

APPOMATTOX RIVER CORRIDOR STUDY

PHASE III

WATER QUALITY

**Prepared by the Crater Planning District Commission with assistance from the
Crater Coastal Resource Management Task Force**

September, 1995



This report was funded, in part, by the Dept. of Environmental Quality's Coastal Resources Management Program through Grant # NA47OZ0287-01 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended.

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Rec'd. by Dept. of
Environmental Quality

NOV 16 1995

Public & Inter-
governmental Affairs

I. INTRODUCTION

The Appomattox River is a major tributary of the James River. It flows in an easterly direction across the piedmont and coastal plain of south central Virginia between Appomattox Courthouse and its confluence with the James River in Hopewell. The River is an important regional resource that is unique and irreplaceable. The portion of the River in the Crater Planning District meanders through six jurisdictions: the Counties of Chesterfield, Dinwiddie, and Prince George, and the Cities of Colonial Heights, Hopewell and Petersburg, and is a valuable resource for commerce, industry, farming, fishing, and recreation. (See map 1).

As more growth occurs, more pressure is being placed on the Appomattox River and its adjacent lands. Competing uses must find ways to survive compatibly, without significantly depleting the resources available.

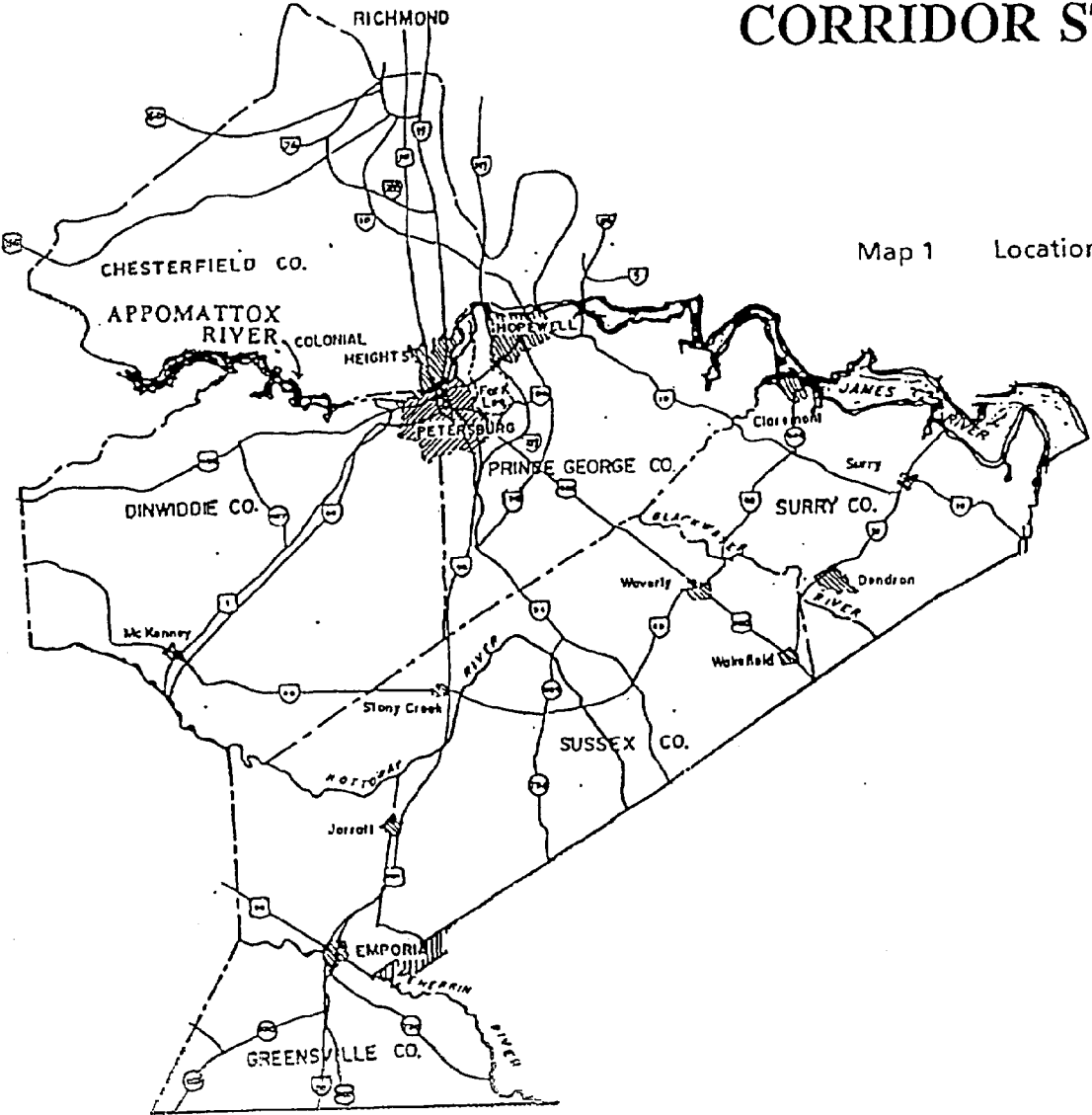
A primary problem with providing a regional perspective has been the lack of a single reliable source of information about the natural, scenic, historic, and man-made features of the Appomattox River. Historically, the River has been the boundary for local planning and decision-making.

The purpose of this corridor study is to help decision-makers understand the complex nature of managing the Appomattox River, and find innovative solutions to balance competing interests while protecting valuable resources. This task is envisioned as the beginning of a corridor effort to establish a regional data base for the purpose of improved coastal planning.

Phase I of the corridor study, completed in 1993, inventoried recreation and riverfront features, such as riverfront configuration, parks and recreation, scenic and cultural areas, as well as wildlife and natural areas. A total of twenty-three existing and potential public access sites were identified. The second phase of the study examined existing and future land use information, zoning, ownership patterns, water and sewer utilities, as well as soils and mineral resources within the corridor. It was completed in 1994.

The third phase will address water quality issues as they relate to the study corridor. This includes local water quality policies, recent water quality improvement efforts, and state and federal water quality regulations and programs.

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Map 1 Location Map



II. EXISTING WATER QUALITY

Water quality is a reflection of a body of water's composition as it is affected by natural processes and human activity. According to the latest water quality assessment reported by the Virginia Department of Environmental Quality (VDEQ) in 1994, the water quality of a section of the Appomattox River between Lake Chesdin and its confluence with the James is generally good.

Virginia's Water Quality Standards

Virginia's water quality standards establish a definition of acceptable ambient quality. Statewide standards are based on criteria to support recreational use, propagation of aquatic life, and protection of human health. The standards serve as a benchmark for water quality monitoring and for the regulation of discharges. All dischargers of wastewater into the Appomattox River must receive a permit which requires a certain minimum level of treatment. If the Virginia Department of Environmental Quality determines that such a treatment level is insufficient to meet the water quality standards, more stringent treatment is required.

As of October 1990, the surface water standards are a combination of (a) narrative statements (concerning general requirements, pollutant mixing zones, anti-degradation of high quality waters, and stream flow); (b) statewide numeric standards for dissolved oxygen, pH, and temperature, (c) numeric standards for bacteria and for several parameters that are applied to surface sources of public water supplies on a site-specific basis; and (d) non-mandatory water quality criteria for additional parameters. The standards are applied to specific river basins, subbasins, and stream sections.

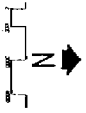
Again, according to the Virginia Water Quality Assessment Report for 1994, the surface water quality of the Appomattox River basin meets the standards of the 1972 Clean Water Act.

Water Quality Monitoring

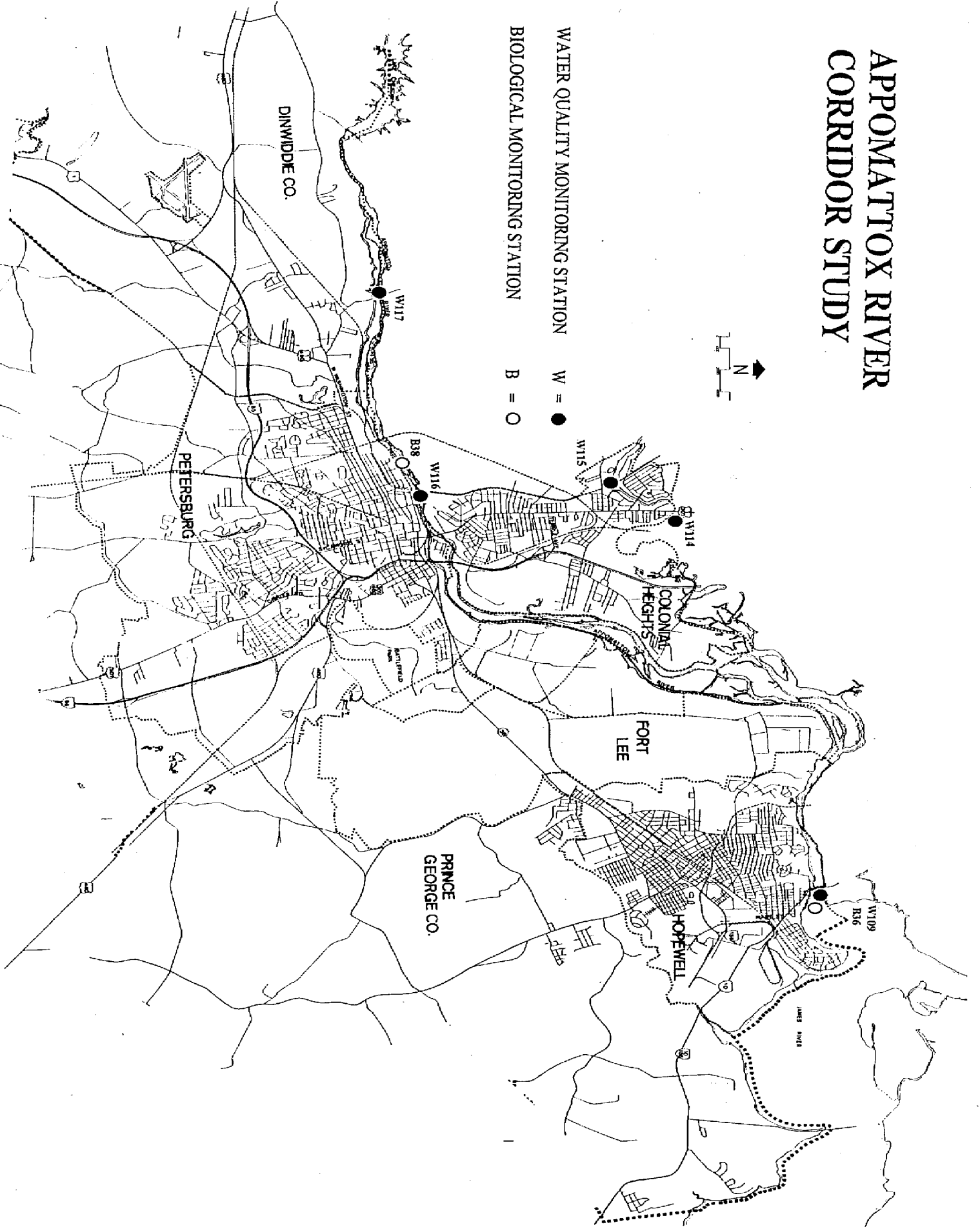
The key to effective implementation of the standards is an effective monitoring program. In the Appomattox River Corridor the VDEQ maintains five fixed water quality monitoring stations including one "core" station at which fish tissue and sediments are monitored, and two biological stations (See map 2). The water quality stations monitor up to 28 different parameters at variable frequencies ranging from monthly to annually.

The fish tissue monitoring program provides biennial sampling of predatory and bottom feeding fish tissue, and analysis of detectable concentrations of 14 different toxic metals and pesticides.

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WATER QUALITY MONITORING STATION W = ●
BIOLOGICAL MONITORING STATION B = ○



Biological monitoring, conducted semiannually in the study corridor, examines benthic macro-invertebrate communities as an indicator of water quality. Evaluation of the communities is based on species type, diversity, and density, and provides a qualitative water quality rating of six categories ranging from "good" to "fair" to "poor" to "no aquatic life."

Table 1 presents the water quality data as monitored in the Appomattox River.

Small quantities of toxic chemicals called PCBs were found in the sediment near the City of Hopewell (River mile 0.0 to River mile 6.0). The source of the toxicant is unknown. VDEQ does not consider this segment's water quality to be impaired because the quantity of pollutants found in the River does not exceed the state water quality minimum standards.

One case each of fecal coliform bacteria was found at three monitoring stations. These pollutants are commonly found in the storm water which carries manure, oil and other waste associated with farms, streets and yards. The presence of fecal coliform bacteria does not mean pathogens are present. It does mean that contamination by warm blooded animals exists and that there is a potential for pathogen contamination. Only two or more samples collected within a 30-day period that exceed state minimum standards is considered a violation of the state's water quality standards. Since only one sample failed to meet the standards, the water quality in the Appomattox River is considered generally good.

Table 1

Monitoring Stations in the Appomattox River Corridor and Water Column Data

Map Key	Station ID	River Name	Station Description	Type	T E M	D O	ph	CB OA CC IT
W 109	2-APP001.53	Appomattox River	BUOY 8 (City of Hopewell)	a,c	0/29	0/29	0/27	1/20
W 114	2-SFT004.92	Swift Creek	Route 1 Bridge (Colonial Heights)	a	0/8	0/8	0/8	0/5
W 115	2-OTC002.49	Old Town Creek	Route 1-301 Bridge (Colonial Heights)	a	0/8	0/8	2/8	1/5
W 116	2-APP012.79	Appomattox River	Route 36 Bridge (Petersburg)	a	0/24	0/24	0/24	1/18
W 117	2-APP016.38	Appomattox River	Route 600 Bridge (Chesterfield Co.)	a	---	---	---	---
B. 36	2-APP001.53	Appomattox	BUOY 8 (Hopewell)	b	---	---	---	---
B. 38	2-APP013.00	Appomattox	0.2 mi. upstream of Route 36 Bridge (Petersburg)	b	Not Impaired	---	---	---

W Water Quality Monitoring Station
 B Biological Monitoring Station
 a Ambient
 b Biological
 c Core (Fish Tissue)

III. WATER QUALITY POLICIES

There are two over-arching policy statements that impact upon all water quality issues within the Appomattox River Corridor. They are (1) the agreement between the Appomattox River Water Authority (ARWA) and the City of Hopewell on water flow and (2) the Richmond-Crater Interim Water Quality Management Plan (R-CWQMP) on setting the wasteload allocation process for the Appomattox River.

1. The Appomattox River Water Flow Agreement

To ensure enough water for wasteload assimilation for the Petersburg Wastewater Treatment Plant and an adequate supply of water for the City of Hopewell, a resolution was signed between the Appomattox River Water Authority and the City of Hopewell in April, 1993. The resolution follows:

"... the Authority agrees that any dam on the Appomattox River built or operated by it or under its authority shall be operated in accordance with the following terms and conditions:

(1) On any calendar day when the average daily water flow of the Appomattox River into the upstream end of the lake created by the dam is 100 million gallons or more, the amount of water discharged into the Appomattox River on the downstream side of the dam during the next calendar day shall be no less than 100 million gallons.

"Average daily flow" or "average daily water flow" as used in this agreement shall mean the number of gallons of water resulting from dividing by thirty on every calendar day the total gallons of water flow of the preceding thirty consecutive calendar days.

"Water discharged into the Appomattox River on the downstream side of the dam," so used in this agreement, is defined as follows:

(a) All water pumped from the lake by the Authority which can reasonably be expected to find its way back to the Appomattox River below the dam, and

(b) The water overflowing or released past the dam. The quantity of water described in subparagraph (a) shall be determined by the pumping records of the Authority and the quantity of the water described in subparagraph (b) by suitable gauging facilities installed at or immediately below the dam and maintained by the Authority.

(2) On any calendar day when the average daily flow from the Appomattox River into the lake is less than 100 million gallons, then the water discharged into the Appomattox River on the downstream side of the dam during the next succeeding calendar day shall be no less than such average daily flow on the preceding calendar day.

A copy of the complete resolution is presented on pages 22-23, Appendix A.

2. The Richmond-Crater Interim Water Quality Management Plan

During the 1970's and early 1980's the Crater PDC, working in conjunction with the Richmond Regional PDC and the State Water Control Board (Now Department of Environmental Quality), spent considerable effort to resolve the wasteload allocation on the James River and establish a model for the Appomattox River in order that wasteloads could be established.

The crux of the problem was that the estuary from Richmond to Hopewell could not continue to receive increasing amounts of treated wastes and exhibit good water quality. Therefore, in order to meet state water quality standards in this portion of the estuary, particularly with reference to dissolved oxygen, and to satisfy the demands for additional quantities of waste to be discharged into the river, a unique and serious approach to this problem had to be taken.

In the early 1970's the State Water Control Board (SWCB), recognizing the need for region-wide water quality management, gave consideration to the idea of developing a comprehensive water quality management study of the lower James River Basin where the Appomattox River is a tributary. On July 1, 1971, the SWCB entered into an agreement with the Environmental Protection Agency (EPA) under Section 3(c) of the Federal Water Pollution Control Act of 1965, as amended. This project was completed in July, 1974.

Early in the year 1980, the SWCB was designated by the Governor to complete the areawide 208 management plan, which would control the area's point and nonpoint sources of water pollution so water quality standards could be met. The most significant part of this effort was the development of alternative wasteload allocation scenarios for the James estuary including the Appomattox. The calibrated and verified James River Water Quality Management Model was an important tool in this endeavor.

Due to the conflicts associated with the modelling process, and the need to develop current information about the James and Appomattox Rivers, Crater PDC and Richmond Regional PDC requested \$300,000 from the 1982 Virginia General Assembly to monitor the rivers.

The James River Water Quality Monitoring Program was first implemented during the Summer of 1983, pursuant to the Richmond/Crater 208 Interim Water Quality Management Plan. The primary objectives of the Monitoring Program included the following:

- Protection of vital water supplies
- Evaluation of wastewater treatment needs and scheduling
- Assessment of water quality conditions
- Establishment of a data base to provide for water quality modeling.

During the initial year of monitoring (1983-84) 25 sampling locations were established on the mainstem James River and on the Appomattox River. Based upon the results of that work, the modelling for the James and Appomattox Rivers was revised and completed. This wasteload allocation process is currently used for both rivers. Over this long period of time the Crater PDC working with Richmond Regional PDC ensured that the local governments were organized and had direct involvement in this vital process. This effort established the foundation for determining how the Region would develop in the future.

IV. WATER QUALITY REGULATIONS AND PROGRAMS

Nonpoint source (NPS) pollution is caused by diffuse sources not regulated as point sources which include runoff from agriculture, silviculture, urban land use, construction, and resource extraction activities; runoff and leachate from land disposal of wastes; impacts of hydraulic channel modification; and other sources, such as atmospheric deposition, leaks, and spills.

While the federal government has provided a relatively strict program for source control, NPS controls have been left primarily to the State. Two state programs were enacted by the General Assembly in 1988 attempting to curb NPS pollution.

In 1988, the General Assembly passed the Chesapeake Bay Preservation Act, which established a comprehensive program for land use control in Tidewater to reduce water quality impacts. The Legislature also amended the Erosion and Sediment Control Act which aimed at strengthening local implementation. Also, in 1988, the General Assembly passed enabling legislation for local governments to develop and/or amend zoning and subdivision ordinances to protect surface and groundwater.

Erosion and Sediment Control Act

Virginia's Erosion and Sediment Control Law (ESCL) provides one of the few regulatory components of the state's NPS control program. Administered by the Division of Soil and Water Conservation (DSWC), the program provides unusual state government involvement in local private land use. However, the program is implemented by local governments with the assistance of soil and water conservation districts. All jurisdictions in the corridor have adopted the new Erosion and Sediment Control Regulations. Local programs must contain regulations consistent with nineteen specific standards. The standards range from soil stabilization, to the use of a sediment basin for drainage areas greater than three acres, to stormwater runoff control to protect downstream properties and waterways. Those proposing regulated land-disturbing activities must submit for approval a control plan consistent with the standards. Following plan approval and installation of controls, certified local officials must inspect the work immediately following installation, at least once every two weeks, within 48 hours after a storm, and at completion of the project.

Chesapeake Bay Preservation Act and Regulations

The General Assembly realized that only through effective and widespread land use controls to reduce NPS pollution could the goals and objectives of the Bay Agreement be achieved, and that local governments must play the leading role in implementing them.

With the exception of Dinwiddie County, each of the other corridor localities is required to amend its comprehensive plan to address the importance of water quality protection under the Chesapeake Bay Preservation Act and Regulations. According to the Regulations, "it shall be the development policy of the locality to protect and enhance the quality of state waters pursuant to the Chesapeake Bay Preservation Act. All functions of the local government shall be administered in a manner which recognizes that what occurs on the land ultimately affects water quality. Land use and development occurring in the Chesapeake Bay Preservation Areas located within the locality shall comply with the Chesapeake Bay Preservation Act and Regulations".

The regulations have three basic elements: (1) specific local requirements and deadlines for adoption, (2) criteria for designating local Chesapeake Bay Preservation Areas (CBPA), and (3) performance criteria for land use and development in CBPAs. The preservation areas are divided into Resource Protection Areas (RPAs), which have special water quality value (e.g., tidal wetlands, tidal shores) and Resource Management Areas (RMAs), which are less sensitive than RPAs but still may impact water quality. Areas outside of designated RPAs are not subject to the regulations.

Areas within RPAs and RMAs that have existing development designated as Intensively Developed Areas (IDAs) may be redeveloped so long as the applicable performance criteria are met. Other non-IDAs that have existing development may also be redeveloped.

Stormwater Regulations

Stormwater run-off, unlike pollution from point sources, is diffuse both in terms of its origin and in the manner in which it enters ground and surface waters. It results from a variety of human activities such as agriculture, construction, motor vehicle usage, pesticide application and logging, activities that take place over wide geographic areas. Currently, there are three programs, the Chesapeake Bay Preservation Act, the State Stormwater Management Regulations and the EPA Stormwater Permitting Regulations, which deal with state and federal stormwater management programs and requirements. The following section briefly summarizes each of these three programs.

The Chesapeake Bay Preservation Act

As previously mentioned, the goal of the Chesapeake Bay Preservation Act (CBPA) is to maintain or restore water quality in the Bay and its tributaries through the protection of preservation areas. To meet this goal, Tidewater jurisdictions are required to implement stormwater management programs and achieve the following objective: prevent a net increase in nonpoint source pollution from new development, achieve a 10 percent reduction in nonpoint source pollution from redevelopment, and achieve a 40 percent reduction in nonpoint source pollution from agricultural and silvicultural uses.

In order to achieve these goals and objectives, a set of performance standards are necessary to minimize erosion and sedimentation potential, reduce land application of nutrient and toxics, maximize rainwater infiltration, and ensure the long-term performance of the measures employed.

All localities in the study corridor subject to the CBPA have elected to pursue the use of on-site best management practices to satisfy the required stormwater management criteria.

State Stormwater Management Regulations

The 1989 Virginia General Assembly passed the Stormwater Management Act, enabling local governments to establish, by ordinance, stormwater management programs. Under this legislation, localities may implement stormwater management programs which would require submission and approval of a stormwater management plan prior to any non-exempt development activity. State regulations establishing minimum acceptable technical criteria and administrative procedures become effective on December 5, 1990. These regulations require that local stormwater management ordinances do the following: (1) require regulated development activities to maintain post development peak runoff rates at or below pre-development runoff rates; (2) establish minimum technical criteria to control nonpoint source pollution and localized flooding; (3) require the provision of long-term responsibility for and maintenance of stormwater management facilities; and (4) require local programs to include certain minimum administrative procedures.

The implementation of a local stormwater management program is voluntary.

EPA Stormwater Permitting Regulations

Due to the improved understanding of NPS pollution problems and the difficulties encountered by the EPA in developing stormwater permitting regulations, the 1987 amendments to the Clean Water Act significantly increased federal involvement in NPS control. Stormwater discharge permitting provisions contained in the Act directed the EPA to promulgate stormwater permit regulations. They require localities to establish stormwater management programs that will affect the manner in which land is developed and managed. At present, permit requirements only apply to communities with a population of more than 100,000. In the study corridor, only Chesterfield County is required to comply with these regulations. The regulatory process to impose similar restrictions on communities with populations of less than 100,000, the balance of the region, are still under evaluation.

Chesapeake Bay Tributary Strategy

The Chesapeake Executive Council (Council), established in 1983, is charged with coordinating the Chesapeake Bay Program. Through the 1987 Chesapeake Bay Agreement, the Council agreed to specific goals and activities. Of major significance was the agreement to

develop, adopt and implement a basin-wide strategy to achieve at least a 40 percent reduction, by the year 2000, of nitrogen and phosphorus entering the main stem of the Chesapeake Bay. This goal guides ongoing point and nonpoint source management programs in the Bay region.

The nutrient reduction target was re-evaluated and the Chesapeake Bay Agreement amended in 1992. The 1992 Amendment reaffirmed the target and indicated the Council's belief that water quality conditions in the major tributaries to the Bay are critical to the health of the Bay.

The individual states are responsible for developing specific strategies for achieving the 40 percent reduction target for their tributaries. Strategies are currently being developed for the Potomac. A series of meetings were held in late 1994 to gather public comment on how to achieve innovative, cost-effective tributary strategies. The strategies for the James River, including the study corridor are planned for completion in the Fall of 1996. Several state agencies are cooperatively undertaking the technical work necessary to develop Virginia's strategy. Although nutrient loadings from Virginia's tributaries are considered to have minimal impact on main stem water quality, the 40 percent reduction target will serve as an interim measure. Final reduction targets will reflect the characteristics of the individual tributaries.

Coastal Nonpoint Source Pollution Program

In 1990, Congress reauthorized the Coastal Zone Management Act. Section 6217 contains provisions that require states with coastal zone management programs to develop coastal nonpoint source pollution programs to control sources of nonpoint pollution which degrade coastal water quality or face the loss of federal grant funds. It defines nonpoint source pollution as "...pollution of our nation's waters caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural pollutants and pollutants resulting from human activity, finally depositing them into lakes, rivers, wetlands, coastal waters and ground waters."

Both the biological and economic productivity of coastal and estuarine waters are threatened by increases in nonpoint source pollution. Coastal waters are natural resources which are vital for the well being of individual states and the nation. In January 1993, EPA and NOAA issued guidance for use by states in developing their Coastal Nonpoint Pollution Control Programs. This guidance specifies required nonpoint source pollution control measures and technical specifications for those measures. It recommends Best Management Practices to control nonpoint source pollution from agriculture, forestry, urban activities, marinas and recreational boating and hydrological modifications. It addresses protection of wetlands and riparian areas and use of vegetated treatment systems. Although these measures are considered to be generally applicable, states are to develop additional measures, if necessary to address local conditions.

The state's lead nonpoint source agency is the Department of Conservation and Recreation (DCR). With the assistance of DEQ and several other cooperating state agencies, DCR submitted its Virginia Threshold Review Report to NOAA in May, 1994. It outlines how Virginia's current coastal nonpoint regulations compare with federally crafted guidelines. While Virginia has not yet decided whether to participate in the federal program, the report is the first step in formulating a plan that has the potential to impact local governments, homeowners, and farmers alike. After review and comment by EPA and NOAA, which is expected to be completed in late 1995, the state will begin developing legislative and regulatory implementation strategies. Extensive public participation in developing the program will be required and local governments and agencies will be called upon to participate through workgroups and regional meetings.

Riparian Restoration and Protection

At the October 1994 meeting of the Chesapeake Bay Executive Council, a directive on riparian restoration and protection was adopted. It requires the state to develop a comprehensive, watershed-wide policy to enhance the maintenance, restoration and stewardship of riparian forests.

The lands that border the stream contain unique and valuable qualities. These border lands are called riparian areas. They play a critical role in protecting water quality, soil, fish and wildlife. "Forests have the ability to absorb and denitrify nitrogen in surface and groundwater, and to trap phosphorus-laden sediment and other pollutants resulting from adjacent land uses, thereby protecting water quality. Riparian forests provide shade, organic matter, and often streambank stability which in turn provide a range of living resource habitat benefits, including the moderation of stream temperature, support of the food web, protection of fish habitat and sediment and erosion control. Riparian forest buffers deliver the greatest range of environmental benefits of any type of stream buffer.

Since the passage of the Chesapeake Bay Preservation Act (CBPA) in 1988, restoration and revegetation of riparian buffers has been a required component of development and redevelopment. The requirement to re-vegetate demanded buffers which serve to increase water quality.

In the study corridor, all jurisdictions except Dinwiddie County are required under the CBPA to designate a 100-foot wide vegetative buffer area along all tidal wetlands, tidal shores, tributary streams, and non-tidal wetlands connected by surface flow as Resource Protection Areas.

There are several grant opportunities for riparian reforestation projects. Under the Virginia Coastal Resources Management Program, DEQ will consider grant projects which address reforestation of riparian buffers, such as planning for restoration sites, actual reforestation on public lands as a demonstration, or creative incentive programs for riparian reforestation on private lands. The Virginia Department of Forestry is also offering grant opportunities to local

jurisdictions and groups to enhance riparian areas through Urban and Community Forestry Assistance Grants (U&CF) and the Small Business Administration Natural Resources Development Program (SBA). Eligible proposals under U&CF grants include riparian forest management or urban stream restoration. The purpose of the SBA program is tree planting using small business contracts.

V. WATER QUALITY IMPROVEMENT EFFORTS

Currently, within the Corridor, several local efforts are either completed or underway that will impact upon the water quality setting.

The City of Petersburg is nearing completion of a major upgrade of its wastewater treatment plant. The \$30 million improvement project is scheduled for completion by the summer of 1996. The Virginia-American Water Company, which serves the City of Hopewell area with water recently upgraded its facilities. The Appomattox River Water Authority completed an expansion of its treatment plant to 46 MGD. STS Hydropower is operating a power generating station at Brasfield Dam. Chesterfield County has undertaken a County Riverfront Project and Lake Chesdin Watershed Study.

All of these efforts impact upon the Appomattox River. Following are brief discussions of each of these efforts.

Petersburg Wastewater Treatment Plant Upgrade

The Petersburg Wastewater Treatment Plant is currently undergoing major upgrade and improvement, including the expansion of the plant capacity from 15 MGD to 20 MGD. The initial construction phase, already completed, includes a secondary clarifier, sludge dewatering and thickening equipment, laboratory, dechlorination facilities and increased pumping capacity at the main pumping station.

The second phase improvements, currently underway, include primary settling tanks with associated scum, grit and screenings equipment, chlorine contact tank, covered sludge storage pad, non-potable water system, phosphate control facilities, standby generators, expanded electrical service and lime stabilization facilities. The land application method, instead of landfilling, may be used to dispose of lime stabilized bio-solids.

Also included in the project is the covering of the primary tanks and installation of an odor control system. This improvement will help to control the generation of hydrogen sulfide which occurs in larger sewer systems during warmer months.

The treated effluent is discharged into the Appomattox River. Since 1992, the plant discharge has consistently met its permit limits. Flows have been averaging approximately 10 million gallons per day. By the time this expansion project is completed in the summer of 1996, the Petersburg Wastewater Treatment Plant will not only meet the present permit requirements, but also the goals of the Chesapeake Bay initiative for nutrient reduction. The plant's discharge permit was reissued in the fall of 1994 for five (5) years.

Virginia-American Water Company Facility Upgrade

The Virginia-American Water Company withdraws its raw water supply from the Appomattox River. The water intake point is at the east side of the Route 10 bridge. It provides domestic, commercial and industrial water service to the customers of Hopewell, Fort Lee and parts of Prince George County outside of the Hopewell city limits.

The Hopewell plant is a rapid filter plant with a capacity of 33 MGD. After the initial purification process, the clarified water then enters two separate filtration buildings. One building, equipped with rapid filters, serves the industrial system. It has the capacity of providing 21 MGD of non-polluted water for industrial or cooling purposes. The other building houses four multimedia filters and eight carbon contactors. It has the capacity of providing 12 MGD of carbon filtered water for domestic uses. Any water treatment residuals are discharged via a forced main pumping station into the Hopewell Regional Wastewater Treatment Facility. No water is discharged into the Appomattox from the plant.

From raw water to treated, over 700 samples are collected for analysis each year. The water is analyzed for 246 compounds. According to the Virginia-American management, the plant performs about 54,700 analyses each year to assure state and federal water quality standards are being met. The water in the Appomattox today does not pose any water treatment problems.

However, there is one water quality consideration worth noting. It is related to the intake's location at the mouth of the Appomattox River and concerns the tidal influence of the James River. Because of heavy industrial development along the Hopewell section of the James, there is a possibility that the intake is susceptible to pollutant spills from the James.

Appomattox River Water Authority Water Treatment Plant Expansion

The Appomattox River Water Authority was created in 1962 by the Virginia General Assembly to provide safe drinking water to its customers. Membership is made up of the Cities of Petersburg and Colonial Heights, and the Counties of Chesterfield, Dinwiddie and Prince George.

The treatment plant capacity was expanded from 22 MGD to 46 MGD in 1983. Today the Authority owns and operates a 4,000 acre reservoir and supplies about 22 MGD of drinking water to the member localities through approximately 13 miles of water lines. Lake Chesdin stores approximately twelve billion gallons of raw water.

The upgraded water treatment facility processes the water as follows:

The raw water from Lake Chesdin is taken in through a bar screen to prevent large debris from entering on the upstream side of the Dam. Then water flows through a smaller screen which removes leaves and small debris. Raw water then flows into a deep well where the raw water pump picks it up and pumps it to the filtration plant. Chemicals are fed into the raw water deep well.

Partially treated water then flows into the settling basin and goes through rapid sand filters. Filtered water goes to a large collection pipe where final chemicals are added. After final chemical treatments the water is ready to be distributed.

The water quality in Lake Chesdin is good. The ever-changing Safe Drinking Water Act has required more testing and stricter water quality standards. Both lead and copper testing by localities have shown no water quality problems.

However, on both sides of the lake and upstream of the river, there are development pressures. Housing and recreation developments are occurring. Earlier this year a new development began on the first section of a large tract on Chesterfield's side of the Lake. Chesdin Landing is offering 535 home sites that will surround a golf course and a marina. As the development continues, the reservoir will experience certain pollution and sedimentation problems in the future.

Brasfield Dam Hydroelectric Generation Facility

STS Hydropower Ltd., a Chicago-based firm, built a three megawatt power generating station at the George F. Brasfield Dam. It began generating power in 1993 using what is called "run of the river" flow. That means the more water coming down and flowing over the Brasfield Dam, the more power that can be generated. The firm cannot draw on the storage of the reservoir to generate power, thus no water quality impacts in the region are expected.

STS Hydropower has a 25 year contract with the Authority. In its first year of operation, the firm produced about 13.6 million kilowatts, which it sold to Virginia Power.

A side benefit of this project is an accompanying fish ladder that will restore migration routes for anadromous fish such as herring and shad. The fish ladder is required by the Federal Energy Regulatory Commission (FERC) as part of the operating license requirements. The FERC operating license requires STS Hydropower to work with several state and federal agencies, providing fish studies as needed and operating the fish ladder during the spring spawning season.

The ladder uses principals of nature to attract fish. Shad and herring are drawn to a mechanical elevator by attraction water that drops from above the dam's head waters through a 24 inch pipe more than 100 feet long, causing turbulence and increased oxygen in the dam's tail waters. The elevator then lifts the fish to a square run that provides passage into Lake Chesdin. Fish have not migrated beyond the Brasfield Dam since it was completed in 1968.

Chesterfield County Riverfront Project

In the fall of 1994, Chesterfield County commenced the Riverfront Project. It calls for the development of a vision for the future of the County's riverfront. Chesterfield County has approximately 75 miles of shoreline along the James and Appomattox Rivers. Over two-thirds of the shoreline is along the Appomattox, an area of beauty, sensitive environmental features and historic resources. It is also an area of abundant vacant undeveloped land. In Phase II of the Corridor study, it was found that over 46 percent of the land area in the corridor was undeveloped and most of it was located in Chesterfield County. The Riverfront Project is designed to prepare a comprehensive plan and implementation strategy which will help strengthen alliances between neighbors and all property owners, preserve aesthetic and environmental quality, protect existing and future land uses, achieve appropriate water-oriented development along the James and Appomattox Rivers, and foster access and enjoyment of the riverfront.

The riverfront planning process is intended to forge a strong partnership among the public, private, and non-profit sectors of the community to achieve a common vision for the County's riverfront. Through this partnership and continued involvement by the general public, a non-profit organization will be formed to undertake the project's action agenda and collaborative activities involving other groups. This project is coordinated with the efforts of this corridor study to promote the orderly growth and development of area river resources, and to protect the area's water quality. The project is scheduled to be completed in the spring of 1996.

Lake Chesdin Watershed Study

In 1994, Chesterfield County initiated a county-wide watershed management program. It identified three critical watersheds in the County where water quality is threatened because of land disturbing activities and rapid growth occurring in these watersheds. A citizen watershed committee was established to study these problems and investigate the cause and specific sources of pollution in each of the reservoirs. Lake Chesdin is one of the three watersheds being studied.

The water quality in Lake Chesdin meets the Safe Drinking Water Standards. The primary focus of this watershed management effort is not on drinking water standards but on the level of eutrophication or biological productivity standards of the Lake. A 1983 consultant study indicated that the reservoir is eutrophic, as evidenced by high levels of nutrients and algae. It further reported that the key pollutant causing the Lake's eutrophication problem was phosphorus, and concluded that loadings of this nutrient would have to be reduced; even a small reduction in pollutants will help in reducing the magnitude of eutrophication problems.

The following are goals and strategies recommended by the Chesterfield County Watershed Committee for improving the water quality of Lake Chesdin.

Goal:

To assist the Appomattox River Water Authority in their efforts to improve water quality.

Strategies:

1. To provide proactive support to the Appomattox River Water Authority in its continued implementation of the Lake Chesdin Watershed Management Plan. In particular, the County could assist the Authority in its attempts to obtain higher levels of state or federal funding to implement a greater amount of agricultural Best Management Practices.
2. To continue the implementation of the various non-point source controls recommended for the Chesterfield County portion of the reservoir. Some of these measures include encouraging quality development through the use of a good subdivision ordinance and the active implementation and enforcement of the County's Erosion and Sediment Control Ordinance.
3. To support the Appomattox River Water Authority in its effort to continue monitoring the lake and to update the Watershed Management Plan from time to time.
4. To discourage the use of fertilizer throughout the full spectrum of land uses.
5. To institute an educational program on the impacts of over fertilization and other daily household practices on water quality.

VI. SUMMARY

Water quality in the Appomattox River is generally good and meets the standards of the 1972 Clean Water Act. This conclusion is based on the state analysis of water column samples, fish tissue, and sediment samples monitored in the Appomattox.

There are two water treatment plants in the corridor, the Appomattox River Water Authority and the Virginia-American Water Company. They are the water sources for the region. One plant operator commented that there is no water quality problem in the Appomattox.

The discharges from the Petersburg Wastewater Treatment Plant have consistently met the permit limits and pose no water quality problems to the Appomattox. The Appomattox River is a major resource in the region. To protect the water quality of the River, all Tidewater jurisdictions in the Corridor delineated the Chesapeake Bay Preservation Areas and adopted land development performance standards as required by the Chesapeake Bay Preservation Act and Regulations. The goal of the water quality program is to reduce, by the Year 2000, the annual load of nitrogen and phosphorus reaching the main Bay by 40 percent.

Appendix A

At a special meeting of the Appomattox River Water Authority, duly called and held at the principal office of the Corporation in the City of Petersburg, Virginia, on April 11, 1963, the following resolution was unanimously adopted:

RESOLVED that if and when bonds are issued and sold by Appomattox River Water Authority to provide funds for the construction of a dam across the Appomattox River at a point west of the City of Petersburg, and before the construction of such dam is completed, Appomattox River Water Authority will enter into a contract or agreement with the City of Hopewell, Virginia, acting through the City Council of said City, substantially as follows:

"1. On any calendar day when the average daily water flow of the Appomattox River into the upstream end of the lake created by the dam is 100 million gallons or more, the amount of water discharged into the Appomattox River on the downstream side of the dam during the next succeeding calendar day shall be no less than 100 million gallons.

"Average daily flow or "average daily water flow" as used in this agreement shall mean the number of gallons of water resulting from dividing by thirty on every calendar day the total gallons of water flow of the preceding thirty consecutive calendar days.

"Water discharged into the Appomattox River on the downstream side of the dam" as used in this agreement is defined as follows:

(a) All that water pumped from the lake by the Authority which can reasonably be expected to find its way back into the Appomattox River below the dam, and

(b) The water overflowing or released past the dam.

The quantity of water described in subparagraph (a) shall be determined by the pumping records of the Authority and the quantity of the water described in subparagraph (b) by suitable gauging facilities installed at or immediately below the dam and maintained by the Authority. The average daily water flow entering the lake from the Appomattox River shall be determined from data collected by suitable gauging facilities installed and maintained by the Authority measuring daily water flow into the lake.

(2) On any calendar day when the average daily flow from the Appomattox River into the lake is less than 100 million gallons, then the water discharged into the Appomattox River on the downstream side of the dam during the next succeeding calendar day shall be no less than such average daily flow on the preceding calendar day.

(3) The Authority agrees to open its records for inspection by representatives of the City of Hopewell, as may be reasonably necessary to verify that this agreement is being fulfilled."

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The consideration for the aforesaid agreement is that the City of Hopewell will not oppose the construction of a dam and water reservoir on the Appomattox River at a point west of the City of Petersburg.

The secretary of Appomattox River Water Authority was instructed to forthwith transmit a copy of the foregoing to the City Manager of the City of Hopewell, Virginia.

A COPY, TESTE:

/S/ Frank K. Martin
Secretary
Appomattox River Water Authority

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