a mapping system designed to evaluate the groundwater pollution potential of an area. The system uses a set of factors relating to soil characteristics, rainfall, geology and topography to estimate the potential for contamination of groundwater should a contaminant be released on the surface of the ground. The higher the DRASTIC point score, the greater the potential for contamination. Henrico County, when it developed its DRASTIC mapping in 1988, was one of the first three Tidewater localities to do so (See Map IV-7) .

Virginia's Groundwater Steering Committee in 1987 identified 32 potential sources of groundwater contamination. The top five potential threats statewide are: underground storage tanks, landfills, waste lagoons, septic tanks, and pesticides and fertilizers. These are termed non-point sources of pollution (i.e., not coming from a discernible point). Other sources are poorly constructed or abandoned wells and point source discharges. Discussed below is the degree of threat to water quality in Henrico County from point source discharges and potential non-point sources of groundwater contamination. (There is no information currently available on waste lagoons in the County. Refer to the prior discussion on Soil Suitability for Septic Tanks for information on potential contamination from septic systems.)

#### POINT SOURCE DISCHARGES

Point sources of pollution are those which reach State waters through a single source such as a pipe outlet. The outfall structures of sewage treatment plants and industrial plants are examples. All legal point source discharges to surface waters are regulated by the Virginia Pollution Discharge Elimination System (VPDES) permit program. Depending upon the permit requirements, some permittees must monitor their outfall to ensure the discharge meets certain quantity and quality parameters. As of May 1995, there were 48 permitted sites in Henrico County.

#### NON-POINT SOURCES

##### Poorly Constructed or Abandoned Wells

Improperly constructed and abandoned wells are considered by health officials to be a threat to public safety and one of the most significant sources of groundwater contamination in Virginia. A well that is improperly abandoned can provide a direct conduit for pollutants.

The Henrico Department of Public Utilities maintains information on public water supply wells which are out of service. All of these wells may not have been properly abandoned. The Department has documentation of the handling of wells the County owns. The County has no present means, however, of accounting for those wells that are privately owned. Some of these wells may still be active but out of sight or lost. These wells are scattered throughout the County. As a result of the Wellhead Protection Pilot Study, the County is considering alternatives for addressing this situation. (See Map IV-8 and Table IV-4 for information on these wells, and see the Wellhead Protection Program in the Implementation Measures Section).

##### Landfills

Landfills are soil excavations filled with solid waste. The waste is covered with soil to help to prevent odors, disease, and pest infestations. The soil cannot, however, prevent precipitation and other water sources from contacting the waste. Water dissolves various materials to form

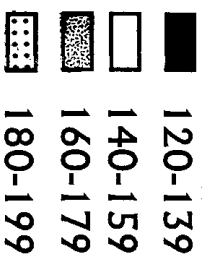
# MAP IV-7

## DRASTIC Map

L E G E N D

### DRASTIC Index Range

Ground Water Pollution Potential

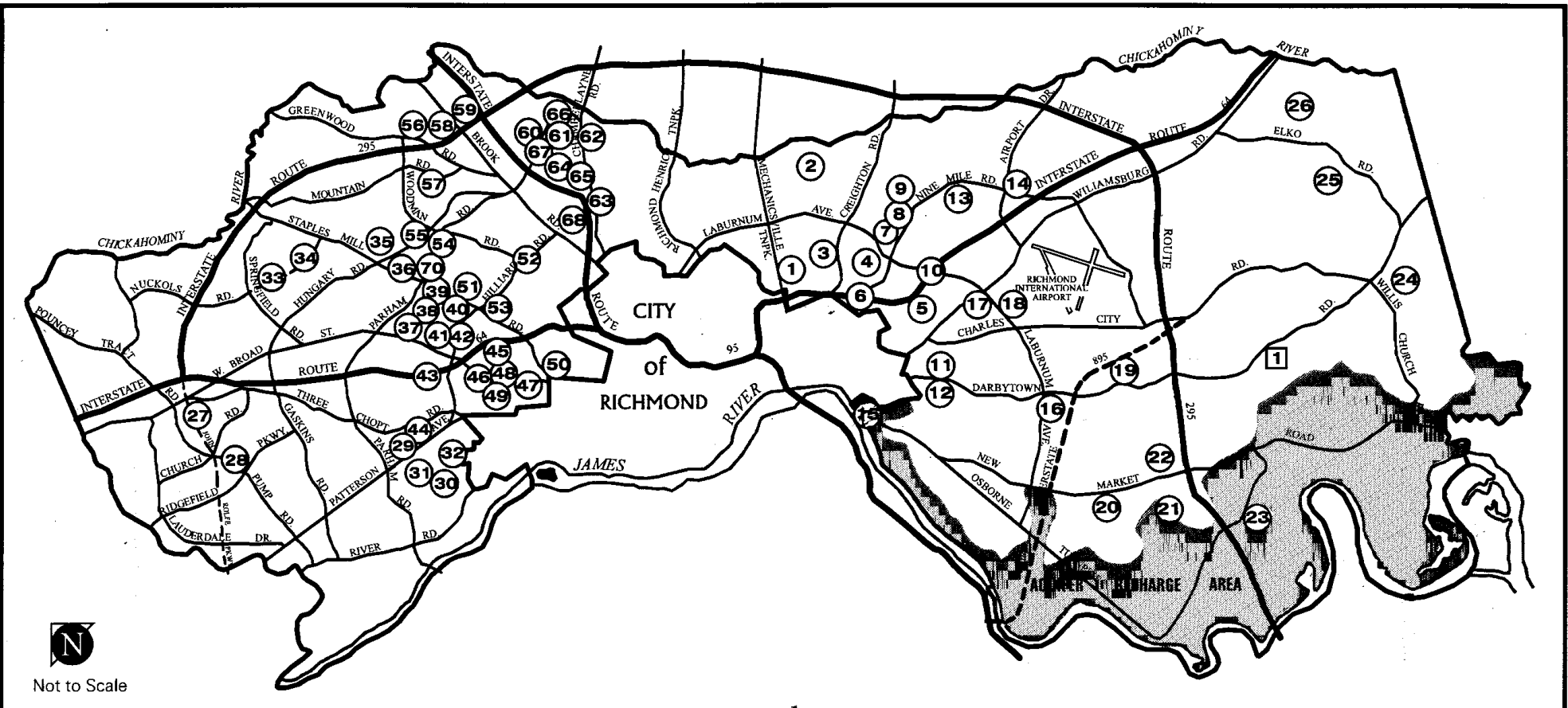


**Note:**  
 The DRASTIC acronym pertains to the physical characteristics of a site that affect the groundwater pollution potential. The higher the point score the greater the potential for ground water contamination.

County of Henrico  
 Virginia

Prepared by The Henrico County Planning Office  
 January, 1996  
 JTR





# MAP IV-8

## Inactive Water Supply Wells

L E G E N D

②③ → See Table 4 for detailed information.

▬ Aquifer Recharge Area

□ Diamond Springs & Camp Holly Springs

**Note:**  
 This map should be considered for general information only. Refer to the Property Identification Maps located in the Planning Office for more specific information on the location of these wells & springs.

## County of Henrico Virginia

Prepared by The Henrico County Planning Office  
 January, 1996  
 JTR

INACTIVE WELLS

Table IV-4

#	WELL NAME	OWNER	STATUS	#	WELL NAME	OWNER	STATUS	#	WELL NAME	OWNER	STATUS
1	Montezuma Farms	private	v	25	Elko Tract	state	v	49	Westwood Terrace	county	v
2	Glenwood Farms	private	v	26	Elko Community Center	private	v	50	Blue Cross & Blue Shield	private	v
3	Glenwood Golf Course	private	v	27	Short Pump Elementary	county	nv	51	Nineakers #1	?	nv
4	School Board Ruritan Buildings	county	nv	28	Columbian Community Center Inc.	private	nv	52	Ginter Gardens	private	v
5	Masonic Home	private	nv	29	Westham	county	nv	53	Formerly Pizza Corner	private	v
6	Reynolds Foreign Car	private	nv	30	Westham	county	nv	54	Laurel Dell	county	nv
7	McDonald's	private	v	31	Westham	county	nv	55	Laurel Dell	county	nv
8	Formerly Dominion Bank	private	v	32	Forest Heights	county	nv	56	Longdale Recreation Center	?	v
9	Arby's	private	nv	33	West Forest Heights	county	nv	57	Randolph Ridge	private	nv
10	Crowder Mobil Station	private	v	34	Mt. Vernon Baptist Church	private	v	58	Old State Police Headquarters	?	nv
11	Formerly Comm. Sand & Gravel	private	v	35	Coal Pit Community Center	county	v	59	Woodcliff	private	v
12	Formerly Longbranch Restaurant	private	v	36	Laurel Athletic Association	county	nv	60	Chamberlayne Heights #3	?	nv
13	Car Wash	private	nv	37	Coffee Time of Richmond	private	nv	61	Chamberlayne Heights #2	?	nv
14	Hanover Grill	private	nv	38	Tuscon Heights #1	?	nv	62	Chamberlayne Hills	?	v
15	N/F Air Reduction Sales	private	v	39	Tuscon Heights #2	?	nv	63	Chamberlayne Farms #1	?	v
16	Manna Christian Fellowship	private	nv	40	Hermitage Farms	county	v	64	Chamberlayne Farms #2	?	nv
17	Bob's Steak House	private	nv	41	Bonnie Brae #1	?	nv	65	Chamberlayne Farms #4	?	nv
18	Inta-Roto Inc.	private	v	42	Wistar Farms #2	private	nv	66	Chamberlayne Farms #5	?	nv
19	Michel S. Yousef	private	nv	43	Wistar Farms #1	private	nv	67	Chamberlayne Farms #3	?	v
20	Varina Elementary School	county	v	44	Berkeley Park	county	nv	68	Belmont Golf Course	county	v
21	Mehfoud Elementary	county	v	45	Bethlehem Little League	private	?	69	Forrests Restaurant	?	GONE
22	Four Mile Creek Baptist Church	private	nv	46	Westhaven	county	nv	70	E & S Service Center	?	GONE
23	Formerly Perry's Inn	private	v	47	Westwood Home Sites	private	nv				
24	Chickahominy Academy	private	v	48	Westwood Terrace	county	nv				

nv - wells on record, not found in the field; may have been properly abandoned, still active but out of sight, or lost  
 Source - Wellhead Protection Pilot Study, Henrico County, Department of Public Utilities

v - wells found in the field

gone - unable to find the lot

NOTE: Location of the well can be found referenced by its number on Map #7

"leachate" which has the potential to percolate through the soil and contaminate groundwater below the landfill.

Strict regulations in Virginia require permits for proper siting and construction of landfills with regard for the geology and hydrology of a potential landfill location. This permitting process diminishes the likelihood of significant groundwater contamination. At the local level, Henrico County uses its DRASTIC maps to evaluate sites for proposed land uses such as landfills, storage facilities for hazardous materials, and mining activities, which have a high potential for groundwater pollution.

The County owns three landfills: two inactive sites located in the east end of the County and one active landfill. The active landfill is located on Ford's Country Lane off Nuckols Road in northwestern Henrico County. It is a 188-acre site and has a projected life span of approximately twelve more years. Of the inactive landfills, the landfill on Nine Mile Road was closed in 1978, and the Charles City Road landfill was closed in 1990. The Charles City Road site has 76 acres remaining which potentially could be used for landfill development. This site also has recycling bins available.

There are three private landfills in the County. Old Dominion, owned by Browning-Ferris, Inc. and Cox landfills are located near the County's landfill on Charles City Road. Simon landfill is on Darbytown Road. Old Dominion and Simon are sanitary landfills; the Cox landfill accepts debris (e.g. clippings from trees, lawns, etc.).

Initial data from the Virginia Department of Environmental Quality (DEQ) Division of Waste Management Assessment Monitoring Program shows that the Charles City Road and Nuckols Road sites are releasing some contaminants into the soil. This data is not definitive and the sites will continue to be monitored.

#### Pesticides and Fertilizers

Fertilizers and pesticides are used for agriculture, forestry, parks, golf courses, and in residential areas. The potential for contamination of aquifers by pesticides and fertilizers occurs not necessarily because these chemicals are misapplied, but because the chemicals are applied repeatedly to vast tracts of land. Contamination of groundwater from these sources can occur as water percolates through the soil. Soil erosion and surface runoff can compound the problems.

When pesticides and fertilizers are properly applied at the recommended time and rate, plant growth is enhanced. Actively growing ground covers such as trees, shrubs, and turfgrasses, reduce nutrient movement through the soil and promote the natural decomposition of these materials. Living ground covers also prevent erosion of soils that contain fertilizers and other chemicals. Research in Maryland and Virginia has shown that living plants actually remove these materials from the soil.

The majority of the remaining active farmland in Henrico is in the southeastern section of the County. The farming area generally begins at Osborne Turnpike and extends east to the County line. Henrico County participates in the Farm Conservation Program. This program provides a means for protecting environmentally sensitive areas from the affects of potential pollutants

normally associated with farming (e.g. pesticides, fertilizers, soil erosion, etc.). The Farm Conservation Program is discussed in more detail in the Implementation Measures section.

#### Underground Storage Tanks

One of the most common groundwater contamination complaints reported to DEQ concerns underground petroleum storage tanks and lines. State regulations enacted in 1989 require owners of underground storage tanks with storage capacities of 5,000 gallons or more to register the tanks with DEQ, to test the tanks periodically, and to report any tanks that are leaking. The owner is liable for any clean up costs.

According to DEQ, Henrico County currently has 711 registered sites that have a total of 1,935 underground storage tanks. These sites are scattered throughout the County. The types of facilities range from gas stations to schools to cemeteries. Of these registered facilities, 347 have reported leaking tanks.

#### Future Demand

The most recent 3-C Population Report (Metropolitan Planning Organization population projection model), as of December 31, 1994, estimates the County's population to be 235,229. By the year 2015, the population is projected to be 291,500 (Richmond Regional Planning District Commission 2015 Projection, 9/1/94). This is an increase of approximately 24% over the next 21 years (1994 to 2015), a yearly growth rate of 1.1%. This percentage is in line with the increases in population shown since 1991. Based on population projections and other factors, the Department of Public Utilities projects that the demands on the water supply are expected to approximately double by the year 2015. (See Map IV-9 and Table IV-5 for the distribution of the 2015 projections).

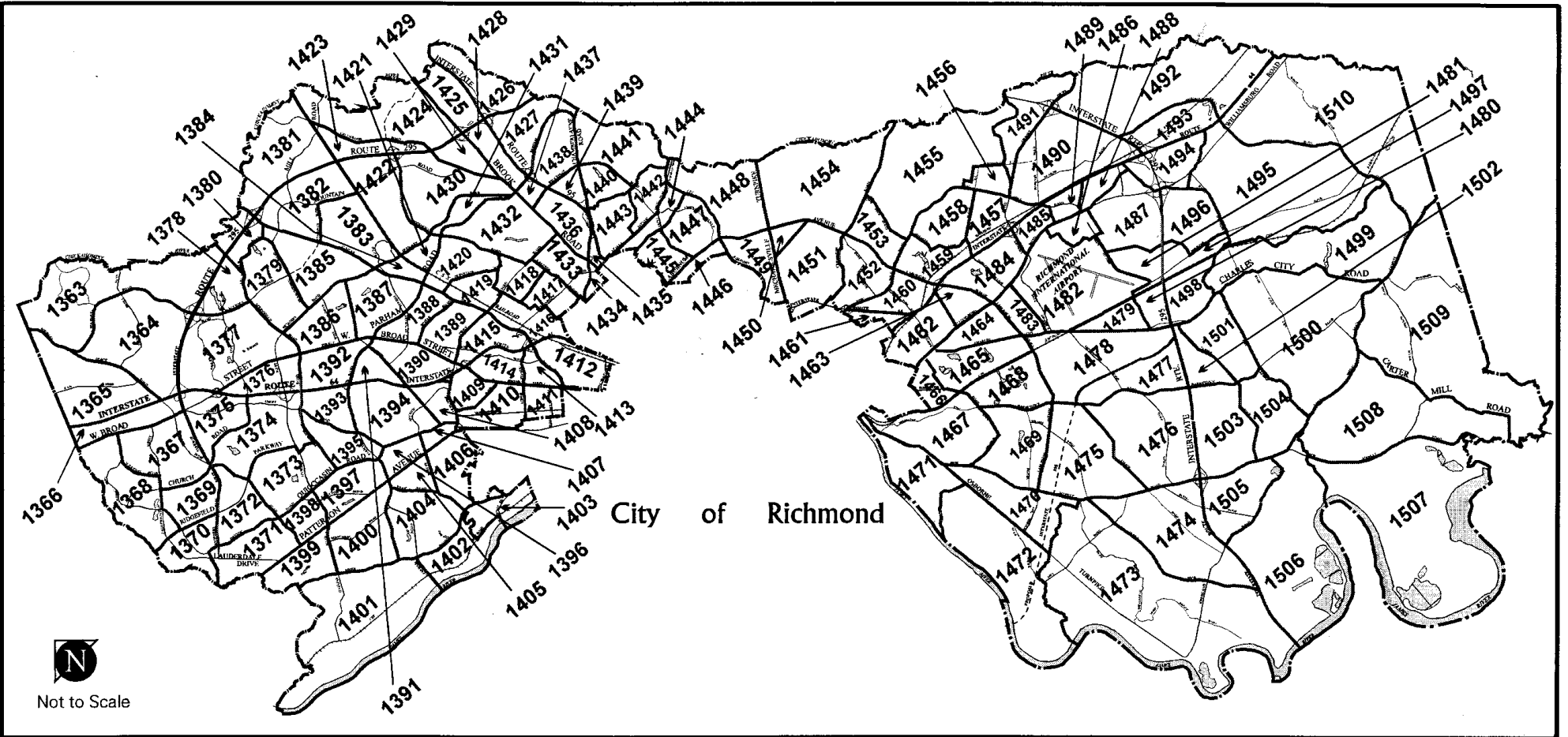
## SHORELINE/STREAMBANK EROSION

Shoreline/streambank erosion is caused by natural forces such as wave action and upland runoff. Land development activity such as grading and removing vegetation can also increase stormwater runoff and erosion.

Shoreline/streambank erosion can have a negative effect on water quality. It contributes to the nutrients and other controllable pollutant loads entering the Bay each year. The undesirable level of sedimentation in the Chesapeake Bay is another result of shoreline erosion.

Shoreline/streambank erosion, however, does not appear to be a major issue in Henrico County. "Shoreline Situation Reports," prepared by the Virginia Institute of Marine Science, provides data for shoreline conditions by localities. These reports define erosion as: (1) slight - less than one foot per year; (2) moderate - one to three feet per year; and (3) severe - more than three feet per year. "The Shoreline Situation Report : Henrico, Chesterfield and Richmond," 1985, states that there are no areas noted which are subject to rapid (i.e., severe) erosion in this locality (this report is somewhat dated, but it is the only comprehensive resource currently available). It also reports that the historical erosion rate in this area averages less than one foot per year. The Chesapeake Bay Public Access Plan identifies two areas along the James River in the east end of the County where the erosion was noted as being greater than two feet per year (See Map IV-10).





# MAP IV-9

## Traffic Zones

L E G E N D

— Boundary lines

1236 Traffic Zone Numbers

County of Henrico  
Virginia

Prepared by The Henrico County Planning Office  
January, 1996  
JTR

PERSONS PER ACRE BY TRAFFIC ZONE (1993, 2015)

PERSONS PER ACRE BY TRAFFIC ZONE (1993, 2015)

Table IV-5

TZ	1993 Pop.	2015 Pop.	Total Acres	Person Per Acre 1993	Person Per Acre 2015
1363	1,151	5,353	3,047.8	0.38	1.76
1364	192	2,674	1,743.6	0.11	1.53
1365	438	2,198	1,624.4	0.27	1.35
1366	82	1,320	617.5	0.13	2.14
1367	4,226	5,329	1,282.1	3.30	4.16
1368	4,387	6,113	1,468.1	2.99	4.16
1369	2,088	2,234	584.9	3.57	3.82
1370	4,970	5,302	679.5	7.31	7.80
1371	4,568	4,574	936.3	4.88	4.88
1372	1,945	2,364	796.9	2.44	2.97
1373	5,223	5,239	1,077.5	4.85	4.86
1374	4,101	4,947	1,298.7	3.16	3.81
1375	1,591	3,175	760.3	2.09	4.18
1376	265	404	563.9	0.47	0.72
1377	4,728	6,399	1,891.8	2.50	3.38
1378	237	474	502.4	0.47	0.94
1379	3,241	3,746	962.8	3.37	3.89
1380	47	140	397.6	0.12	0.35
1381	523	1,764	1,680.9	0.31	1.05
1382	771	1,860	968.3	0.80	1.92
1383	3,631	4,257	937.4	3.87	4.54
1384	47	106	192.0	0.24	0.55
1385	2,266	3,008	1,099.3	2.06	2.74
1386	3,907	4,019	834.6	4.63	4.82
1387	6,968	7,398	908.9	7.67	8.14
1388	1,374	1,397	544.0	2.53	2.57
1389	5,072	5,449	590.9	8.58	9.22
1390	2,390	2,673	1,014.7	2.35	2.63
1391	1,308	1,393	314.9	4.15	4.42
1392	8,215	8,514	672.5	12.22	12.66
1393	2,421	2,233	489.7	4.94	4.56
1394	5,610	5,572	1,135.1	4.94	4.91
1395	3,548	3,607	572.5	6.20	6.30
1396	1,563	1,621	329.2	4.75	4.92
1397	4,638	4,962	739.8	6.27	6.71
1398	1,265	1,268	381.5	3.32	3.32
1399	2,123	2,423	701.4	3.03	3.45
1400	4,316	4,785	1,166.7	3.70	4.10
1401	1,490	2,012	3,204.5	0.47	0.63
1402	180	210	605.5	0.30	0.35
1403	811	515	456.7	1.78	1.13
1404	3,007	3,236	1,141.8	2.63	2.83

TZ	1993 Pop.	2015 Pop.	Total Acres	Person Per Acre 1993	Person Per Acre 2015
1405	1,117	1,249	301.4	3.71	4.15
1406	2,742	2,772	705.1	3.89	3.93
1407	916	926	154.7	5.92	5.99
1408	1,734	1,576	345.0	5.03	4.57
1409	1,751	1,876	357.8	4.89	5.24
1410	3,461	3,525	609.2	5.68	5.79
1411	2,024	1,849	311.8	6.49	5.93
1412	192	192	726.3	0.26	0.26
1413	2,081	2,043	270.1	7.71	7.57
1414	1,353	1,371	405.2	3.34	3.38
1415	2,748	3,064	580.7	4.73	5.28
1416	1,326	1,446	551.3	2.41	2.62
1417	2,145	2,146	262.2	8.18	8.19
1418	4,353	4,354	363.4	11.98	11.98
1419	424	429	404.5	1.05	1.06
1420	1,750	1,984	649.5	2.69	3.05
1421	414	260	211.9	1.96	1.23
1422	2,746	3,290	1,067.5	2.57	3.08
1423	480	833	511.5	0.94	1.63
1424	553	1,936	1,769.5	0.31	1.09
1425	164	364	595.4	0.28	0.61
1426	0	0	758.0	0.00	0.00
1427	75	617	946.1	0.08	0.65
1428	384	802	458.1	0.84	1.75
1429	895	908	347.2	2.58	2.62
1430	3,419	4,027	1,282.6	2.67	3.14
1431	457	534	275.6	1.66	1.94
1432	3,224	3,174	1,159.5	2.78	2.74
1433	2,348	2,359	651.6	3.60	3.62
1434	625	2	110.2	5.67	0.02
1435	2	2	100.3	0.02	0.02
1436	1,436	1,711	603.2	2.38	2.84
1437	68	118	137.1	0.50	0.86
1438	2,175	2,425	654.2	3.32	3.71
1439	623	624	213.7	2.92	2.92
1440	972	1,052	376.5	2.58	2.79
1441	729	1,542	1,102.5	0.66	1.40
1442	2,381	2,964	399.3	5.96	7.42
1443	2,798	3,506	590.2	4.74	5.94
1444	546	731	341.0	1.60	2.14
1445	1,809	1,853	420.0	4.31	4.41
1446	1,262	1,262	207.2	6.09	6.09

Source: 1993 3-C Data Report, RRPDC 2015 Projections; Sept. 1, 1994

Source: 1993 3-C Data Report, RRPDC 2015 Projections; Sept. 1, 1994

PERSONS PER ACRE BY TRAFFIC ZONE (1993, 2015)

TZ	1993 Pop.	2015 Pop.	Total Acres	Person Per Acre 1993	Person Per Acre 2015
1447	309	365	618.9	0.50	0.59
1448	1,572	2,027	1,353.3	1.16	1.50
1449	1,680	1,873	593.5	2.83	3.16
1450	1,100	1,102	173.3	6.34	6.36
1451	5,025	5,577	1,294.7	3.88	4.31
1452	652	1,138	726.5	0.90	1.57
1453	3,115	3,964	511.9	6.08	7.74
1454	2,415	4,120	2,480.9	0.97	1.66
1455	3,488	5,000	2,851.2	1.22	1.75
1456	2,015	2,072	313.2	6.43	6.62
1457	1,742	1,933	726.1	2.40	2.66
1458	3,169	3,664	715.8	4.43	5.12
1459	1,043	1,305	595.2	1.75	2.19
1460	1,259	1,146	535.9	2.35	2.14
1461	0	0	200.2	0.00	0.00
1462	3,414	4,041	780.1	4.38	5.18
1463	973	1,071	345.3	2.82	3.10
1464	59	59	553.0	0.11	0.11
1465	262	265	883.5	0.30	0.30
1466	1,932	2,189	326.9	5.91	6.70
1467	2,754	4,142	1,504.9	1.83	2.75
1468	12	12	862.5	0.01	0.01
1469	377	2,067	1,273.8	0.30	1.62
1470	937	1,602	1,067.7	0.85	1.50
1471	122	516	1,029.3	0.12	0.50
1472	410	1,257	2,755.7	0.15	0.46
1473	994	1,358	6,105.7	0.16	0.22
1474	750	1,795	2,610.5	0.29	0.69
1475	598	1,781	1,772.9	0.34	1.00
1476	879	2,082	2,087.2	0.42	1.00
1477	218	773	954.8	0.23	0.81
1478	277	578	1,631.3	0.17	0.35
1479	19	19	358.0	0.05	0.05
1480	12	12	320.8	0.04	0.04
1481	12	12	435.7	0.03	0.03
1482	9	9	2,273.1	0.00	0.00
1483	870	871	382.2	2.28	2.28
1484	1,219	1,370	861.2	1.42	1.59
1485	815	838	286.4	2.84	2.93
1486	1,256	1,317	325.5	3.86	4.05
1487	450	1,082	1,192.7	0.38	0.91
1488	66	1,352	341.4	0.19	3.96

Source: 1993 3-C Data Report, RRPDC 2015 Projections; Sept. 1, 1994

PERSONS PER ACRE BY TRAFFIC ZONE (1993, 2015)

TZ	1993 Pop.	2015 Pop.	Total Acres	Person Per Acre 1993	Person Per Acre 2015
1489	998	1,033	227.2	4.39	4.55
1490	3,409	4,166	1,826.1	1.87	2.28
1491	171	676	791.7	0.22	0.85
1492	1,015	1,898	3,149.2	0.32	0.60
1493	59	127	741.2	0.08	0.17
1494	295	602	724.9	0.41	0.83
1495	691	2,010	4,022.1	0.17	0.50
1496	70	1,033	862.6	0.08	1.20
1497	40	40	392.0	0.10	0.10
1498	94	123	602.7	0.16	0.20
1499	316	657	2,649.1	0.12	0.25
1500	684	1,160	3,834.8	0.18	0.30
1501	150	337	922.3	0.16	0.36
1502	363	530	506.0	0.72	1.05
1503	337	1,107	1,473.6	0.23	0.75
1504	117	332	1,028.3	0.11	0.32
1505	63	290	953.7	0.07	0.30
1506	162	250	3,245.9	0.05	0.08
1507	21	150	4,757.2	0.00	0.03
1508	75	439	3,147.9	0.02	0.14
1509	209	502	5,208.3	0.04	0.10
1510	1,481	2,314	4,914.1	0.30	0.47
TOTAL	230,729	291,500	156,200.6	1.48	1.87

Source: 1993 3-C Data Report, RRPDC 2015 Projections; Sept. 1, 1994

These and other instances of shoreline erosion along the James River have been from major flooding events, boat wakes, ship traffic to the Deep Water Terminal, and from current and tidal action.

Along stream banks in the County, there have been only 14 complaints from citizens in the past five years (prior to 1994), according to files from the Department of Public Works. DCR shows an additional 15 requests for assistance either along the James River or various streams. When DCR or the County's Public Works Department receive requests for assistance with an erosion problem, the site is studied and recommendations are made for possible structural (e.g., rip rap) or non structural (e.g., vegetative) solutions. At the present time, shoreline protection generally relies on individual property owners to provide the appropriate remedy for these situations.

Stormwater detention, known as Best Management Practices (BMPs), is one technique, among others, for minimizing shoreline/streambank erosion. Detaining stormwater on-site decreases the runoff into the receiving channel (waterway) which minimizes erosion activity along the channel. This is particularly important if the receiving channel is inadequate to accommodate the runoff. Henrico County requires all new commercial and industrial development and redevelopment in designated watersheds either to incorporate BMPs or to improve the receiving channel to an adequate condition.

Determining which watersheds require stormwater detention is based on the 1990 Camp Dresser & McKee Stormwater Management Plan (See the Implementation Measures Section for additional information on this Plan). The study area included 23 individual watersheds within the County, covering approximately 192 square miles. The individual watershed plans evaluated storm water management measures required to prevent erosion, overtopping of stream crossings and building flooding. Regional and on-site detention basins are evaluated in conjunction with other measures to determine the impact on erosion control, flood control and water quality.

## **PUBLIC AND PRIVATE ACCESS TO WATERFRONT AREAS**

The Henrico County Parks, Recreation and Open Space Plan (adopted 1988) assesses recreation and open space needs and establishes a program for meeting those needs through 2005. The Plan describes the relationship between existing recreation facilities and future park/recreation needs. The Open Space Plan identifies several proposed locations for waterfront parks along the James and Chickahominy Rivers.

The Open Space Plan also proposed the designation of a portion of the James and Chickahominy Rivers as scenic rivers. In order to be eligible for designation, a river, or portion of it, must contain substantial natural, scenic, recreational, and historic attributes. In 1989 the Board of Supervisors approved a resolution supporting designation of a portion of the Chickahominy River, from Route 360 (Mechanicsville Turnpike) east to the County line, as a scenic river.

The Chesapeake Bay Public Access Plan (DCR, Dec. 1990) also identifies existing and potential areas in the County for access to the James and Chickahominy Rivers. The Access Plan recommends criteria for determining the appropriate location, type and intensity for a variety of waterfront access activities. This Plan also provides information on shoreline planning factors,

and existing and potential site uses (e.g., boat launch ramp, bank and pier fishing, hiking, picnicking, and marina sites). The Chesapeake Bay Public Access Plan contains information on public and private access sites in map format. While not a comprehensive list of environmental considerations, it includes four factors (i.e., shoreline erosion, wetlands, natural heritage areas and cultural resources) which should be evaluated in the siting of an access area. See Map IV-10 for existing and potential waterfront access sites as designated on the Open Space Plan and the Access Plan.

### **Existing Public and Private Access Areas**

Public access to the waterfront for recreational activities is somewhat limited. There are currently three public access sites (i.e., Osborne Pike Landing, Richmond National Battlefield Park-Fort Brady and Deep Bottom Boat Landing) as well as two private marinas along the James River, all in the east end of the County.

### **Potential Access Areas**

Waterfront parks which provide opportunities for bank fishing and other water-enhanced recreational uses have been proposed on the James River and the Chickahominy River. James River East Park and James River West Park, community parks (twenty to one hundred acres), have been proposed as part of the County's Open Space Plan. The Open Space Plan also proposes three community parks along the Chickahominy River – Meadowview, Highland Springs North and Charles City/Chickahominy.

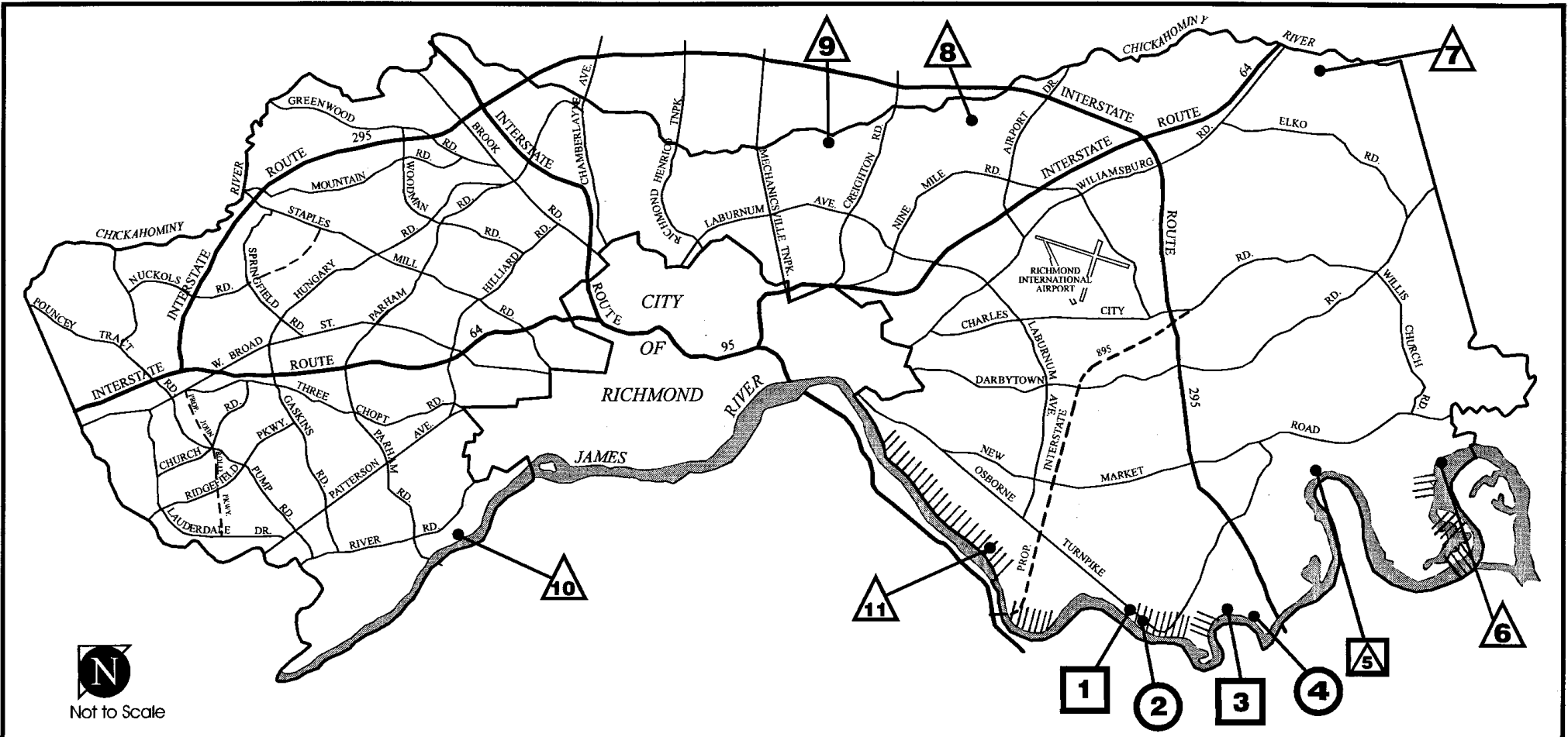
Planned boat launching facilities are proposed to be placed so as to minimize conflicts with existing boat traffic. Expansion of the Deep Bottom Boat Ramp would help to alleviate the boat traffic currently using the Osborne Turnpike Ramp. The Department of Game and Inland Fisheries recommends an additional boat ramp site east of Curles Neck.

### **Potential Impacts from Public and Private Access**

The four general types of public and private access are boat-related, swimming, fishing and natural area access. Boat-related access is discussed in more detail below since it has a greater potential impact on water quality and is usually a major element in access programs.

The physical characteristics of a site which influence suitability for access include topography, geologic features, capacity to sustain proposed use, and presence of fragile environmental resources, including threatened or endangered species. Significant shoreline erosion, and potential impact on water quality are other important factors to consider.

The volume, flushing characteristics, and tidal action of each waterbody is important to the support of docking facilities. Consideration also should be given to the appropriateness of community facilities over individual docks in some areas, and the visual character of a predominantly natural area. Numerous facilities could diminish visual amenities. Access policies should be an integral part of local park and recreation policies and programs. Access to waterfront areas should also seek to balance public and private interests with water resource protection goals.


















  
Not to Scale

# MAP IV-10

## Waterfront Access

L E G E N D

-  Existing Public Access
-  Existing Private Access (Marinas)
-  Potential Public Access Areas
-  Shoreline Erosion (>2Ft/Yr)
-  1 Osborne Pike Landing
-  2 Kingsland Reach Marina
-  3 Richmond National Battlefield Park, Fort Brady
-  4 Richmond Yacht Basin
-  5 Deep Bottom Boat Landing
-  6 East Curles Neck Boat Launch
-  7 Charles City Chickahominy Park
-  8 Highland Springs North Park
-  9 Meadowview Park
-  10 James River West Park
-  11 James River East Park

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### Boat-related Facilities

Boating is generally recognized as a non-point source of pollution. Pollutants that can result from the operation of boats include spilled petroleum products, non-biodegradable litter, and sanitary waste. Boat traffic increases the waterway's turbidity thus increasing the rate of shoreline erosion. This turbidity also impacts the ecology of marsh areas.

Clearing shoreline vegetation for access, structures and adjacent parking areas can generate additional runoff which carries pollutants and eroded sediments, and impacts marine wildlife habitats. On-shore storage of fuel, oil, and sewage waste at such facilities can pose a threat to water quality if these substances are not properly managed. Dredging and channel widening, in situations where it is necessary for the functioning of boat related facilities, can release settled pollutants and increase turbidity in the water.

The Chesapeake Bay Public Access Plan was developed to help ensure maximum water quality protection in the siting and development of boat-related and other access facilities. The Access Plan suggests criteria for determining the appropriate location, type and intensity for a variety of access activities. Information from this resource can be incorporated into the County's planning efforts with respect to public and private waterfront access facilities.

The Osborne Pike Boat Landing (a State-owned facility leased to the County) had a significant increase in boat traffic in recent years. To improve operations here, in September 1995, the County Board of Supervisors authorized an application to the Virginia Department of Game and Inland Fisheries to establish a "No Wake Area." This area would extend fifty (50) feet from the shoreline into the James River and run parallel to the landing for approximately 150 feet. Pilings near the landing are sometimes hidden during high tide which poses a safety concern. Although safety is the main concern for this request, this "No Wake Area" would also help to minimize siltation along the shoreline from the increased boat traffic.

## **REDEVELOPMENT IN INTENSELY DEVELOPED AREAS**

Intensely Developed Areas (IDAs) consist of existing development and infill sites where little of the natural environment remains. These areas represent urban centers, heavy industrial areas, and other densely developed areas characterized by extensive pavement and other impervious surfaces. Research has shown that the increase in stormwater runoff pollution is directly proportional to increases in impervious surfaces. Runoff in these areas typically is collected in an underground drainage network which carries untreated stormwater directly into adjacent waterways.

The Chesapeake Bay Program's intent is to reclaim some natural areas through stormwater quality management techniques as redevelopment occurs. Pollution entering the Bay from older, densely developed areas is the primary reason that regulations now require redevelopment projects within IDAs to reduce stormwater runoff pollutant loadings by 10 percent.

The 2010 Land Development Guide provides specific guidance for land use and development in Henrico County. It serves as a tool for phasing development based on availability of public services. One of the areas identified in the Phasing Plan is the Existing Area. This area is

generally ninety percent developed, includes vacant parcels less than ten acres, and undeveloped subdivision lots. It is characterized by a mixture of uses and densities. All levels of public services are available. These also are the areas of the County where impervious surfaces are most prevalent (see the 2010 Land Use Plan Map and Guidelines for Growth).

In addition, the 2010 Land Development Guide identifies Special Strategy Areas to recognize the need for special development guidelines in particular areas of the County. Identification of Special Strategy Areas is intended to focus attention on appropriate design considerations for development and redevelopment in these areas to minimize potential adverse effects. For Special Strategy Areas where redevelopment is likely, important water quality considerations include reestablishment of buffer areas and reduction of impervious surface to reduce stormwater pollutant loadings. In addition, the Capital Improvement Program is used to replace antiquated water and sewer lines as part of the County's water quality improvement strategy.

It should be noted that the County requires stormwater quality management, not only in Chesapeake Bay areas, but for all new and redevelopment sites whose impervious area is greater than 16%. Additionally, through the County's NPDES program, all industrial activities are identified and prioritized as potential pollution sources to the storm sewer system. (Refer to the section on Protection of Potable Water for the list of permitted sites in Henrico County.) The County conducts inspections of these sites to ensure that all pollution prevention measures are being undertaken.

## **AIR QUALITY**

The Richmond Metropolitan area is classified by the U. S. Environmental Protection Agency (EPA) as a "moderate" nonattainment area for ozone. This means that the air quality in the Richmond region does not meet standards set for ozone by the Clean Air Act, originally adopted by Congress in 1970. Ground level ozone is a precursor to smog and is emitted both from mobile (e.g., cars and trucks) and stationary (e.g., industrial plants) sources. Five exceedances of ozone standards were recorded in the Richmond region in 1993.

The 1990 amendments to the Clean Air Act required states to submit revisions to their state implementation plans (SIP) for air quality by November 15, 1993. In addition to the requirement for a revised SIP, Virginia also submitted a plan to EPA which commits to a measured reduction in urban smog of 15 percent in 1996. As specified by the 1990 Clean Air Act amendments, a Lead Planning Organization (LPO) was formed of elected officials in the Richmond region that developed the 15 Percent Plan for this area. Over the long term, states are required to achieve reductions in smog of at least three percent per year after 1996 until they attain compliance with air quality standards, in any case, no later than 2010.

On September 27, 1995, the County Board of Supervisors passed a resolution authorizing the County Manager to submit an application to the Virginia Department of Transportation for a grant to convert a number of the County's existing vehicles to natural gas. This grant is available through the Virginia Alternative Fuels Revolving Fund. The Fund was established to encourage publicly owned automotive fleets to use alternative fuels as a source of motor fuel to improve air quality in the Commonwealth and to reduce dependence on imported oil.



## **NOISE**

In Henrico County, the greatest noise generator is the Richmond International Airport. Aircraft noise prediction models have been used to assess noise levels in areas surrounding the Airport. The noise impacts are expressed in terms of contours of equal noise exposure in the Day/Night Average Sound Level (DNL) noise metric.

The following noise exposure levels were identified for Richmond International Airport:

**65 DNL - Noise level considered to have an adverse effect upon land use activities. Land use limitations and controls should be considered.**

**70 DNL - Noise level considered to have significant adverse effects upon land use activities. Land use limitations, easements, and other compatibility controls should be considered.**

**75 DNL - Noise level considered to have the most severe adverse effect upon land use activities. Land uses other than airport related facilities should generally be excluded from this area.**

See Map IV-11, Aircraft Noise Impact Areas for designation of these contours.

# MAP IV-11

## Aircraft Noise Impact 1993 Exposure Contours

### L E G E N D

#### 65DNL

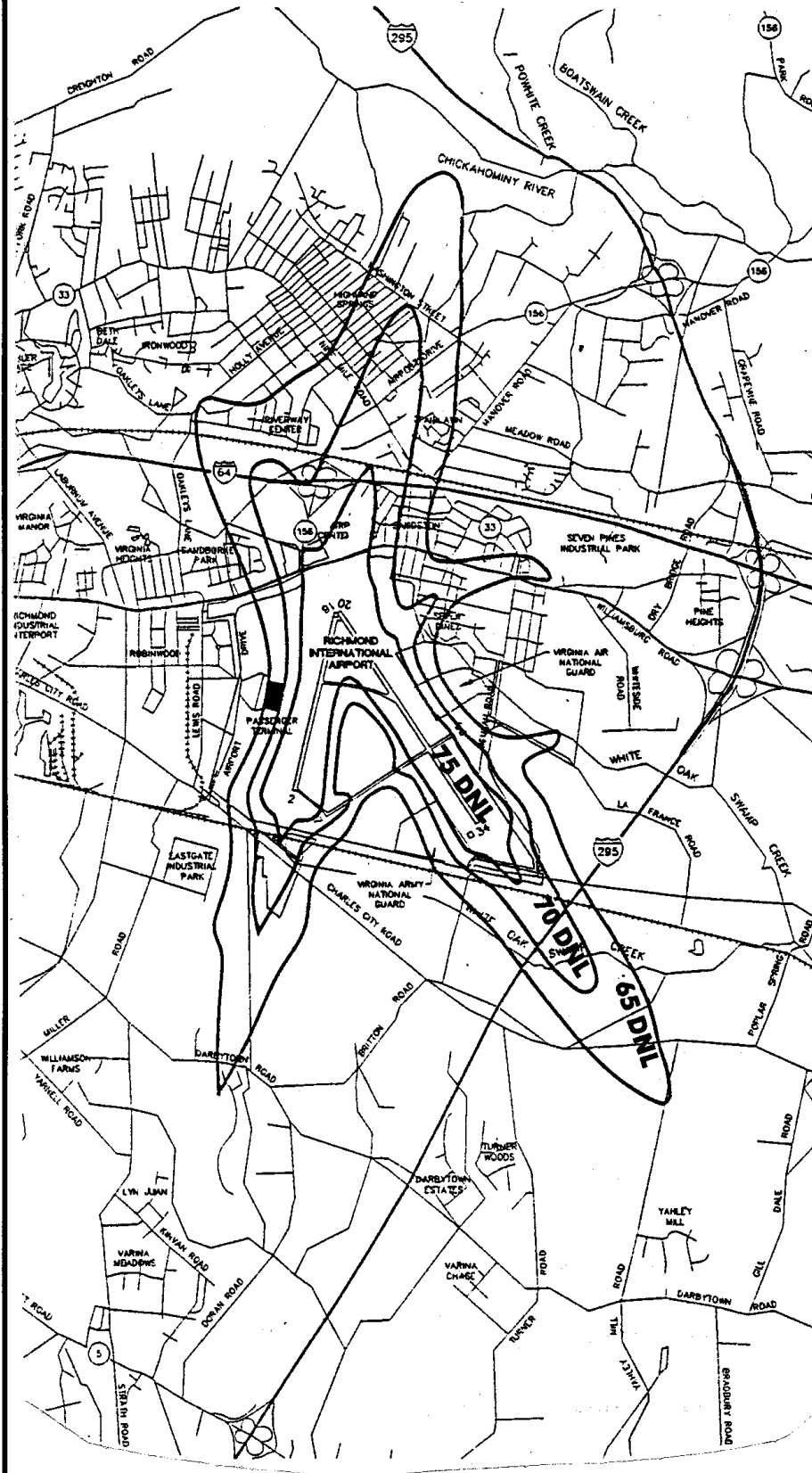
Noise level considered to have an adverse effects upon land use activities. Land use limitations and controls should be considered.

#### 70DNL

Noise level considered to have significant adverse effects upon land use activities. Land use limitations, easements, & other compatibility controls should be considered

#### 75DNL

Noise level considered to have the most severe adverse effect upon land use activities. Land uses other than airport related facilities should generally be excluded from this area.



#### Source:

Part 150 Noise Compatibility Study (draft) for the Capital Region Airport Commission, Aviation Planning Associates, November, 1994.

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