CHAPTER 1

BACKGROUND, HISTORY, RECENT DEVELOPMENTS, AND TRENDS

A. BACKGROUND

This Comprehensive Plan is a series of related documents for use by Lancaster County to anticipate and deal constructively with the many changes occurring in the community and its immediate surroundings. The plan was prepared by the county planning staff in collaboration with the Planning Commission, the Board of Supervisors, other County and State officials, and citizens of Lancaster County. The report also contains information obtained from many other sources, such as other comprehensive plans, professional papers, periodicals, public documents, environmental and health regulations, and information required by State and Federal statutes to be included in all county comprehensive plans. The Lancaster County Comprehensive Plan has two broad objectives: first, to identify near-term, long-range and strategic needs of the county's population, and second, to provide a planning framework for guiding the physical, social and economic changes occurring in response to future growth and development. This plan also complies with the Commonwealth of Virginia's Title 15.2-2223 of the State Code (See Appendix II), which requires all counties to prepare a comprehensive plan. The requirement to review the plan every five years is a very significant part of the Code.

The following chapters of the Comprehensive Plan focus on current physical and environmental conditions that may influence or limit the future use of land. The conditions examined include both natural and man-made conditions that, for purposes of analysis, are grouped into categories. They reflect the planning emphasis of the Chesapeake Bay program, with the exception of the category "redevelopment of intensely developed areas." No areas in Lancaster County meet the Chesapeake Bay criteria for "intensely developed."

The views indicated above are further illustrated in later chapters. In Chapter 2, environmental issues and assessment of existing conditions are discussed as they relate to suitability of land for development in Lancaster County. In Chapter 3, the structural framework of the future land use plan and land use policies will flow from the evaluation, plus the issues of Chapter 2.

The Chesapeake Bay Preservation Act mandated further requirements. Regulations adopted in accordance with this Act, for communities participating in Chesapeake Bay Local Assistance Department Regulations (CBLADS), are as follows:

- Physical constraints to development: Addresses those natural geographic qualities that seriously limit the potential for development.

- Protection of Potable Water Supply: Addresses protection of the existing and potential supply of drinkable water within the community to include quality and quantity.

- Shoreline Erosion Control: Focuses on the loss or potential loss of shoreline due to

wind and wave erosion.

- Access to Waterfront Areas: Deals with access to state waters and the potential access of areas for private and public use.

- Redevelopment of Intensely Developed Areas and other Areas Targeted for Redevelopment: Focuses on opportunities to reduce pollution through conversions of existing development.

In Chapter 4, the "Water Quality Preservation Plan," a strategy for meeting the requirements of the Chesapeake Bay preservation laws and regulations will be organized around the same topics.

B. HISTORY

Lancaster County is located at the southeastern end of Virginia's Northern Neck peninsula, between the Rappahannock and Potomac Rivers. It was formed in 1651 from portions of Northumberland and York Counties. Over time, other counties were formed from its original area until it reached its present size of 134.8 square miles or approximately 86,267 acres of land. Creeks and waterways with rolling woodlands and fields characterize the county. It is also known for its quiet rural charm, the retention of which citizens attending input sessions in early 2005 overwhelmingly supported.

Lancaster was settled shortly after 1640, predominantly by people of English descent moving from settlements along the James and York Rivers. The first County seat was established at Queenstown on the west side of the Corrotoman River. In 1742, the courthouse was moved inland to what is now Lancaster Courthouse. The present courthouse dates to 1863 and houses basically all records dating from 1652. On the Courthouse Green, the original clerk's office (1797), and the old jail (dating to the first quarter of the 19th century) still stand. Mary Ball Washington Museum, Incorporated uses these two buildings.

Prior to the Civil War, the economy of the county depended on tobacco and other types of agriculture. After the Civil War, the economy began to rely on the seafood industry. The shared importance of agriculture and seafood was evident by the early 1900's. By 1920, the economy included forestry as well. Fish, crab, and oyster industries were also important to the people. Trucking of tomatoes and potatoes was the prevalent agricultural industry. These industries were aided by inexpensive and easy transportation to market by steamboats. The menhaden industry has been a mainstay since the early 1900's, and remains important today.

During the 1920's, tourism and retail industries began to develop in White Stone and Kilmarnock. The commerce of Kilmarnock offered many shops and services to county residents. White Stone was seen as a thriving community, and Irvington was the largest town and the center of the seafood business.

Changes that occurred during the 1930's made great impact on the county's economy.

Automobiles became commonplace, and trucks began to replace steamboats as a means to transport marketable goods. After a devastating hurricane in 1933, many docks and wharves were destroyed and were not rebuilt, thus ending reliance on outside markets.

Although employment was good in the 1940's, the economy of the county declined during the 1950's. Lancaster County became relatively unknown and unimportant, because of poor means of travel to any outlying areas.

With the opening of the Robert O. Norris Bridge in 1957, Lancaster County was provided ready access to counties on the Middle Peninsula. This led to several trends. The age distribution of people in the county began to change. Young people were seeking employment elsewhere and the number of senior citizens was increasing. There was quick growth in the

trade and service industries, and tourism and recreation industries regained strength. The Tides Inn, Windmill Point Marine Resort, and the Tides Lodge were all established between 1945 and 1970 and began to flourish.

Other services and facilities began to appear in response to the changing community needs. The Lancashire Nursing Home, Rappahannock General Hospital, and Rappahannock Community College were all established during the 1960's and 1970's.

Although the basic industries of manufacturing, agriculture, and fisheries declined slightly in the 1980's, dramatic increases were noted in retail trade, recreational activity, and professional service employment. Kilmarnock has become the hub of retail and service businesses in the Northern Neck. The influx of retirees and outflow of younger people began in the early 1990's and continues today. The Rappahannock Westminster-Canterbury retirement community, opened in 1985, is a multi-million dollar investment, providing services that continue to attract retirees to the county.

Abundant sights and attractions encourage tourism and recreation today. One of the most notable is the Steamboat Era Musuem in Irvington that opened in 2004. Historic buildings, restaurants, marinas, and resorts all entice tourists interested in the serene, natural beauty of the county as well as the recreational activities available.

C. RECENT DEVELOPMENTS AND TRENDS

Land development in Lancaster County has recently accelerated with every indication that the current pace will continue for the foreseeable future. Hill's Quarter, a multi-use development approved in 1997 for construction on tracts of land adjoining Route 200 midway between Irvington and Kilmarnock, is currently building out with over eighty building permits for single family residences issued, mostly within the last two years. An eighteen-hole golf course has also been built within the community and began full operation in the spring of 2005. Development will also include a significant commercial area.

While much of the future development will continue to be residential, to include approved

major residential developments at the Golden Eagle and Windmill Point, there is also evidence of significant commercial development. This is most evident in the Kilmarnock Technology Park where several local and new businesses are constructing new facilities. Also, the demand for mini-storage units has resulted in the in the construction and approval of new facilities of this type with several more in the planning stage.

What of the future? The population of Lancaster County was 11,600 as of the 2000 census, was estimated to be 12,030 as of 2004, and is expected to be in excess of 13,500 by the year 2015 based on current rates of growth. Given that growth is occurring and will likely continue to do so, it must be managed and controlled in a positive manner to preserve the natural beauty and rural character of the area. Expansion of tourism, the recreation industry, and retail trade are still feasible within this context. Support of the basic industries of agriculture and those that are water dependent, as well as those related to the building trades and services, is key to maintaining a self-sufficient economy in Lancaster County. Best management practices designed to protect the natural environment must be mandated where they are critical and encouraged in all other activities. Detail consistent with and in support of these views will be provided in later chapters

CHAPTER 2

I. LANCASTER COUNTY SUITABILITY OF LAND FOR DEVELOPMENT

A. ASSESSMENT OF EXISTING CONDITIONS

Lancaster County covers approximately 135 square miles or approximately 86,267 acres of land. The County is rural in nature with limited public infrastructure such as public water supplies and sewage collection/treatment works. Due to this limited public infrastructure, development in Lancaster County usually requires on-site sewage facilities for disposal of waste and individual or community wells for domestic water supplies. Therefore, development of land in Lancaster County is closely tied to the physical characteristics of the land. These characteristics include the suitability of the soil for septic systems, the degree of slope of the land, the depth of the soil to the water table, the shrink-swell potential of the soil, and the proximity of the intended development to sensitive environmental features.

Sometimes the physical characteristics can act to preclude development such as when a parcel of land has steep slopes, wetlands, no suitable septic sites, or the presence of other environmentally sensitive features. Often development can occur, but with sensitivity to the unique physical properties of the particular parcel. The overall goal of the Lancaster County Suitability of Land for Development Plan is to provide a comprehensive base of information concerning physical constraints to development in Lancaster County. This base will provide a resource from which to draw policies and recommendations concerning future development in the County.

B. PHYSICAL FACTORS THAT INFLUENCE OR CONSTRAIN DEVELOPMENT

1. Chesapeake Bay Preservation Areas

The Chesapeake Bay Preservation Act of 1989 requires each county in Tidewater Virginia to designate land areas in their county that, if improperly developed, would contribute to significant degradation of the water quality of the Chesapeake Bay and its tributaries. The Chesapeake Bay Preservation Areas were broken into two classifications: Resource Protection Areas and Resource Management Areas. Resource Protection Areas (RPAs) are those lands and features that have a direct water quality function or impact. Resource Management Areas (RMAs) are lands that, if not properly managed, have the potential to degrade water quality or impact the functioning of RPAs. Detailed descriptions of the two Chesapeake Bay Preservation Areas and lands included in each are given on the next page.

a. Resource Protection Area (RPA)

The RPA includes: 1) tidal wetlands, 2) non-tidal wetlands connected by surface flow and contiguous to tidal wetlands or tributary streams, 3) tidal shores, 4) other

lands as designated and 5) a 100' buffer adjacent to and landward of any of the preceding components. This buffer area acts to filter run-off from developed areas, to provide natural stabilization of soils from forces of tidal and upland erosion, and to provide a setback that protects dwellings from erosion, wave action, and flooding. The total amount of land designated as RPAs in Lancaster County is estimated to be 3,356 acres.

Resource Protection Areas are strictly regulated. Development in the RPA is limited to new water-dependent facilities, expansion of existing water-dependent facilities, and redevelopment. In the RPA, a 100 foot buffer area of vegetation that is effective in limiting runoff, preventing erosion, and filtering non-point source pollution from runoff must be retained if already present, or established if it does not exist. Clearing in the RPA is limited to what is necessary to provide for reasonable views of the water, access to the water, and for general woodland management purposes. Cleared vegetation must be replaced with other vegetation that is equally effective in protecting water quality.

b. Resource Management Area

In Lancaster County all land outside of the designated RPA is classified as an RMA. The RMA is protected by the Chesapeake Bay Preservation Act and the Lancaster County Chesapeake Bay Preservation Ordinance through the establishment of performance standards that apply to all development and redevelopment.

Performance standards are as follows:

1) No more land shall be disturbed than is necessary to provide for the desired use or development;
2) Indigenous vegetation shall be preserved to the maximum extent possible consistent with the use and development allowed;
3) A maintenance agreement with the owner or developer shall be established where best management practices require regular or periodic maintenance;
4) All development exceeding 2,500 square feet of land disturbance shall require the issuance of a permit and be accomplished through a plan of development review process;
5) Land development shall minimize impervious cover consistent with the use or development allowed;
6) Any land disturbing activity regardless of size shall comply with the requirements of the Lancaster County Erosion and Sediment Control Ordinance;
7) On-site sewage treatment systems not requiring a Virginia Pollutant Discharge Elimination System (VPDES) permit shall be pumped out at least once every five years, and, for new construction, a reserve sewage disposal site with a capacity at least equal to that of the

primary sewage disposal site shall be provided;

8) Stormwater management criteria which accomplish the goals and objectives of the Virginia Stormwater Management Regulations shall be satisfied;
9) Land upon which agricultural activities are being conducted, including but not limited to crop production, pasture, and dairy and feedlot operations, or lands otherwise defined as agricultural land, shall have a soil and water conservation plan;
10) Silvicultural activities are exempt provided that these activities adhere to water quality protection procedures prescribed by the Virginia Department of Forestry in the January, 1997 edition of "Forestry Best Management Practices Handbook for Water Quality In Virginia';
11) All wetlands permits required by law must be obtained prior to authorizing grading or other on-site activities to begin.

2. Flood-Prone Areas

Due to its proximity to large tidal bodies of water, Lancaster County has a number of flood prone areas. Damage from floodwaters in these areas can result in expensive repairs to structures, loss of use of structures (damaged homes), temporarily inoperable septic systems, contamination of water supplies, and quite possibly in bodily injury or loss of life. These are problems that can be further aggravated by the cumulative impact of development in flood-prone areas.

Once developed, land in the flood plain is lost as an area of filtration due to the resulting placement of structures and impervious cover. The result is that flood events can cause more damage than they did prior to development. For example, floodwater will travel faster and crest higher if water is not allowed to filtrate into the ground, or travel down streams unimpeded from man-made structures. The increased velocity of floodwaters can result in increased damage to properties, and the higher flood elevations could result in damage to properties that were not affected previously.

In all, the County has approximately 12,448 acres, or 19.45 square miles, of land that lies within the 100- year flood plain. These areas are highlighted in the "100 Year Flood Map" and are summarized in the chart below.

	Area in Acres	**% of County**
100 Year Floodplain	12,448	14
Outside 100 Year Floodplain	73,819	86
Total	86,267	100

3. Wetlands

Wetlands are defined by the United States Fish and Wildlife Service as "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water" (Pg. 4, Atlas of National Wetlands Inventory Maps of Chesapeake Bay. U.S. Fish and Wildlife Services; September, 1986.). Generally, wetlands can be classified as either tidal or non-tidal. Locally, Lancaster County has approximately 4,500 acres of tidal wetlands and 1,349 acres of non-tidal wetlands. (Figures were obtained using the Lancaster County Geographic Information System utilizing a digital National Wetland Inventory map layer. Distribution of tidal and non-tidal wetlands in Lancaster County can be viewed on the "Tidal and Non-Tidal Wetlands" Map.)

Wetlands are important natural resources that provide many positive benefits to the man-made and natural environments. Wetlands provide aesthetic, recreational, and economic benefits to the community. Furthermore, wetlands are spawning and nursery grounds for finfish and shellfish, feeding and wintering sites for migratory waterfowl, nesting habitat for shore birds, and homes to a wide variety of wildlife. Wetlands further serve as important areas for groundwater recharge, flood control, pollution absorption, and retention of sediment from storm water run-off (Pg. 1, Atlas of National Wetlands Inventory Maps of Chesapeake Bay. U.S. Fish and Wildlife Services; September, 1986.).

The inclusion of non-tidal wetlands within the Resource Protection Areas (RPAs) is crucial and integral to meeting the criteria in the Chesapeake Bay Preservation Act Regulations adopted by the Chesapeake Bay Local Assistance Board. The designation of RPAs requires the inclusion of tidal wetlands as well as non-tidal wetlands that are both contiguous and connected by surface flow to either tidal wetlands or tidal waters. Surface flow means perennial streams. Intermittent streams and their associated wetlands are not required to be included in the RPA. However, it is policy within Lancaster County that a wetland contiguous to and connected by surface flow to an intermittent stream will be designated as part of the RPA if the wetland is sensitive to impacts which may cause degradation to the quality of state waters.

4. Steep Slopes

Development and disturbance of land on steep slopes (over 15%) can have many negative impacts. First, stabilization of soils after development is often costly and difficult due to the fact that highly erodible soils are often found on steep slopes. Disturbance of these areas can result in erosion of the soils, causing sedimentation from run-off soils to flow into the streams and main bodies of water. Furthermore, steep slopes, and the soils found there, are not suitable for septic systems. The combination of unstable soils and poor septic suitability can result in higher construction costs if development is allowed to occur.

In Lancaster County, steep slopes are often found adjacent to the tributary streams and creeks of the Rappahannock River and Chesapeake Bay. In the County there are 19,415

acres of land which are classified as steep slopes. These areas can be seen in more detail on the "Slope Map" and “Topography Map” and are summarized in the following chart.

Degree of Slope	Area in Acres	% of County
0 -6%	56,763	66
6 - 15%	10,002	12
15 - 45%	15,652	18
Over 45%	3,763	4
N/A	87	0
Total	86,267	100

5. Shrink-Swell Soils

Shrink-swell soils are those that can greatly change in volume when their moisture level fluctuates normally throughout the year. The shrink-swell potential of the soil is a measurement of how much volume change can be expected in a soil with an increase or decrease in moisture levels. This measurement is important because continued expansion of shrink-swell soil can result in heaving, which places additional pressure on foundations. Contraction of these soils can lead to void areas that do not provide uniform, adequate support to the footing of the foundation.

The shrink-swell potential of Lancaster County soils was mapped using the County's Geographic Information Systems and the Lancaster and Northumberland Counties Soil Survey. Soil types in the County were studied as to their shrink-swell potential up to depths of 60". Sixty inches was chosen to account for any change in grade along the length of any planned or future structures. If any soil type was classified as having high shrink-swell potential anywhere in this 60" range, it was grouped in the "high" category. The extent of shrink-swell soils in Lancaster County can be seen on the "Shrink-Swell Potential Map" and are further described in the following chart.

Shrink-Swell Potential	Area in Acres	% of County
None	416	0.40
Low	24,992	29.10
Moderate	56,201	65.10
High	4,571	5.30
N/A	87	0.10
Total	86,267	100.00

6. Septic Suitability

a. Septic Systems/Sewage Disposal

Approximately 83% of all private residences in Lancaster County utilize on-site septic systems for sewage disposal purposes. The chart below gives some indication of the actual numbers of septic systems in the County and if they are located in or outside of the three towns.

Septic/Cesspool for Sewage Disposal
Lancaster County, VA - 1990

Towns	534	52% of Housing Units in Towns
County	4,370	89% of Housing Units in County
Total	4,904	83% of all Housing Units

Source: 1990 United States Census Statistics.

The potential for septic systems causing pollution of surface water bodies can stem from the initial improper siting of the system, or from the failing of aged or not properly maintained systems. Often septic systems have been placed in soils that can act to heighten the negative impact of the system. Specific soil characteristics that can impact operation of septic systems are discussed below.

b. Depth to Water table

Depth to the water table varies greatly throughout Lancaster County. In some areas of Lancaster County the seasonal high water level is as much as 40 or more feet below the ground surface. However, in other areas of the County the seasonal high water table is often less than 24 inches from the ground surface. The depth to the water table is important because soils where the water table is higher are not suitable for the use of septic systems.

First, in areas with high water tables, groundwater can rise into septic drain fields, mixing with untreated effluent. This situation can result in contamination of the water table aquifer that is used by over one fourth of all homes in Lancaster County. Additionally, septic systems in areas with seasonally high water tables can act to contaminate nearby surface water bodies. During times of high water table levels, effluent in an affected system is not able to percolate down through the drain field. Instead the effluent can rise to the surface untreated and pool because of the high water table. During a rainstorm, this pooled effluent can quickly drain into nearby surface water bodies.

Areas in Lancaster County with high water tables can be viewed in the "Water Depth Map" and are further summarized in the following chart.

	Area in Acres	% of County
< 24" to Water Table	24,386	28.40
> 24" to Water Table	61,794	72.50
N/A	87	0.10
Total	86,267	100.00

c. Highly Permeable Soils

Highly permeable soils also can act to increase negative impacts of septic systems. These soils allow septic effluent to percolate more quickly through soils underneath the drain field, while not allowing for proper filtration. If the effluent percolates before it is properly treated then it can become a threat to the ground or surface water that it acts to recharge.

The combination of high water tables and highly permeable soils is particularly a problem in densely developed areas close to the county's shoreline. The high number of septic systems in conjunction with poor soil conditions can lead to elevated levels of fecal coliform bacteria in adjacent surface water bodies, which can then result in the condemnation of the area for shell fishing. (See "Septic Suitability Map")

Highly permeable soils in Lancaster County include the following types:

1. Coastal Beach (0.48%)
2. Dragston fine sandy loam (3.2%)
3. Lakeland loamy fine sand, gently sloping (0.6%)
4. Rumford loamy sand, gently sloping (0.2%)
5. Rumford loamy sand, sloping, eroded (0.05%)
6. Sloping sandy land (9.3%)
7. Steep sandy land (18.0%)

d. Low Permeability Soil

Clayey soils with low permeability are not desirable for septic systems. These types of soils do not allow effluent to percolate down properly out of the drain field. If the effluent does not percolate down through the system's drain field, because of low permeability soil conditions, it could instead rise to the surface. This is an undesirable situation, which can be worsened in times of run-off when untreated effluent can run off into nearby surface water bodies. (See "Septic Suitability" map)

e. Steep Slopes

As discussed in the "Steep Slopes" Section, areas of steep slopes are not suitable for the placement of septic systems. Generally, septic systems need level areas

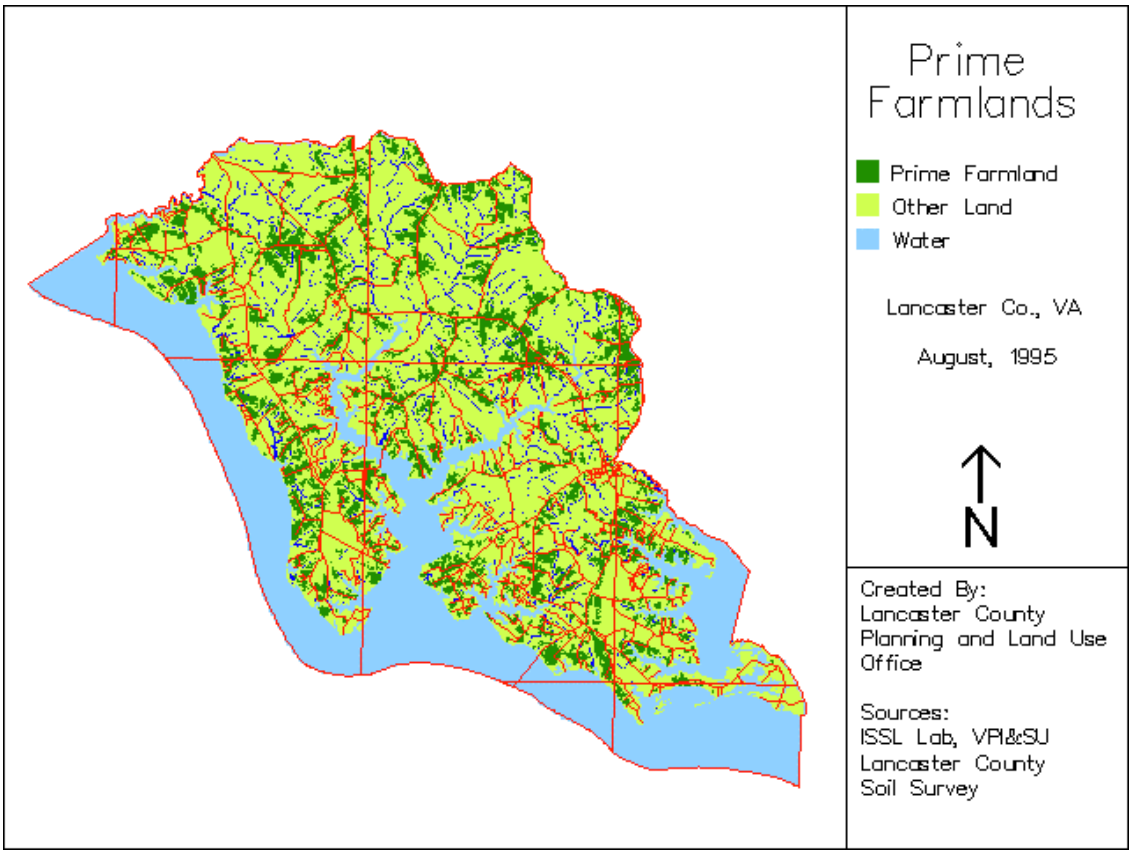
for drain fields. Septic systems placed on slopes do not allow for the proper treatment of wastewater because the resulting effluent will travel down-hill to the end of drain field, where it can leach out, instead of slowly and evenly percolating through the entire length of the drain field. (See "Slope Map" and Chart)

Septic Suitability	Area in Acres	% of County
Poor	30,336	35
Fair to Poor	742	1
Fair	21,902	25
Good	31,452	37
N/A	1,835	2
Total	86,267	100

7. Prime Farmlands

Lancaster County has a rich history of agriculture dating back to the Colonial Era. Agriculture and related services are important contributors to the local economy. Even though their role in the local economy has diminished, farms in Lancaster County still serve many important purposes. First, farmlands provide an aesthetically pleasing landscape that is enjoyed by all residents of the County. The 1992 adopted comprehensive plan cites farmlands as strong contributors to the County's rural nature. Additionally, farmlands play an important environmental function in that they are prime areas for recharge of the County's groundwater aquifers. Areas of undeveloped, pervious land, such as woodland and farmland, are necessary for the purposes of aquifer recharge. It is because of these important roles that the 1992 Comprehensive Plan identified farmlands as resources that are worthy of conservation and preservation.

However, lands that have historically supported agriculture in Lancaster County are also the lands that are the most suitable for development. Lands in agricultural use are usually level, cleared, well drained, and consist of soils suitable for septic systems. These are conditions that are usually sought for other land uses such as residential development. This is further evident when it is seen that of the 42,930 acres of land in Lancaster County considered to prime for agricultural activity, only 17,014 acres were still in use in 1990 for farming purposes.



The Lancaster and Northumberland Counties Soils Survey ranks soil as to its potential for farming. Soils are grouped into eight different "capability units" which define their suitability for farming. The classifications are based on the limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. Class I soils are the best soils for farming, descending to Class VIII soils which have limitations that make them unsuitable for farming, as well as most other uses. For purposes of this plan, all Class I and some Class II soils were considered to be prime soils for agriculture. Areas of prime agricultural soils can seen in the "Prime Farmlands" map and are further detailed in the following chart. (A list of soil types considered prime for agricultural activity can be seen in Appendix IV.)

Type of Land	Area in Acres	% of County
Prime Agricultural Land Being Farmed	17,014	20
Other Land Being Farmed	4,591	5
Prime Agricultural Land in Other Use	25,916	30
Other Land/Other Use	38,746	45
Total	86,267	100

C. EXISTING LANCASTER COUNTY ORDINANCES

1. Erosion and Sediment Control Ordinance

The Lancaster County Erosion and Sediment Control Ordinance establishes a program to protect and improve the water quality of the Chesapeake Bay which can be implemented on the local level. The ordinance regulates any land disturbance resulting in the disturbance of an area equal to or greater than 2,500 square feet in size. Before any site disturbance occurs, an erosion and sediment control plan for the site must be submitted and approved by the County's erosion and sediment control officer. Furthermore, all land-disturbing activities must comply with the Chesapeake Bay Preservation Ordinance.

2. Zoning Ordinance

a. Waterfront Residential Overlay Zone (Article 18; Zoning Ordinance)

The Waterfront Overlay Zone regulates all parcels of land recorded on or after May 11, 1988 which are for residential use or residential-development and which lie within 800 feet of tidal waters and wetlands. This zone requires lots to have a 2 acre minimum size. Additionally, the zone requires a 100-foot buffer landward from high water mark and tidal wetlands, and a 50-foot buffer landward from non-tidal, non-RPA wetlands, as well as a 200 foot wide average waterfront requirement for new subdivision lots.

b. Chesapeake Bay Preservation

This zone and its requirements were discussed in the "Chesapeake Bay Preservation Areas" section on pages 2-1 and 2-2.

c. Flood Plain Overlay (Article 23; Zoning Ordinance)

The Flood Plain Overlay Zone applies to all lands within the County which are identified as being in the 100-year floodplain by the Federal Emergency Management Agency. All activities in the flood plain district can be undertaken only after issuance of a zoning permit, and any development has to strictly comply with the Virginia Uniform Statewide Building Code and the Lancaster County Subdivision Ordinance. All applications for development and building permits in the floodplain further require submission of a site plan. The site plan must detail the existing and proposed topography on the site, the 100-year flood elevation, and the elevation of the first floor of any future residential structures.

3. Subdivision Ordinance

The Subdivision Ordinance of Lancaster County recognizes that the County's economic viability is dependent on the wise use of its land and other natural resources. Many water quality related issues are addressed by this ordinance including the proper siting of wastewater disposal systems, assurances of strict adherence to the requirements of the Chesapeake Bay Preservation Act, and the adequate provision of proper erosion and

sedimentation control, drainage, storm water management and flood control.

4. Wetlands (Article III, Environmental Ordinance; Lancaster County Code)

The Wetlands Ordinance of Lancaster County applies to all tidal, non-vegetated and vegetated wetlands in Lancaster County. This ordinance requires any person pursuing a permitted use in a wetlands area, to first file an application with the Virginia Marine Resources Commission. The permit application details the intended use, the scale of the project, equipment to be used in construction and how the equipment will access the site, the cost of the project, the purpose of the project, and other applicable information. After submittal of the application, the proposed project will go to public hearing at a regularly scheduled meeting of the Lancaster County Wetlands Board, which has the authority to approve or deny the permit application.

II. LAND USE

Development in Lancaster County is closely tied to the physical characteristics of the site to be developed. This close bond with the land is further magnified by the wide variety of environmentally sensitive areas found in the County including steep slopes, flood plains, prime agricultural lands, wetlands, and soils not suitable for septic systems. In all, approximately 56,229 acres or 65% of Lancaster County land is limited in some form. There is still a large quantity of land that has no limitations and is suitable for development. In total 30,038 acres or 35% of Lancaster County land has no physical constraints to development. These areas can be seen on the "Existing Conditions" Map, and the accompanying inset maps.

A. PHYSICAL CONSTRAINTS TO DEVELOPMENT

Specific physical limitations to development that cause concern in Lancaster County include the suitability of soils for septic systems, the loss of prime agricultural farmlands to development, and the presence and location of shrink-swell soils in Lancaster County.

Approximately 30,336 acres, or 35%, of land in Lancaster County is classified as "poor" for suitability of its use for septic systems. Currently, approximately 83% of all private residences in Lancaster County are dependent on septic systems for their sewage disposal purposes. Moreover, the total number of septic systems will continue to grow as more land becomes developed in the County. The dependency on septic systems is amplified because the Town of Kilmarnock possesses the only public sewage treatment facility in Lancaster County. Therefore, continued protection of ground and surface water supplies in Lancaster County will be contingent on the proper siting of new septic systems. This is further significant because the water table aquifers (the Yorktown-Eastover and the Columbia), which are the ones most susceptible to contamination, are used by 1,679, or 28%, of all homes in Lancaster County.

Farmland in Lancaster County is a major contributor to the rural nature of which residents are so proud. However, of the 42,930 acres of land in Lancaster County considered to be prime for agricultural activity, only 17,014 acres were still in use in 1990 for farming purposes. This loss of farmland to other uses in Lancaster County is a trend which needs to be stabilized. Farmlands provide acres of pervious land surface which act as recharge areas for groundwater aquifers. As more land is developed, remaining recharge areas become increasingly important. This is of particular importance in Lancaster County, which is totally dependent on groundwater for its drinking water supply.

Shrink-swell soil can act to damage the foundations and walls of buildings, resulting in expensive repairs to affected structures. However, the negative impacts of shrink-swell soil can be prevented during the initial construction of a building, if the builder is aware of this soil condition. In Lancaster County there is approximately 4,571 acres (5% of the County), of soil with "high" shrink-swell potential. Awareness of this soil condition needs to be heightened in Lancaster County to better protect property owners and their investments.

B. EXISTING COUNTY ORDINANCES

All new development in Lancaster County has to adhere to existing county ordinances and is often subject to the public hearing process. Lancaster County has many ordinances that regulate new and existing development including the Zoning Ordinance, the Wetlands Ordinance, the Subdivision Ordinance, and the Erosion and Sediment Control Ordinance. A standalone ordinance deals with Chesapeake Bay Preservation and makes violations a Class I misdemeanor. Overall, Lancaster County's present ordinances are strong in the protection of water quality and the current level of enforcement is high.

C. HEIGHTENED AWARENESS

Residents in Lancaster County are very attuned to many environmental topics such as residential shoreline development, the Chesapeake Bay Preservation Regulations, the value of wetlands in protecting water quality, the location of flood-prone areas in the County, and the impact of land use on surface water quality. However, there is significantly less awareness of other sensitive environmental features that need to be considered in planning for new development. Many citizens in Lancaster County are not aware of the presence of shrink-swell soils in Lancaster County, the important role farmlands play in providing ground water recharge areas, the effect of development on steep slopes, and the impact of improper septic system placement on surface and groundwater supplies. Providing County residents this information, particularly in regard to their own property, will help them make environmentally sound decisions when considering new development on their lands.

The pace of development in Lancaster County, and the size of the county is such that people developing sites have significant interaction with County officials throughout the process. Having a system in place that enables County officials to advise citizens and potential property developers of limitations on their property, prior to development, can prevent much of the negative impact of development before it occurs.

III. LANCASTER COUNTY SUITABILITY OF LAND FOR DEVELOPMENT PLAN

A. PHYSICAL CONSTRAINTS/LIMITATIONS DATABASE

To assure that new development occurs with full knowledge of site constraints prior to development occurring, it is recommended that the County develop a countywide, parcel specific database highlighting the physical constraints present on each parcel of land. County staff could utilize the County's Geographic Information System in developing a customized database showing the different limitations present on individual properties. Furthermore, this database could be used to make printouts that could be checked when property owners start the development process. The printout could be similar in style to the current Lancaster County Strip Files, or it could be done as an addition to the Strip Files. The printout would let County staff and property owners know if there is the possibility of a physical constraint on the property at the onset of development plans. Alternative plans made necessary by the limitation can then be discussed at this point in the development process.

Implementations of this type of system will save time in the initial planning stages, will save property owners from having to make costly repairs at a later date, and will prevent possible negative environmental impacts of development before they occur.

B. SEPTIC SYSTEM INVENTORY

To help identify areas of the county where there are already high concentrations of septic systems, it is recommended that Lancaster County inventory and map existing septic systems in the County. Information obtained from this inventory would be valuable in developing a future land use map for Lancaster County. Additionally, once compiled, this information would aid in any future efforts to identify and prioritize areas for efficient placement of a wastewater treatment works. This recommendation is consistent with a similar proposal in the Lancaster County Protection of Potable Water Supply Study and Plan, put forth to assure continued protection of Lancaster County's surface and groundwater resources. The proposed inventory would help to pinpoint high concentrations of septic systems in the County, which could act together to negatively impact the quality of Lancaster's surface and groundwater supplies.

C. CONTINUE PRESENT ENFORCEMENT AND PLANNING LEVELS

To assure continued protection of the quality of Lancaster County's surface water bodies, the County must continue its present, active enforcement of the Chesapeake Bay Preservation and Erosion & Sediment Control Ordinances.

D. ENCOURAGE RE-USE OF SUITABLE ABANDONED STRUCTURES

To limit the need for new construction on undeveloped sites and to limit increases in the

amount of impervious surface cover in the County, it is recommended that Lancaster County strongly encourage re-use and rehabilitation of suitable, abandoned structures. This proposal is designed to serve many purposes. First, these properties are sometimes safety hazards and often have abandoned wells. Improvements to the on-site water and sewage facilities at these structures would act to protect water quality in Lancaster County. Additionally, improvements to abandoned properties would result in increased assessments and, in turn, increased tax revenue. Lastly, by using an existing structure the user prevents undeveloped land from being developed at that time and also prevents an increase in impervious surface cover in Lancaster County.

E. INVESTIGATE FEASIBLE METHODS OF PRESERVING PRIME FARMLAND IN LANCASTER COUNTY

To assure continued protection of the quality of groundwater supplies, to assure that farming remains a viable occupation in the County, and to retain the rural character of the County, feasible methods of preserving prime farmland in must be developed. Such strategies as expansion of the existing land use taxation program, conservation planning whereby farmland is designated a primary conservation area, and, most importantly, promoting new market opportunities will be pursued. While obvious, protection and enhancement of the livelihood of the farmer through new markets is essential to frmland preservation.

F. IDENTIFY POSSIBLE IMPOUNDMENT AREAS

This recommendation would be carried out in conjunction with the similar proposal put forth in the Lancaster County Protection of Potable Water Supply Plan. It is further recommended that the County explore strengthened county ordinances to assure protection of proposed impoundment areas.

IV. GOALS AND OBJECTIVES

GOAL #1: **Encourage new and orderly development in areas of the County most suitable for new growth.**

Objective: Create zoning incentives and ordinance amendments that help direct new development to areas of the County most suitable for growth.

Objective: Develop amendments to the zoning ordinance that help protect property owners from potential hazards of shrink-swell soil and high water tables.

GOAL #2: **Assure that new development is designed in a manner that provides for continued protection of the surface and groundwater resources of Lancaster County and the State of Virginia.**

Objective: Continue consistent enforcement of the Chesapeake Bay Preservation Act and Erosion and Sediment Control Act Regulations to assure protection of the water quality of the Chesapeake Bay and its tributaries.

Objective: Protect possible water impoundment areas presented in the Lancaster County Protection of Potable Water Supply Plan.

Objective: Support enhancement of county ordinances to protect proposed impoundment areas.

Objective: Develop methods of preserving prime farmlands in Lancaster County in order to protect groundwater recharge areas.

Objective: Incentivize re-use and rehabilitation of existing, vacant structures in order to limit need for new construction and increases in impervious surface cover in the County.

CHAPTER 3

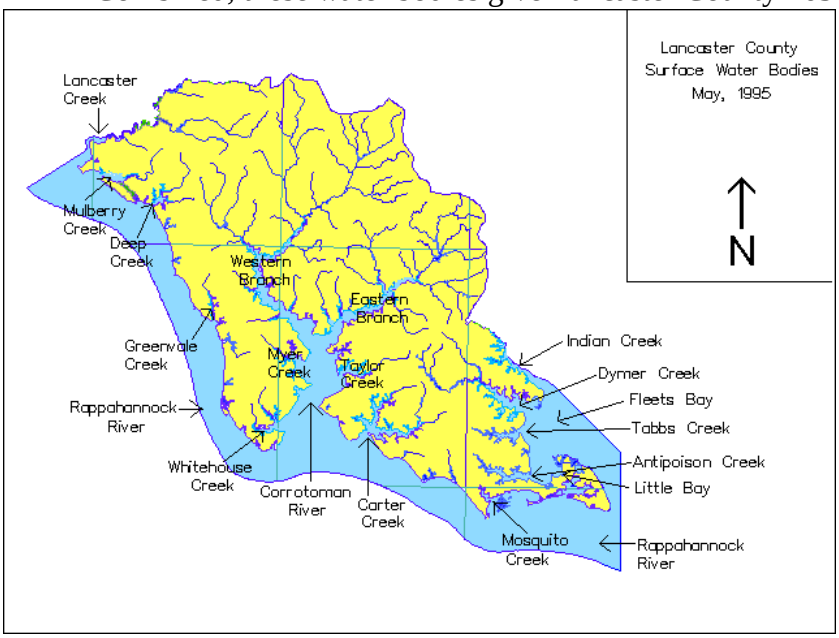
I. PROTECTION OF WATER IN LANCASTER COUNTY

The groundwater and surface water supplies of Lancaster County are recognized to be some of its most valuable natural resources. Lancaster's groundwater resources provide the County with 100% of its potable water supply. Meanwhile, the County's surface water provides a source of employment for the seafood industry, a major attraction for the tourism industry, a source of recreation for citizens, and a potential future water supply for the County. The health of the people, the economy, and the hope for future growth all depend on the quality of these important water resources.

The Lancaster County Potable Water Supply Study and Plan will assess the existing state of these resources, develop goals and objectives concerning the water supply, and present recommendations for protecting and enhancing the water supply in the future. The study will be divided into two sections. The first will examine the existing surface water conditions in Lancaster County. The second will investigate the existing groundwater conditions in the County. The plan will be realistic in that it recognizes that surface and groundwater resources are regionally shared and therefore require regional efforts to assure their protection. However, the plan also recognizes that much can be done within the county's boundaries to protect our vital water resources. Recommendations proposed in this plan address the regional and local nature of these resources.

A. SURFACE WATER

Lancaster County is bordered by the Chesapeake Bay to the East and the Rappahannock River to the South. Many tidal water bodies meander through the County on the way to the Bay and River including Lancaster Creek, the Eastern and Western branches of the Corrotoman River, including the Western and Eastern Branches, Carters Creek, Indian Creek, Dymer Creek, Tabbs Creek, Antipoison Creek, as well as many smaller creeks. Combined, these water bodies give Lancaster County 265 miles of tidal shoreline.



Lancaster County also has many existing privately owned millponds which are categorized as surface water. These millponds are generally located in the freshwater sections at the headwaters of the above mentioned creeks and were created through the use of impoundment structures. Included in this group are Balls, Blakemore, Kamps, Chinns, Davis, Dunton, and Norris millponds.

1. Surface Water Quality

The quality of surface water is of vital importance to the Lancaster County community. First, many commercial fishermen, seafood industry owners, marina owners, and related employees depend on local waters for their livelihood. Second, citizens of the county enjoy living in a rural, scenic setting that is enhanced by views of, and access, to the water. Lastly, the water is a source of recreation for many in the Lancaster County community, as well as for many visitors to the area.

Agriculture is a major industry within Lancaster County and one whose activities can significantly affect the quality of surface water Farmers and county officials are and will continue to actively work with the local Soil and Water Conservation District in the development of conservation plans that will provide protection to Bay waters while allowing farmers to maximize the productivity of their land.

Conservation plans consider the existing conditions of each individual farm. The plan takes into account soil types, slope, drainage patterns, crop cover and animal populations. Based on the available data and using the Soil Conservation Field Office Technical Guide, a plan is drawn up that recommends the most appropriate conservation practices for each farm. Components of the plan may include grassed waterways for drainage, rotating crop covers crop rotation, contour strips, water diversion structures, nutrient management, pesticide management, and herbicide management.

Farmers in Lancaster County generally control the use of fertilizers and pesticides as a matter of complying with law, but also as a matter of economics. With the depressed price of crops and drought conditions of recent years, farmers are extremely careful to prevent runoff and to use only the amount of fertilizer and pesticide that can be absorbed into the soil rapidly. No-till farming is commonplace and has helped considerably to control runoff by limiting disruption to the soil.

The map, Lancaster County Farm Plan Inventory CBLAD and NNSWCD Farm Plan Data, shows cultivated areas in Lancaster County. It draws a distinction between those farms for which a plan is on record and those for which a plan is not on record. While this map indicates a large number of farms for which a plan does not exist, or is not recorded, it is believed that many do have a plan. It will be considered a priority to accurately establish the inventory of existing plans and take the necessary action to ensure plans are developed for the remainder.

While the potential for redevelopment is limited in Lancaster County, opportunity exists primarily on former seafood processing sites. There are several of these sites in Lancaster County, some covering fairly extensive areas of shoreline with impervious cover. There appears to be little demand to reopen these sites for seafood processing, and, as the crab population becomes more depleted, there is indication that some existing

sites may go out of business. These sites occupy prime real estate for redevelopment for residential purposes. All site plans submitted for development must show a reduction in impervious cover within the buffer area and must also show at least the required ten percent reduction in the introduction of pollutants and nutrients to protected waters.

2. Measures of Surface Water Quality

a. Condemned Shellfish Grounds

One indicator of surface water quality is the location of condemned and seasonally condemned shellfish grounds. Every two years the Commonwealth of Virginia prepares a report on the quality of the State's Waters and presents it to the U.S. Environmental Protection Agency and the United States Congress. The document is called the 305 (b) Report to EPA and Congress and addresses how well the State is meeting the Federal Clean Water Act's goals of providing fishable and swimmable waters. In this report, state waters are evaluated as to whether they are "Fully Supporting," "Fully Supporting But Threatened," "Partially Supporting," or "Not Supporting" concerning the goal of fishable waters. Local waters that have been condemned for shellfishing by the Virginia Department of Health fall under the category of Partially Supporting in regard to fishing.

Lancaster County has approximately 1,370 acres of condemned shellfish grounds. Typically shellfish condemnation areas in Lancaster County are found only in small portions of creeks, not throughout the entire creek. Exceptions are Carter Creek, Greenvale Creek, Paynes Creek, Beach Creek, Lancaster Creek, and Mulberry Creek, which are all mostly, or totally, designated as condemned or seasonally condemned.

Locations of shellfish condemnations are important water quality indicators because the waters have been condemned due to elevated levels of fecal coliform bacteria. High levels of fecal coliform bacteria can be due to animal (domestic and wild) waste, failing septic systems, marinas, or the flushing characteristics of the particular water body.

b. Ambient Water Quality Monitoring

Another measurement of water quality that is addressed in the 305 (b) Report is ambient water quality monitoring results. The Virginia Department of Environmental Quality has designated monitoring stations at various locations in the different surface water bodies throughout the state. The stations are used to monitor four conventional pollutant levels including dissolved oxygen, pH, temperature, and fecal coliform bacteria. Data collected from each station is then assessed to see if it meets the Virginia Water Quality Standards for Dissolved Oxygen, pH, and Maximum Temperature. There are seven ambient water quality stations located in, or very close to, Lancaster County's boundaries. Five of these are located in the Rappahannock River, one in the Corrotoman River, and one in Indian Creek. Results from these seven stations are indicated on the map and

listed below:

W 22 (Station ID: 3-CRR003.38) - This station is located in the Corrotoman River near Red Buoy #6 in Lancaster County. This station recorded 0 violations of the Virginia Water Quality Standards. During the reporting time frame, there were 25 samples taken for temperature, 24 samples of dissolved oxygen, 26 for pH, and 14 for coliform bacteria. (p. B-7 of the Appendix, 305 (b) Report to EPA and Congress.)

W 23 (Station ID: 3-RPP010.60) - This station is located in the Rappahannock River off Orchard Point near the Lancaster County and Middlesex County boundary in the Rappahannock River Basin. This station recorded 0 violations of the Virginia Water Quality Standards. During the reporting time frame, there were 26 samples taken for temperature, 24 samples of dissolved oxygen, 26 for pH, and 15 for coliform bacteria. (p. B-8 of the Appendix, 305 (b) Report to EPA and Congress.)

W 24 (Station ID: 3-RPP017.72) - This station is located near buoy #8 southwest of the mouth of Greenvale Creek near the Lancaster County and Middlesex County boundary in the Rappahannock River Basin. This station recorded 0 violations of the Virginia Water Quality Standards. During the reporting time frame, there were 27 samples taken for temperature, 22 samples of dissolved oxygen, 27 for pH, and 14 for coliform bacteria. (p. B-8 of the Appendix, 305 (b) Report to EPA and Congress.)

W 25 (Station ID:3-RPP025.52) - This station is located near buoy #11 off Goose Point on the Middlesex County side in the Rappahannock River Basin. This station recorded 0 violations of the Virginia Water Quality Standards. During the reporting time frame, there were 23 samples taken for temperature, 20 samples of dissolved oxygen, 23 for pH, and 0 for coliform bacteria. (p. B-8 of the Appendix, 305 (b) Report to EPA and Congress.)

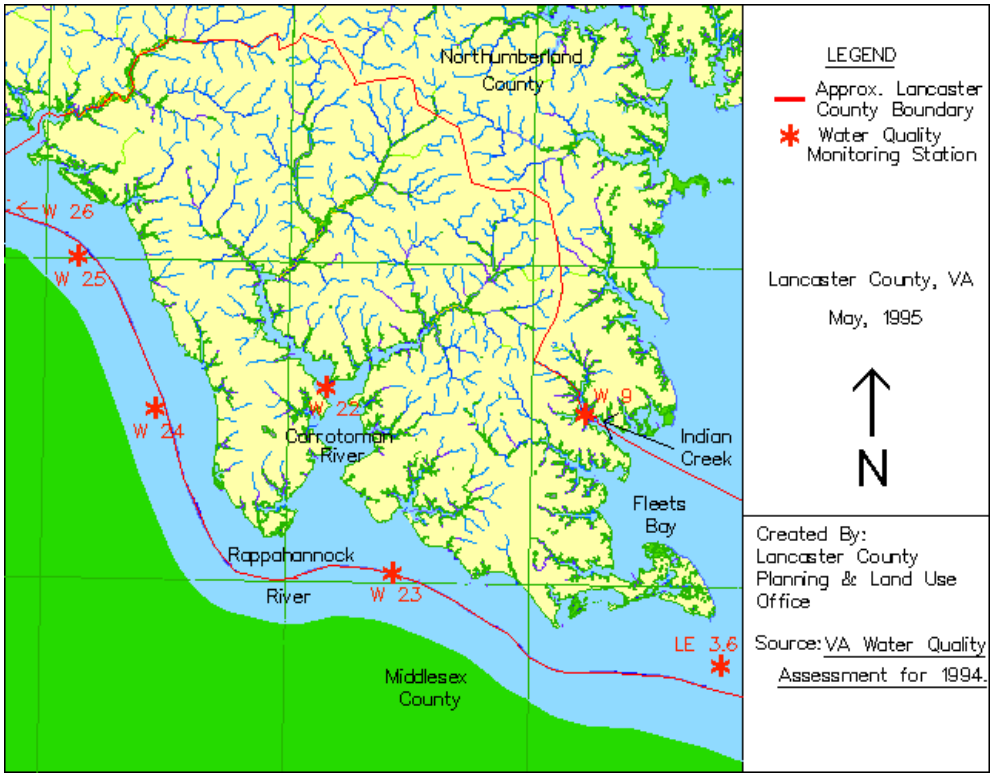
W 26 (Station ID:3-RPP031.57) - This station is located opposite Morattico on the Middlesex County side in the Rappahannock River Basin. This station recorded 0 violations of the Virginia Water Quality Standards. During the reporting time frame, there were 23 samples taken for temperature, 21 samples of dissolved oxygen, 23 for pH, and 0 for coliform bacteria. (p. B-8 of the Appendix, 305 (b) Report to EPA and Congress.)

W 9 (Station ID: 7-IND002.26) - This station is located in Indian Creek opposite Kilmarnock Wharf on the Northumberland County side of the creek in the Chesapeake Bay Basin. This station recorded 0 violations of the Virginia Water Quality Standards. During the reporting time frame, there were 22 samples taken for temperature, 21 samples of dissolved oxygen, 22 for Ph, and 21 for coliform bacteria. However, there was one instance where the test of sediments exceeded standards due to copper (metals) in the creek sediment (p. B-14 of the Appendix, 305 (b) Report to EPA and Congress).

LE 3.6 (Station ID: LE3.6) - This station is located at the mouth of the

Rappahannock River between Windmill and Stingray Points in the Chesapeake Bay Basin and is designated as a Chesapeake Bay Water Quality Monitoring Station. No data could be found to determine water quality for this area.

c. Nonpoint Source Pollution Monitoring (will be addressed below under "Threats to Surface Water Quality" section.)



3. Sensitive Surface Water Features

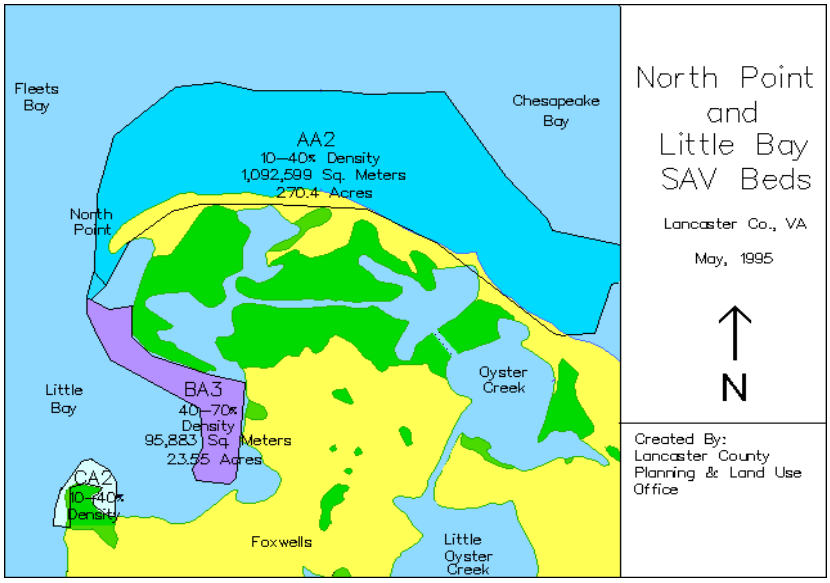
Lancaster County is fortunate to benefit from an abundance of marine resources that are directly related to the quality of its surface water bodies. These natural resources include Submerged Aquatic Vegetation, Wetlands, and Shellfish Grounds. Descriptions of these features, their functions in the man-made and natural environments, and the extent of their presence in Lancaster County are given below.

a. Submerged Aquatic Vegetation

Submerged Aquatic Vegetation (SAV), or sea grass, is a valuable natural marine resource that is found adjacent to the shoreline in many parts of Lancaster County. SAV is important because it provides ideal habitat for blue crabs and juvenile finfish. SAV also acts to provide protection for molting crabs and is a source of food for waterfowl. Lastly, as evidenced by the important role it plays in the marine environment, SAV is also of great value to the County's commercial and recreational fisheries.

According to the 1993 Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay (Virginia Institute of Marine Science, School of Marine

Science; The College of William and Mary), SAV beds in Lancaster County are found in the Corrotoman River, along the north shore of the Rappahannock River from the Corrotoman River to Windmill Point; as well as in Dymer Creek, Indian Creek, Little Bay, and Fleets Bay. Furthermore, this report notes that SAV beds have declined in the area of the Rappahannock River between Carters Creek and the mouth of the Corrotoman River. However, SAV has also slowly expanded in some areas of Lancaster County. One large bed near Windmill Point is cited as having grown from 28 hectares in 1992 to 44 hectares in 1993. (Specific distribution of SAV in the lower part of Lancaster County can be seen in the "Submerged Aquatic Vegetation, 1993 Irvington, Fleets Bay, Wilton, and Deltaville, VA Quadrangles.")



b. Wetlands

Wetlands are defined by the United States Fish and Wildlife Service as "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water" (Pg. 4, Atlas of National Wetlands Inventory Maps of Chesapeake Bay. U.S. Fish and Wildlife Services; September, 1986.). Generally, wetlands can be classified as either tidal or non-tidal. Locally, Lancaster County has approximately 4,504 acres of tidal wetlands and 1,349.26 acres of non-tidal wetlands (Figures were obtained using the Lancaster County Geographic Information System utilizing a digital National Wetland Inventory map layer.)

Wetlands are important natural resources that provide many benefits to the man-made and natural environments. Wetlands provide aesthetic, recreational, and economic benefits to the community. Furthermore, wetlands are spawning and nursery grounds for finfish and shellfish, feeding and wintering sites for migratory waterfowl, nesting habitat for shore birds, and homes to a wide variety of wildlife. Wetlands further serve as important areas for groundwater recharge, flood control, pollution absorption, and retention of sediment from storm water run-off (Pg 1, Atlas of National Wetlands Inventory Maps of Chesapeake Bay.

U.S. Fish and Wildlife Services: September, 1986.).

c. Shellfish Grounds

Lancaster County has a wealth of suitable shellfish grounds in the water adjacent to its shores. Despite dramatic decreases in shellfish populations and catches in the last decade due to the diseases MSX and Dermo, these grounds remain a valuable resource that should be protected. Although it cannot be determined if, or when, shellfish populations will recover from these diseases, the possibility remains that the resource could thrive again or disease resistant varieties of shellfish could be introduced.

4. Threats to Surface Water Quality

a. Role of Soils in Pollution

Pollutants generally affect water quality through two different methods: run-off and leaching. Run-off refers to water that is not absorbed by the soil, but is instead carried off by natural or man-made drainage courses to a surface water body. Leaching refers to water that is absorbed by the soil and percolates into the soil layers underneath. The effect of this type of pollution is usually felt on the groundwater supply. The amount of run-off or leaching in a community is usually dependent on the present land cover. Generally the more heavily an area is developed, the more susceptible the area is to run-off due to increased amounts of impervious land cover such as parking lots, buildings, and roads. The less intensely an area is used, the more the area is prone to leaching because of the extensive pervious groundwater recharge areas such as large tracts of farmland and forest.

Impacts from run-off and leaching are further complicated by the types of soils present in different areas of the County. Highly erodible soils have the potential to become a source of pollution in times of large run-off such as heavy rainstorms and melting periods after ice or snowstorms. This combination of a high amount of run-off and the presence of highly erodible soils can result in a higher concentration of sediments entering the county's surface waters. Furthermore, individual occurrences of pollution through leaching can be worsened through the presence of highly permeable soils. Awareness of these soil properties as they relate to existing and future land uses can help in pinpointing areas currently in need of mitigation efforts, as well planning for the avoidance of further contamination of water resources through improper land use.

Lancaster County Soils that are highly erodible and the percent each soil type comprises of the County's total soils:

1. Caroline very fine sandy loam, sloping eroded (0.17%)

2. Caroline clay loam, sloping, severely eroded (0.05%)
3. Caroline clay loam, strongly sloping, see. eroded (0.18%)
4. Craven silt loam, sloping, eroded (0.02%)

5. Craven clay loam, strongly sloping, severely eroded (0.21%)
6. Kempsville fine sandy loam, sloping, severely eroded (0.09%)
7. Matapeake silt loam, strongly sloping, eroded (<0.01%)
8. Sassafras fine sandy loam, sloping, severely eroded (0.46%)
9. Sassafras fine sandy loam, strongly sloping, eroded (0.07%)
10. Sassafras fine sandy loam, str. sloping, sev. eroded (0.08%)
11. Sloping sandy land (9.26%)
12. Steep sandy land (18.13%)

Lancaster County Soils that are highly permeable and the percent each soil type comprises of the County's total soils:

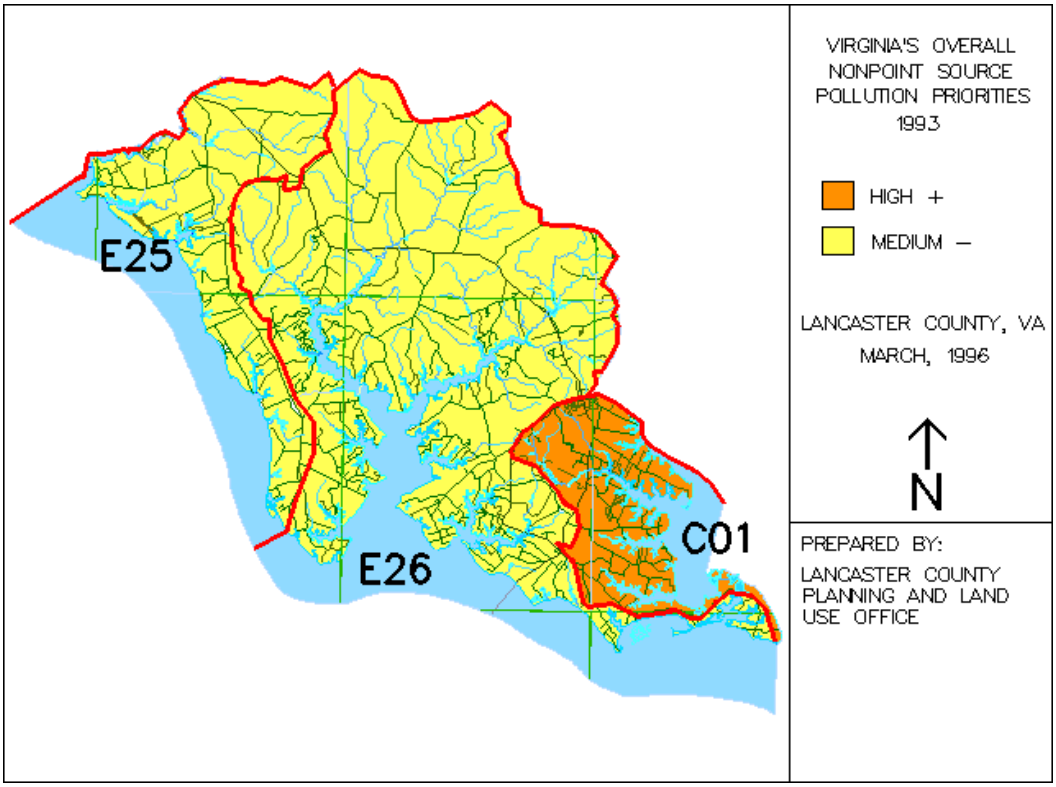
1. Coastal Beach (0.48%)
2. Dragston fine sandy loam (3.19%)
3. Lakeland loamy fine sand, gently sloping (0.61%)
4. Rumford loamy sand, gently sloping (0.16%)
5. Rumford loamy sand, sloping, eroded (0.05%)
6. Sloping sandy land (9.26%)
7. Steep sandy land (18.13%)

b. Sources of Surface Water Pollution

(1) Non-point Source Pollution

One measure of the effect of pollution on the water quality of Lancaster County's surface water is found in the Virginia Non-point Source Pollution Watershed Assessment Report (VA Department of Conservation and Recreation; March, 1993). This report divides the State of Virginia into 491 different watersheds or hydrologic units. A watershed is defined as "a land area drained by a river/stream or system of connecting rivers and streams such that all water within the area flows through a single outlet." There are three state hydrologic units in Lancaster County: E25, E26, and C01. E25 and E26 are part of the Rappahannock River Basin and C01 is part of the Chesapeake Bay Coastal Basin. This report compares water quality of hydrologic units throughout the state in order to prioritize nonpoint source pollution protection efforts.

c. State Hydrologic Units in Lancaster County



(1) A brief summary of watersheds in Lancaster County is given below:

E25 - This watershed is cited as having "significant levels of urban use impacts due to urban erosion and nutrient loading, and the amount of disturbed urban land." However, this watershed is not described as having any significant water quality violations for fecal coliforms or pH levels. Statewide this watershed is given a final non-point source pollution rank of "MEDIUM -", with a rank of "High+" being the highest priority watersheds for state non-point source pollution protection efforts.

E26 - This watershed is not described as having any significant water quality violations due to fecal coliforms or pH level. Additionally, this watershed is not cited for having "significant levels of urban use impacts." Statewide this watershed is given a final nonpoint source pollution rank of "MEDIUM -", with a rank of "High+" being the highest priority watersheds for state non-point source pollution protection efforts.

C01 - This watershed is rated as a "medium priority watershed for agricultural non-point source pollution concerns. Due primarily to existing development, watershed C01 is rated in the top 10% statewide for urban pollution potential." Additionally, the watershed is cited as having a large number of shellfish condemnations because of "urban non-point source influences." However, the watershed was not cited for having any significant violations of state water quality standards. Statewide this watershed is given a final non-point source pollution rank of "High+," with
a rank of "High+" being the highest priority watersheds for state non-point

source pollution protection efforts.

(2) Point Sources/Permitted Discharges

Point source pollution sources are often referred to as the "end of the pipe" type of pollution. This means that the discharge into the water body can be traced to a single, identifiable source. The Federal Water Pollution Control Act requires a uniform permit program nationwide which acts to regulate this type of pollution. In Virginia, the Department of Environmental Quality runs a permitting program named the Virginia Pollutant Discharge Elimination System (VPDES) which carries out the requirements of the federal act. VPDES is a permit program which establishes, on an individual basis, limits on the quantity and/or concentration of pollutants allowed in the discharge.

When a VPDES permit is issued, guidelines are established which discharged effluent is required to meet. Moreover, the owner of the discharging facility is required to monitor the quality of the effluent and report the results of testing to the state. Additionally, the Virginia Department of Health designates condemned shellfish areas around certain point source discharges to act as a buffer zone from the impact of the discharge. In Lancaster County there are currently 10 VPDES, 14 Special Consent Orders (Extensions to VPDES), and 1 VPA permit issued to various businesses throughout the County. The chief industry utilizing these types of permits in Lancaster County is the seafood industry, with resort hotels a distant second.

(3) Septic Systems/Sewage Disposal

Approximately 89% of all private residences in Lancaster County utilize septic systems for sewage disposal purposes. The chart below gives some indication of the actual numbers of septic systems in the County and if they are located in or outside of the three towns.

Septic/Cesspool for Sewage Disposal
Lancaster County, VA - 1990

Towns	534	52% of Housing Units in Towns
County	4,370	89% of Housing Units in County
Total	4,904	Housing Units

Source: 1990 United States Census Statistics

The potential for septic systems causing pollution of surface water bodies can stem from the initial improper siting of the system, or from the failing

of aged or not properly maintained systems. Often septic systems have

been placed in soils that can act to heighten the negative impact of the system. In soils with seasonally high water tables, the water table can rise into the septic systems' drain fields and intermix with the relatively untreated effluent. Furthermore, high water tables can cause pooling of septic effluent on the ground surface. During a rain storm, pooled effluent can then quickly drain into nearby surface water bodies.

Highly permeable soils also can act to increase negative impacts of septic systems. These soils allow septic effluent to percolate more quickly through soils underneath the drain field, while not allowing for proper filtration. If the effluent percolates before it is properly treated then it can become a threat to the ground or surface water that it acts to recharge. The combination of high water tables and highly permeable soils is particularly a problem in densely developed areas close to the county's shoreline. A high number of septic systems in conjunction with poor soil conditions can lead to elevated levels of fecal coliform bacteria in adjacent surface water bodies, which can then result in the condemnation of the area for shell fishing.

d. Potential of Surface Waters for Future Water Supply

Much of the surface water in Lancaster County is tidally influenced and has saline levels too high to be considered as a potential drinking water source. Additionally, in the upper reaches of the creeks where the water is fresh enough to be used for drinking water, there is not enough stream flow to allow for direct intakes from the water body. However, at the headwaters of these creeks there are a number of existing millponds. Furthermore, with improved, higher impoundment structures there is the potential to create larger ponds or reservoirs. The existing millponds, or the potential new ponds, could be possible surface water drinking water sources, subject to the Joint Permit Application review process for activities in the waters and wetlands of the Commonwealth of Virginia.

In 1973, the Northern Neck Planning District Commission conducted a water and sewage facilities plan for the Northern Neck (Water Quality Management Plan - Planning District 17. Northern Neck Planning District Commission and Deward M. Martin and Associates, Inc.; Callao, VA: 1973). This plan recommended several possible impoundment sites for each of the counties of the Northern Neck. In most cases the proposed impoundment sites roughly coincided with existing millpond locations at the headwaters of the creeks. However, the proposed impoundments were usually larger than the existing millponds, with new impoundment structures located a little further downstream than the existing structures. Eight possible impoundment sites and their proposed sizes were identified in Lancaster County. They included:

Reservoir #: LBBI Streams: Balls Branch, Lancaster Creek
The drainage area for this proposed reservoir site is approximately 1,287 acres or two square miles. The proposed reservoir would have a total maximum storage of 1,212 acres. The 1,212 acres would be divided into 483 acres allotted for flood and sediment

volume, 561 acres for water supply volume, and 167 acres for fish and wildlife volume.

The maximum water supply draft from the reservoir would be 0.58 Million Gallons Daily.

Reservoir #: LCMI Streams: Camps Millpond
The drainage area for this proposed reservoir site is approximately 3,944 acres or six square miles. The proposed reservoir would have a total maximum storage of 849 acres. The 849 acres would be divided into 164 acres allotted for flood and sediment volume, 685 acres for water supply volume, and 0 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 1.78 Million Gallons Daily.

Reservoir #: LLBI Streams: Little Branch, Corrotoman River
The drainage area for this proposed reservoir site is approximately 2,694 acres or four square miles. The proposed reservoir would have a total maximum storage of 1,736 acres. The 1,736 acres would be divided into 562 acres allotted for flood and sediment volume, 1,174 acres for water supply volume, and 0 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 1.22 Million Gallons Daily.

Reservoir #: LLB2 Streams: Little Branch, Corrotoman River
The drainage area for this proposed reservoir site is approximately 1,178 acres or two square miles. The proposed reservoir would have a total maximum storage of 1,350 acres. The 1,350 acres would be divided into 442 acres allotted for flood and sediment volume, 792 acres for water supply volume, and 116 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 0.53 Million Gallons Daily.

Reservoir #: LMSI Streams: McMahon Swamp, Corrotoman River
The drainage area for this proposed reservoir site is approximately 3,390 acres or five square miles. The proposed reservoir would have a total maximum storage of 4,693 acres. The 4,693 acres would be divided into 1,271 acres allotted for flood and sediment volume, 1,479 acres for water supply volume, and 1,943 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 1.53 Million Gallons Daily.

Reservoir #: LMS2 Streams: McMahon Swamp, Corrotoman River
The drainage area for this proposed reservoir site is approximately 2,657 acres or four square miles. The proposed reservoir would have a total maximum storage of 2,365 acres. The 2,365 acres would be divided into 996 acres allotted for flood and sediment volume, 1,159 acres for water supply volume, and 210 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 1.20 Million Gallons Daily.

Reservoir #: LCRI Streams: Upper West Branch Corrotoman River
The drainage area for this proposed reservoir site is approximately 5,495 acres or nine square miles. The proposed reservoir would have a total maximum storage of 3,719 acres. The 3,719 acres would be divided into 1,322 acres allotted for flood and sediment volume, 2,397 acres for water supply volume, and 0 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 2.48 Million Gallons Daily.

Reservoir #: LOCI Streams: Quarter Cove
The drainage area for this proposed reservoir site is approximately 3,944 acres or six square miles. The proposed reservoir would have a total maximum storage of 849. The 849 acres would be divided into 164 acres allotted for flood and sediment volume, 685 acres for water supply volume, and 0 acres for fish and wildlife volume. The maximum water supply draft from the reservoir would be 1.78 Million Gallons Daily.

Source: Martin, Clifford, & Associates, NEDCO Report, Volume II, Pg.. VIII-44, VIII-45.

Precise locations and boundaries for these reservoir locations can be viewed in the Future Land Use Map found in Chapter 8.

B. GROUNDWATER

1. Groundwater Structure

As stated previously, Lancaster County residents are 100% dependent on groundwater for their drinking water supplies. Lancaster County's groundwater resources come from an underground system of aquifers that reflect the geology of the Coastal Plain Region of Virginia. Underground, the coastal plain is made up of unconsolidated gravels, sands, silts, and clays in addition to variable amounts of shells. This mixture of deposits rest on an underground rock surface called the basement, which slopes gently eastward. The basement rocks actually come out of the earth's surface at the fall line of the rivers, which is the dividing line between the Piedmont and Coastal Plain Regions of Virginia. As a point of reference the fall line of the Rappahannock River is at Fredericksburg, the fall line of the James River is at Richmond, and the fall line of the Potomac River is at Washington, DC. At the fall line the thickness of the coastal plain sediments is zero; however, going east from the fall line the basement rock slopes down and the coastal plain sediments become thick. By the time the downward slope stops at the coast, the coastal plain sediments are over 6,000 feet thick. Contained in the Coastal Plain sediments are a system of underground aquifers. These aquifers can be pictured as underground rivers that travel through sand. These rivers also come to the surface near the fall line, then they slope downward to the east. At the fall line the aquifers are recharged, meaning this is the point where water enters them. From this point on the aquifers, except for the water table aquifer, are deep below ground. Additionally, each aquifer is separated from those above and below by clay confining beds, from which they get the name confined aquifers. These confining beds act to trap the water in between, allowing water to escape up and down only at very slow rates. The confining beds also act to add pressure to the water, therefore, when the aquifers are tapped by a well the pressure enhances the flow of the water upward.

Throughout the Coastal Plain there is also an unconfined, water table aquifer. The water table aquifer is found between the ground surface and the top of the first confining bed. This aquifer is not pressurized and is the one used by shallow wells. This aquifer is recharged at ground surface level by rainwater and below the ground surface by water

bodies such as creeks and rivers. Because this aquifer is unconfined and recharges from the surface, it is very susceptible to contamination. Anything that permeates the ground surface can quickly reach the water table aquifer.

Wells in Lancaster County tap four underground aquifers. Shallow wells utilize the Columbia and Yorktown-Eastover Aquifers, which are the water table aquifers. Deep wells, or artesians, tap the Chickahominy-Piney Point Aquifer and the deeper Brightest-Upper Potomac Aquifer. Detail on each of these aquifers is given below.

a. Columbia Aquifer (Water Table)

The water table aquifer in the higher elevated parts of the western and central, and throughout the entire eastern section of Lancaster County is actually an aquifer named the Columbia. The Columbia Aquifer is moderately used as a drinking water supply by the residents and businesses utilizing shallow wells in Lancaster County (See Shallow Well Chart on Page 3-15). This aquifer is unconfined and made up of sand and sediment deposits found underground from an elevation approximately at sea level, to about 100 feet above sea level. However, clayey sediments can produce localized confined or semi-confined conditions (Pg. C52, USGS Professional Paper 1404-C).

The saturated thickness of the Columbia Aquifer ranges from 15 feet at the aquifer's western limit to about 80 feet in the southeastern part of the Coastal Plain (Pg. F5, USGS Professional Paper 1404-F). The local recharge area for the Columbia Aquifer is the ground surface of Lancaster County. The major sources of recharge are rain, ice, and snowstorms on the ground level and underwater surface water body flows below the ground surface. Local conditions including topography, drainage patterns, and land cover influence where the most important recharge areas in the county are located. However, because the aquifer recharges primarily from the surface, it is very susceptible to contamination. Septic system discharge, agricultural and lawn fertilizers, leaking underground storage tanks, and improper disposal of hazardous home waste can cause contamination of this aquifer. Contamination in this aquifer also affects lower aquifers, because the Columbia is also a source of recharge for the underlying confined aquifers (Pg. F5, USGS Professional Paper 1404-F).

The groundwater supplies of the Columbia Aquifer usually fluctuate according to the seasons of the year, with lowest supplies present during local drought conditions. Lastly, localized high chloride concentrations in wells utilizing the Columbia are due to local intrusion of water from the Chesapeake Bay and its major estuaries (Pg. 11, USGS WRI Report 92-4175). This condition is reported to be present in shallow wells in some parts of Lancaster County which are very close to large surface water bodies.

b. Yorktown-Eastover (Unconfined, Water Table and Confined)

The Yorktown-Eastover Aquifer is unconfined in its western limits, but becomes

confined as the aquifer slopes eastward (Pg. F7, USGS Professional Paper 1404-F). The western limit of the Yorktown-Eastover is in the western part of Lancaster County. In this part of the County, the Yorktown-Eastover acts as the water table aquifer. This area also serves as the recharge area for the confined part of the aquifer (Pg. F7, USGS Professional Paper 1404-F). The unconfined, water table recharge areas of the Yorktown-Eastover are important because it is where contaminants can quickly reach the aquifer through the ground surface. This is of further concern because the Yorktown-Eastover Aquifer is a primary source of drinking water for the Eastern Shore of Virginia (Pg. C51, USGS Professional Paper 1404-C).

The Yorktown-Eastover Aquifer is not used heavily in Lancaster County (See Shallow Well Chart Below). Use in Lancaster County would be by people with shallow wells in the western part of the County, and with wells reaching 75-85 feet in depth in the eastern parts of the County. Lastly, localized high chloride concentrations in wells utilizing the Yorktown-Eastover, like the Columbia, are due to local intrusion of water from the Chesapeake Bay and its major estuaries. This condition is reported to be present in shallow wells in some parts of Lancaster County which are very close to large surface water bodies.

Dug (Shallow) Well for Source of Water Supply Lancaster County, VA - 1990		
Towns	27	3% of Housing Units in Towns
County	1652	34% of Housing Units in County
Total	1679	28% of all Housing Units
Source: 1990 United States Census		

c. Chickahominy-Piney Point Aquifer (Confined)

This confined aquifer is located approximately 200-425 feet below the ground surface in Lancaster County and averages 50 to 100 feet in thickness throughout its reach, with a maximum thickness of 140 feet in Lancaster County (Pg. C46, USGS Professional Paper 1404-C). The Chickahominy-Piney Point starts at outcrop areas near the major stream valleys in Stafford and King George Counties, on down through Caroline, Hanover, and Henrico Counties, just east of the fall line (Pg. C46, USGS Professional Paper 1404-C). The major recharge area for this aquifer is also found at the outcrop location. Water entering from the recharge area flows down and eastward to reach Lancaster County. Lesser recharge of the aquifer also occurs in smaller amounts from vertical seepage between the confining beds of the other aquifers and along existing well conduits. This aquifer is not as prone to contamination as the water table aquifer due to its limited recharge potential in Lancaster County. Furthermore, supply in this aquifer is not as susceptible to decreases due to local drought conditions.

This aquifer is moderately used as a deep/artesian well supply by many light industrial, small municipal, and domestic users in Lancaster County (See Individual Drilled Well Chart on Page 3-18. Furthermore, the aquifer is thought to be capable of supplying large quantities of water suitable for most uses (Pg. C47, USGS Professional Paper 1404-C). Water in this aquifer contains concentrations of sodium, dissolved solids, and fluoride, which decrease while moving west in the aquifer. Specifically, sodium concentrations exceed 20mg/L throughout most of the aquifer, fluoride concentrations exceed 2mg/L in the south-central part of the aquifer, and concentrations of sulfate, chloride, and dissolved solids exceed the U.S. EPA Secondary Maximum Contaminant Level in the eastern part of the aquifer (Pgs. 13, 14, and 15, USGS WRI Report 92-4175).

d. Brightseat-Upper Potomac Aquifer (Confined)

This aquifer is located approximately 525-725 feet below the ground surface in Lancaster County. The aquifer is actually two aquifers located very close together, and separated by a thin confining bed. The Brightseat is the smaller aquifer and is located above the Upper Potomac Aquifer. The Upper Potomac Aquifer is located further below the surface at depths of 750 feet to 820 feet. These aquifers start from "subsurface pinchouts" east of the fall line and build to almost 400 feet in thickness to the east (Pg. C42, USGS Professional Paper 1404-C). Recharge areas for these aquifers are located at the start of the "pinchouts" east of the fall line. Recharge also occurs in much smaller amounts from vertical seepage between aquifers and along existing well conduits. These aquifers are not as prone to contamination as the water table aquifer due to its limited recharge potential in Lancaster County. Furthermore, supply of these aquifers is not susceptible to decreases due to local drought conditions.

Most deep wells in Lancaster County tap the Brightseat Aquifer, not the Upper-Potomac. Water in the Brightseat Aquifer is of the sodium bicarbonate type in the central part of the aquifer, and becomes of the sodium chloride type when moving east. Additionally, groundwater in this aquifer becomes more mineralized the further one moves east. For Lancaster County this means that certain parts of the county utilizing this aquifer have higher concentrations of sodium, fluoride and chloride in their drinking water. Specifically, dissolved-solid concentrations exceed the 500 mg/L U.S. EPA SMCL in the eastern part of the aquifer, fluoride concentrations exceed the 4mg/L U.S. EPA MCL in the south-central part of the aquifer and the 2mg/L U.S. EPA SMCL in the rest of the aquifer, and chloride concentrations exceed the 250 mg/L U.S. EPA SMCL in the eastern part of the aquifer (Pg. 15, USGS WRI Report 92-4175). Locally, there are elevated concentrations of sodium, fluoride, and chloride in water drawn from this aquifer. These levels are particularly high in areas from White Stone east including Palmer, Foxwells, and Windmill Point. Sodium levels are approximately 230 mg/L in White Stone, 300 mg/L in Palmer, 400 mg/L in Foxwells, and as high as 500 mg/L at Windmill Point.

(1) Effects of Drawdown in the Brightseat-Upper Potomac

The Brightseat-Upper Potomac Aquifers are heavily tapped for deep/artesian well supplies in Lancaster County and regionally (See Individual Drilled Well Chart on Page 3-18). The aquifers are a principal source of groundwater for municipal, industrial, and agricultural use in the York-James, Middle, and Northern Neck Peninsulas of Virginia (Pg. F9, USGS Professional Paper 1404-F). Due to this heavy use there has been some regional drawdown in the aquifer throughout the Coastal Plain Region. Drawdown is caused by the withdrawal of large amounts of groundwater from the confined aquifers. The result of drawdown is that water levels in the confined aquifers have declined and the underground flow of water has changed. These resulting situations could present future problems for Lancaster County deep well users.

Several United States Geological Survey reports have studied the Coastal Plain groundwater aquifers, as well as the effect of drawdown caused by heavy pumping. According to one report, the decline in the level of water in the aquifers has changed the direction of ground-water flow toward the major pumping centers. When considering the Brightseat-Upper Potomac Aquifers, these centers are located near the cities of Franklin, Williamsburg, Suffolk, and Alexandria and the towns of West Point and Smithfield. Total withdrawal from these centers is estimated to have been 65 MGD in 1980. Franklin alone had withdrawals over 40 MGD in 1980 (Pg. F83, USGS Professional Paper 1404-F).

Furthermore, this report states that the heavy withdrawals have increased vertical leakage through confining units, reduced the volume of water stored in the ground-water flow system, increased flow from the water-table aquifer into the confined flow system, and decreased local ground-water discharge to streams and regional discharge to coastal water. Basically the natural balance between recharge and discharge that existed prior to periods of heavy pumping has been disturbed. Areas of heavy pumping now capture a large part of the water previously discharged from the ground-water flow system to surface water, such as the Chesapeake Bay and the Rappahannock River (Pgs. F10, F11, and F12, USGS Professional Paper 1404-F).

For Lancaster County this means that contaminants in the water table aquifer can now more easily reach the confined aquifers. Furthermore, future underground water supplies are decreasing at faster rates than before periods of heavy pumping. Lastly, groundwater supplies which used to travel all the way to the coast to recharge surface water bodies with fresh water get detoured before they reach the surface water. Impacts of this situation on the water quality of the Chesapeake Bay and its tributaries is unknown. (Specific data on water levels in wells monitored in Lancaster and surrounding counties by the United States Geological Survey, as well as a list of major water use areas can be seen in Appendix VII.)

Despite all the problems surrounding regional drawdown, it is believed that ample groundwater supplies exist for the foreseeable future. The Brightseat-Upper Potomac Aquifer is documented as capable of producing large quantities of high-quality water suitable for most uses (Pg. C42, USGS Professional Paper 1404-C).

* Public Supply Well for Source of Water Supply Lancaster County, VA - 1990		
Towns	951	92% of Housing Units in Towns
County	1,200	25% of Housing Units in County
Total	2,151	36% of all Housing Units

* Individual Drilled Well for Source of Water Supply Lancaster County, VA - 1990		
Towns	51	5% of Housing Units in Towns
County	1,982	41% of Housing Units in County
Total	2,033	34% of all Housing Units
Source: 1990 United States Census Statistics		

* The large majority of the wells utilize the Brightseat-Upper Potomac aquifers for groundwater supplies. A smaller but significant number use the Chickahominy-Piney Point Aquifer.

2. Existing And Projected Demand For Groundwater in Lancaster County, VA

In 1990 there were 10,896 people in Lancaster County, including approximately 1,100 people in the Town of Kilmarnock. (1,053 in Lancaster, and 56 in Northumberland) The 1,100 people in Kilmarnock used a total of .129 MGD (million gallons daily) of groundwater in 1990. The 9,769 people in the remainder of Lancaster County used a total of .88 MGD of groundwater in 1990. This comes to a County-wide total of 1.01 MGD for 1990. These figures were approximating a 117 gallons used per customer per day (GPCD) in the Town of Kilmarnock and 90 gallons used per customer per day in the remainder of Lancaster County. These averages were obtained from the 1988 Rappahannock Water Supply Plan prepared by the State Water Control Board. These figures can further be used to predict future demand for groundwater in Lancaster County.

First, recent population projections were obtained for Lancaster County from the Virginia Employment Commission (VA Population Projections, 2010. VEC, June 1993). The projected annualized growth rate for the County was then applied to the Town's 1990 population to calculate projections. Lastly, the previous water use average for each customer per day was multiplied by the appropriate population for the Town or County to calculated projected groundwater demand. This is detailed in the following chart.

Year	Town Population	Town GPCD	Town MGD	County Population	County GPCD	County MGD	Total Population	Total MGD
1990	1,100	117	.129	9,796	90	.88	10,896	1.01
1995	1,141	117	.133	10,162	90	.91	11,303	1.04
2000	1,183	117	.138	10,508	90	.95	11,691	1.09
2010	1,250	117	.146	11,140	90	1.00	12,390	1.15

As is evidenced in the above chart, Lancaster County's projected groundwater supply needs are not expected to grow significantly. This projection would be in line with the 1988 Rappahannock Water Supply Plan which stated that the present groundwater system should be adequate to meet the needs of Kilmarnock's water supply through the 50-year planning period. These projections would indicate that despite the negative impacts of drawdown, the amount of the water supply is not the immediate problem. Instead the problems with the quality of the supply, as discussed under the individual aquifer sections, appear to be of more immediate concern.

3. Threats to Groundwater Supply

a. Septic Systems/Sewage Disposal

As discussed previously in the "Surface Water Section," individual homeowners sewage disposal means can act to negatively impact groundwater supplies. The aquifers most susceptible to contamination from individual sewage disposal systems are the Columbia and the unconfined water table part of the Yorktown-Eastover. Localized soil conditions such as high water tables and highly permeable soils in conjunction with large concentrations of septic systems can threaten the quality of the water table aquifers. The charts below detail the number of housing units in Lancaster County utilizing septic systems for sewage disposal, as well as the number of housing units lacking complete plumbing and kitchen facilities.

Septic/Cesspool for Sewage Disposal, Lancaster County, VA - 1990		
Towns	534	52% of Housing Units in Towns
County	4,370	89% of Housing Units in County
Total	4,904	83% of all Housing Units

Housing Units Lacking Complete Plumbing Facilities Lancaster County, VA - 1990		
Towns	8	< 1% of Housing Units in Towns
County	324	7% of Housing Units in County
Total	332	6% of all Housing Units
Housing Units Lacking Complete Kitchen Facilities, Lancaster County, VA - 1990		
Towns	6	< 1% of Housing Units in Towns
County	201	4% of Housing Units in County
Total	207	3.5% of all Housing Units
Source: 1990 United States Census Statistics		

b. Underground Storage Tanks

According to the Department of Environmental Quality's Underground Storage Tank database there are approximately 326 regulated underground storage tanks in Lancaster County (Local Inventory of Regulated Underground Storage Tanks can be viewed at the Lancaster County Planning and Land Use Office). Additionally, many people in the county have unregulated storage tanks which contain fuel for the home heating source or their personal vehicles. These underground storage tanks can be a possible source of contamination for groundwater in Lancaster County.

Regulated storage tanks in the county are all tanks over 110 gallons, except for residential/non-commercial tanks less than 1,100 gallons, farm tanks less than 1,100 gallons, and residential/commercial heating fuel tanks less than 5,000 gallons. Therefore, regulated tanks are generally the tanks found at most gas stations, convenience stores, and automobile distributors in the county. Current state regulations have strict requirements for the operation of regulated underground storage tanks. First, these tanks must be protected from corrosion if they are to be placed underground. Second, owners and operators of new and existing tanks must provide a method, or combination of methods for release detection. Additionally, these tanks are required to be monitored periodically by the owners for leaks. Lastly, the owner and operator must report, investigate, and clean up any spills and overfills in accordance with state regulations.

Residential underground storage tanks are not regulated by the Department of Environmental Quality. Most leaks are discovered and taken care of by the owners of the tanks. Information available from local oil companies suggests that problems with leaks are only found in areas with low groundwater tables. In areas with high water tables, water leaks into leaking tanks instead of fuel leaking out. Leaks in these cases will often be detected when water levels in the tank cause the
owner's furnace or heating source not to light. However, in areas with low water

tables fuel will often leak out and down when a leak occurs. Leaks in these cases will be detected only by noticing a drop in tank levels, or an increase in the usage of the fuel. The chart below indicates the number of housing units in the county which utilize fuel oil, kerosene, propane, etc. for the home heating fuel. It is assumed that these individual heating supplies are stored in either above or underground storage tanks. However, the percentage of these tanks located underground is undetermined.

Fuel Oil, Kerosene, etc., for House Heating Fuel, Lancaster County, VA - 1990		
Towns	402	46.5% of Housing Units in Towns
County	1,491	40.3% of Housing Units in County
Total	1,893	41.5% of all Housing Units
Source: 1990 United States Census Statistics.		

c. Uncapped/Abandoned Wells

Uncapped abandoned wells are potential sources for groundwater contamination. These wells, particularly shallow/dug wells, act as direct conduits to the groundwater supply. Disposal of waste into these wells can quickly lead to contamination. Furthermore, abandoned deep wells provide direct access to lower confined aquifers that are usually somewhat protected from vertical leakage. Census figures for Lancaster County indicate that there are possibly several hundred of these wells in the county.

d. Improper Disposal of Household Hazardous Waste

Due to tightened regulations and prohibitive costs, many rural counties no longer operate their own landfills to dispose of solid waste. In the Northern Neck each of the four counties have switched to waste transfer types of waste collection and disposal. In Lancaster County, waste and recyclable material are collected at three transfer sites. Waste collected at these sites is then carried by a waste carrier to a large regional landfill in King & Queen County. Furthermore, marketable recyclable materials such as cardboard, paper, aluminum, and glass collected at
these sites are sold by the county to generate revenue to support the costs of operating the collection centers.

However, due to limitations on the type of waste accepted by the regional landfill and the high costs of collection and proper disposal of household hazardous waste, Lancaster County has no system in place for citizens to dispose of this type of waste. Household hazardous waste can include used motor oil, paint thinners, solvents, antifreeze, etc. Therefore, limited options can lead homeowners to choose improper means for disposing of this type of waste, which in turn becomes a threat to groundwater supplies.

II. ASSESSMENT OF EXISTING CONDITIONS

A. SURFACE WATER

Lancaster County is fortunate to have large areas of surface water within its boundaries. Overall, the condition of these surface waters is good; however, there are some areas for concern. Non-point source pollution has caused some degradation of water quality in the E25 (Corrotoman River) and C01 (Chesapeake Bay) watersheds. The E25 watershed was cited as having significant levels of urban use impacts due to urban erosion and nutrient loadings, and the amount of disturbed land. This type of pollution would be attributed to new home or business construction, particularly on the water. The C01 watershed was cited as having a large number of shellfish condemnations due to urban non-point source influences. This type of pollution would be attributed to high densities of septic systems, or a number of failing septic systems located close to surface water. The C01 watershed also was negatively impacted from agricultural non-point source pollution. However, despite being mentioned for these specific non-point source pollution impacts, none of the three watersheds were cited as having violations of state water quality standards.

Lancaster County's surface water resources also have potential, although limited, for use as a future potable water supply. In the County, there are no smaller fresh water streams that have suitable flow to allow for raw intake for drinking water purposes. Furthermore, saline conditions in the larger tidal portions of the County's surface water bodies would make them unsuitable as a supply for drinking water. However, the County does have a large number of existing millponds, as well as other possible locations for impoundment of fresh surface water supplies.

The existing millponds already serve an important function, since they act as areas of recharge for water table aquifer. Furthermore, the existing millponds are generally located at the headwaters of streams or creeks, and many have sparsely populated areas surrounding them. With enlarged impoundment structures, these millponds could be potential surface water supplies for drinking water. Lastly, all the millponds are located upstream of permitted discharges. This situation would prevent discharges from affecting millpond or reservoir waters.

B. GROUNDWATER

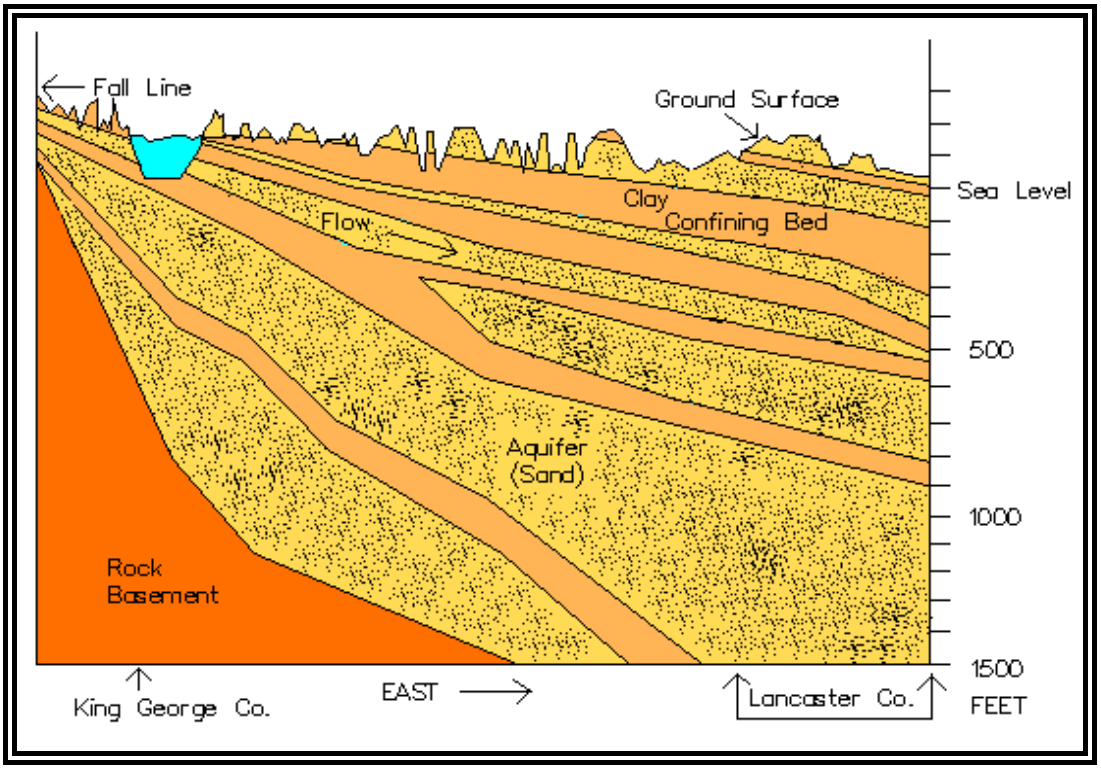
Lancaster County's citizens get their water from four aquifers; the Columbia, the Yorktown-Eastover, the Chickahominy-Piney Point, and the Brightseat/Upper Potomac. The Chickahominy-Piney Point and the Brightseat/Upper Potomac are the deeper, confined aquifers. The two deeper confined aquifers also supply other regions of Virginia with water, as well as parts of Maryland. Quality problems exist in the Chickahominy-Piney Point and Brightseat-Upper Potomac aquifers, mainly due to elevated levels of chloride, sodium, and fluoride. Levels of sodium and fluoride are of particular concern in Lancaster County. Sodium levels are elevated near White Stone and get higher going towards Windmill Point. Patterns of fluoride levels are more random, but tend to be high throughout the County.

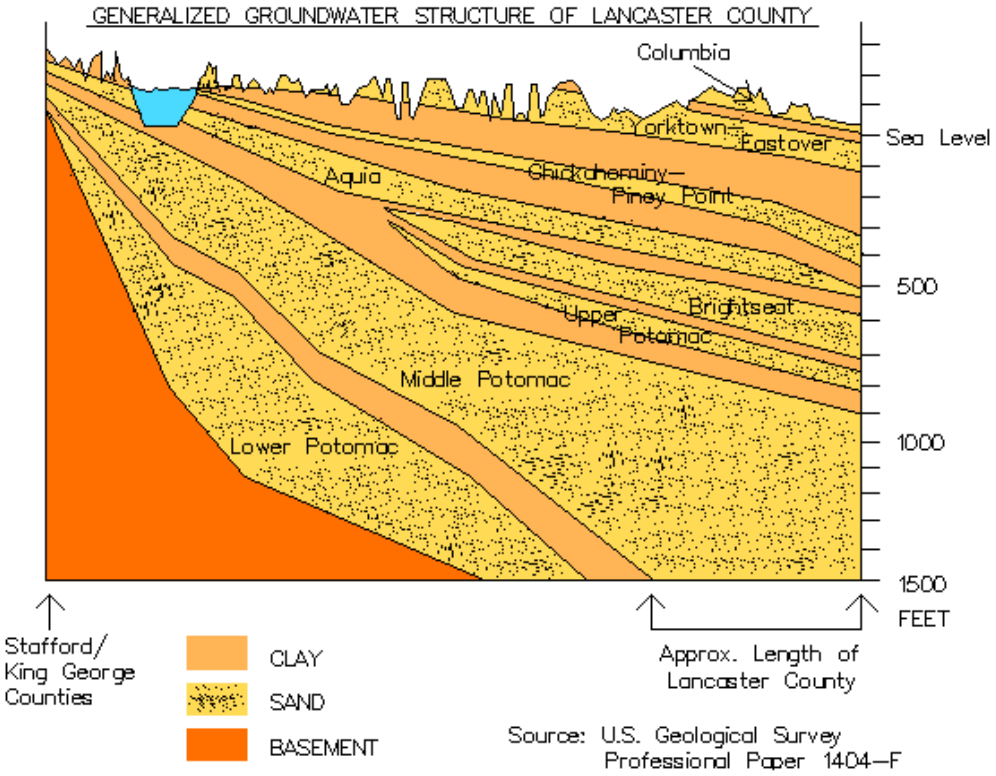
Each of the four aquifers has a particular recharge area. The Columbia Aquifer recharges

from the ground surface in Lancaster County. The County has some influence through land use controls on protecting these areas. The Yorktown-Eastover Aquifer recharges at the outcrop of this aquifer in the western part of Lancaster County. Again, the County has some control over the protection of these areas through land use ordinances. This area is of particular importance because the Yorktown-Eastover Aquifer is the primary supply of drinking water for the Eastern Shore of Virginia. Lastly, the two deeper aquifers, the Chickahominy-Piney Point and the Brightseat-Upper Potomac, primarily recharge at their outcrop areas just east of the fall line. They also recharge to a lesser degree through vertical leakage from the water table aquifers. However, the outcrop recharge areas are located near Westmoreland, King George, and Stafford Counties, and the City of Fredericksburg. The Groundwater Management Study Committee, under the direction of the Northern Neck Planning District is developing methods to protect the recharge areas.

Locally, Lancaster County can act to protect the two water table aquifers. The Columbia is the principal water table aquifer, and the Yorktown-Eastover is the secondary aquifer. The main users of the water table aquifers are owners of shallow wells. The water table aquifers are the most susceptible to pollution, and the recharge area is the land above the aquifers in Lancaster County. Direct threats include septic systems, underground storage tanks, improper disposal of hazardous home waste (oil, gas, etc.), and abandoned, uncapped wells. Additionally, recharge areas can be affected by large areas of impervious cover, local drainage patterns, vegetation, and drought conditions. Lastly, the highest concentrations of shallow well, water table aquifer users are most likely found in the older developed areas of the county.

On the surface there appears to be an adequate supply of groundwater for the future. However, recent studies conclude that regional drawdowns due to heavy pumping of deeper, confined aquifers should cause concern and warrant further study.


Fall Line
Ground Surface
Sea Level
Clay
Confining Bed
Flow
500
Aquifer
(Sand)
1000
Rock
Basement
1500
FEET
King George Co.
EAST
Lancaster Co.


GENERALIZED GROUNDWATER STRUCTURE OF LANCASTER COUNTY
Columbia
Yorktown
Eastover
Sea Level
Aquia
Chickahominy
Piney Point
500
Brightseat
Upper
Potomac
Middle Potomac
Lower Potomac
1000
1500
FEET
Stafford/
King George
Counties
Approx. Length of
Lancaster County
CLAY
SAND
BASEMENT
Source: U.S. Geological Survey
Professional Paper 1404-F

III. POTABLE WATER SUPPLY PLAN

A. GROUNDWATER

1. Water Table Aquifers

In Lancaster County, the water table aquifers are those most susceptible to contamination. Failing septic systems, agricultural fertilizers, hazardous home wastes, etc. can act to pollute water table aquifer resources. Furthermore, no regular water quality testing is done on these shallow wells to determine present areas of contamination. Therefore, it is strongly recommended that a parcel specific inventory be taken of homeowners utilizing shallow wells for their drinking water supply. After the inventory is completed, parcels with shallow wells in high septic system and agricultural areas will be targeted for water sampling. Available outside resources for water quality testing will be explored and pursued. When funds are obtained, water samples will be taken to see if these shallow wells are contaminated by fecal coliform, organic and inorganic chemicals, and nitrates or some other foreign matter. Well samples determine contamination of water based on MCL's, as specified in the Waterworks Regulation. Areas with large numbers of contaminated wells will be targeted for local water system improvements.

If there are existing clusters of contaminated wells, it is recommended that outside funds again be pursued for improvements to these wells. Specifically, if there are enough affected shallow wells in an area, the possibility of drilling a shared artesian well should be explored. After the well is in place, houses that were previously on shallow wells should be hooked up to the new deep well. The contaminated shallow wells would then be permanently abandoned in accordance with the Waterworks Regulations to prevent them from becoming new sources of groundwater contamination.

It is further recommended that as these new community systems are established, care be taken to keep the total number of hook-ups to each system to a maximum of 10. The reason is that at 15 hook-ups a well becomes an official public supply well which must be monitored and regulated by the State Department of Environmental Quality (DEQ). Public Supply wells must be regularly tested with samples submitted to DEQ. The result is that the well requires careful monitoring and costs more money to operate due to required sampling. Keeping the number of hook-ups below 10 will keep the new well from becoming designated public supply system, while still leaving a small number of hook-ups available for future development. *(Recommend deleting this entire paragraph since the recommendations made are not sound)*

Furthermore, it is recommended that a blanket well user agreement be established for users wanting to switch to the new well. This agreement will be a legally binding document that each homeowner signs. The agreement will assure that homeowners are fully responsible for their fair share of maintenance or repair costs for the new well system. This will hopefully reduce any future disagreements over who is financially responsible for any well maintenance or repairs.

2. Abandoned Wells

As part of the effort to control threats to the county's groundwater supply, it is recommended that the county undertake a parcel specific inventory of all abandoned wells in the county. After wells are identified an informative mailing will be prepared to send to each property owner with an abandoned well. The mailing will caution owners to protect the well area and not to use it for disposal of solid or liquid waste. Furthermore, it will ask the owners if they would be interested in participating in a countywide permanent well abandonment.

The abandoned well-capping project would utilize available outside funding offered for protection of groundwater supplies. The county would explore sources of such funding and apply for any available amounts.

3. Household Hazardous Waste Collection Day

To provide further protection to the County's groundwater resources it is recommended that Lancaster County establish a semi-annual Household Hazardous Waste Collection Day. This event could be held at the existing solid waste refuse sites. To sponsor such an event, the County would have to hire a certified waste disposal contractor who would have proper authorization to handle and dispose of this type of waste. The event would be widely marketed to the public and on this particular day, Lancaster County residents would be allowed to properly dispose of household hazardous waste. This type of event is offered by other localities and provides an alternative disposal option for residents with this type of waste.

4. Groundwater Management District

As a way to gain influence over the protection of groundwater resources found outside the County's boundaries, it is recommended that Lancaster County support any future proposals in the region for the creation of a State Groundwater Management District. Groundwater Management Districts are found in other areas of the state such as Hampton Roads and the City of Richmond. However, there is presently no such District to coordinate management and protection of groundwater resources in the Middle Peninsula and the Northern Neck. Participation in a Groundwater Management District would enable Lancaster County to expand its ability to protect the supply and quality of groundwater resources.

5. Drilling Test Wells

To expand existing knowledge of the groundwater resources of Lancaster County and the Northern Neck, it is proposed that the County endorse previous recommendations made by the Department of Environmental Quality (then the State Water Control Board) to establish monitoring wells in Lancaster County and the Northern Neck. Specifically, it is recommended that a monitoring well be developed to track the possible inland migration

of elevated sodium, chloride, and fluoride levels in the White Stone, Palmer, Foxwells, Windmill Point area. Understanding water quality problems in the southeastern part of the County is vital to assure protection of less affected supplies located nearby in the more densely populated areas in and around Kilmarnock.

6. Regional Water System Plan

To prepare for the coordination and efficient use of the future water supply in Lancaster County, it is recommended that the County support the preparation of a regional water system plan. The State Water Control Board made the original proposal for such a plan in the 1988 Rappahannock Water Supply Plan. The goal was to develop a plan that would encompass the County as well as the Towns of Irvington, Kilmarnock, and White Stone. The plan would emphasize the cost savings of using a coordinated, regional approach to address the future water supply needs, and water quality problems of Lancaster County. This plan could also provide the opportunity to explore possible water impoundment sites for future potable surface water supplies.

B. SURFACE WATER

1. Inventory Septic Systems

As part of the effort to assure continued protection of Lancaster County's Surface and Groundwater Resources, it is proposed that the County inventory and map existing septic systems in the County. This effort would help to pinpoint high concentrations of septic systems in the County, which could act cumulatively to deteriorate the quality of Lancaster's surface and groundwater supplies. Information obtained from this inventory would be valuable in developing a future land use map for Lancaster County. Additionally, once compiled this information would aid in any future efforts to identify and prioritize areas for efficient placement of a wastewater treatment plant.

2. Identify Possible Impoundment Areas

This recommendation can be carried out in conjunction with the proposal to support creation of a Regional Water System Plan.

3. Continue Present Enforcement Levels

To assure continued protection of the quality of Lancaster County's surface water bodies, it is recommended that the County continue its present, active enforcement of the Chesapeake Bay Preservation Act and the Erosion and Sediment Control Acts.

IV. GOALS AND OBJECTIVES FOR LANCASTER COUNTY POTABLE WATER SUPPLY PLAN

GOAL #1: **Protect and improve quality of surface waters of Lancaster County to assure their continued benefit to the economy, recreation, and health of the County.**

Objective: Continue strict enforcement of the Chesapeake Bay Preservation Act and Erosion and Sediment Control Act Regulations to assure protection of the water quality of the Chesapeake Bay and its tributaries.

Objective: Explore possible water impoundment areas presented in plan for Lancaster County.

Objective: Support strengthened county ordinances to assure protection of proposed impoundment areas.

GOAL #2: **Develop methods to prevent groundwater pollution in order to protect the supply of groundwater in Lancaster County and to assure that an adequate future supply exists for the continued growth of the County.**

Objective: Organize a hazardous home waste collection day to give residents an opportunity to safely dispose of their waste.

Objective: Inventory and map uncapped, inactive wells in the county and identify procedures to encourage property owners to cap off wells.

Objective: Seek state and federal funding to initiate an Inactive Well Capping Project.

Objective: Develop a method of collecting waste oil in the county to give residents a safe disposal option.

GOAL #3: **Develop methods to improve and protect groundwater quality in Lancaster County to assure the continued safe health of the local people and the economy.**

Objective: Work in coordination with existing community organizations and the health department in efficiently utilizing existing local resources to improve drinking water quality.

Objective: Inventory and map active shallow wells in the county to lay groundwork for identification of concentrations of contaminated shallow wells and, if feasible, prioritize for upgrading to small community deep well systems.

Objective: Identify possible funding for community well improvements.

Objective: Strongly support Department of Environmental Quality proposals to drill

test wells in the eastern half of the county to monitor water quality problems. (Track inland movement of dissolved solids; chloride, sodium, and fluoride in groundwater aquifers.)

Objective: Support future regional efforts to establish a groundwater management district for the Northern Neck and Middle Peninsula areas of Virginia.

Objective: Support preparation of a regional water system plan for the southeastern part of Lancaster County. The plan would encompass the county, as well as the towns of Irvington, Kilmarnock, and White Stone. The plan would emphasize cost savings of using a coordinated, regional approach to address future water supply.

GLOSSARY OF TERMS

Terms and measurements used to further understanding of groundwater quality descriptions are listed and detailed. They have been obtained from the following United States Geological Survey Report:

Water-Resources Investigations Report 92-4175, "Quality of Groundwater in the Coastal Plain Physiographic Province of Virginia." Focazio, Michael J.; Speiran, Gary K.; and Rowan, M. Eileen; U.S. Geological Survey; Richmond, VA: 1993.

Chloride - The U.S. EPA has established a SMCL for chloride of 250 mg/L. (U.S. Environmental Protection Agency, 1990c;) Furthermore, the State of Virginia maintains an antidegradation standard for chloride in groundwater in the Coastal Plain of 50 mg/L (Commonwealth of Virginia, 1988)

Dissolved Solids - This refers to the measure of the concentration of all dissolved material in the water. The U.S. EPA SMCL for dissolved solids is 500 mg.L (U.S. EPA, 1990c). The State of Virginia's antidegradation standard for dissolved solids in groundwater in the Coastal Plain is 1,000 mg/L. (Commonwealth of Virginia, 1988)

Fluoride - The U.S. EPA has established both an MCL of 4.0 mg/L and an SMCL of 2.0 mg/L for fluoride. The State of Virginia enforces a standard of 1.8 mg/L. (Commonwealth of Virginia, 1982)

MCL - This refers to Maximum Contaminant Levels, which is a U.S. Environmental Protection Agency (1990a) designation. Reported MCL's are set for health concerns. This is the maximum permissible level of a contaminant in water that is delivered to any user of a public-water system. These levels are enforceable.

SMCL - This refers to Secondary Maximum Contaminant Levels, which is a U.S. Environmental Protection Agency (1990a) designation. Reported SMCL's are set for aesthetics (such as taste or odor) or for limits on properties that affect use of the water (such as chemical aggressiveness, or potential for the water to deposit solid chemicals). These levels are not enforceable.

Sodium - Presently, there are no Federal drinking water regulations concerning sodium; however, the State of Virginia maintains an antidegradation standard for sodium in groundwater in the Coastal Plain of 100 mg/L. The State also advises that persons on sodium-restricted diets avoid drinking water with sodium concentrations greater than 20mg/L, if the restriction is severe, and 270 mg/L, if moderate.