

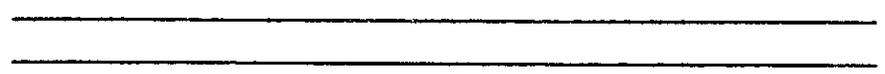
APPROVED

SC 121A
JH Rule



ELIZABETH RIVER

205(j) WATER QUALITY PLAN



VIRGINIA STATE WATER CONTROL BOARD

SEPTEMBER 1988

JOSEPH G. WINFIELD

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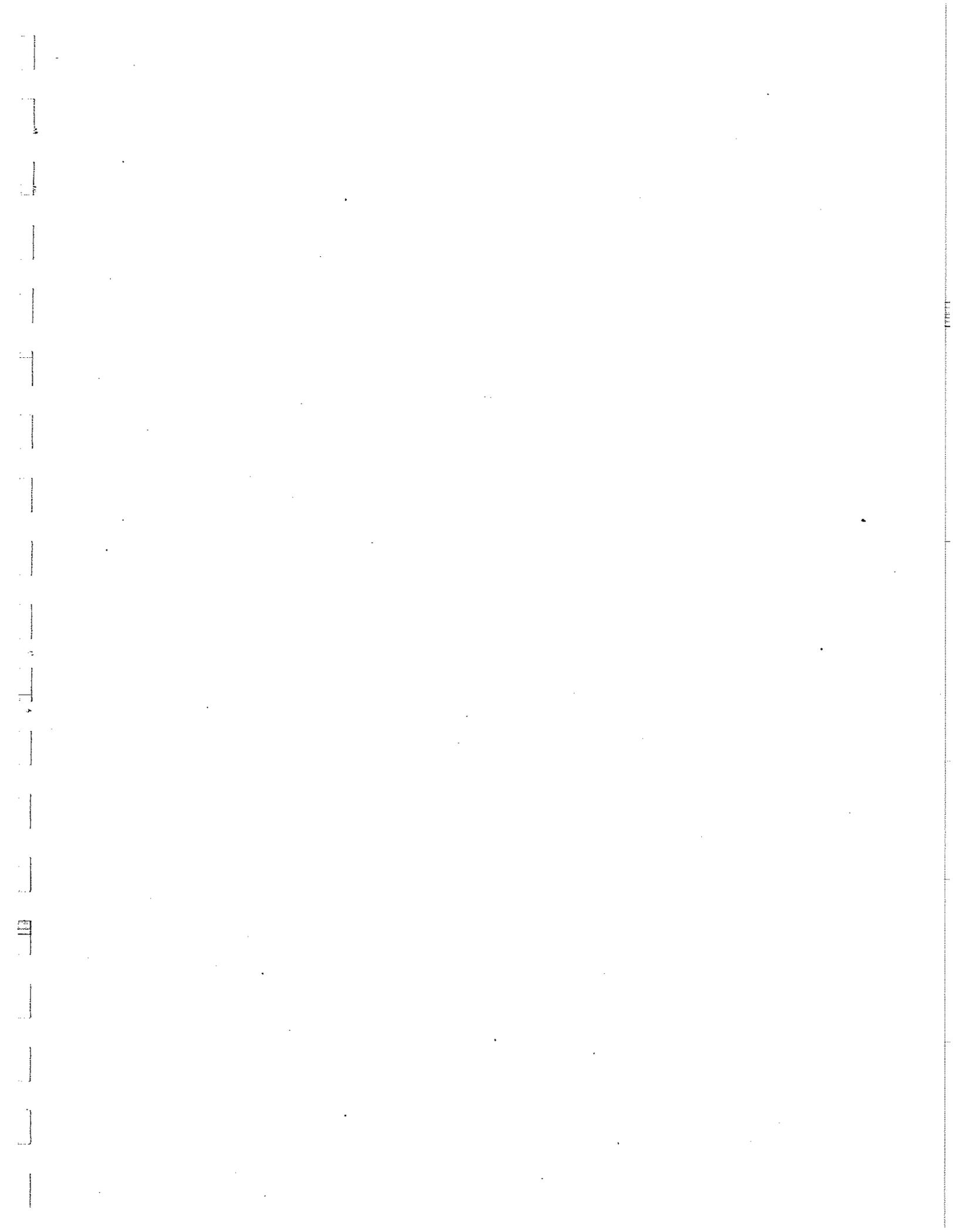
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INTRODUCTION

LOCATION

The Elizabeth River, a subestuary of the James River, is the major deep water port of the Hampton Roads Harbor. The River Basin drains over 700 km² (estimated values range between 550 and 777 km²) in Southeastern Virginia within the cities of Chesapeake, Norfolk, Portsmouth, and Virginia Beach (Fig. 1). The major segments of the River are the Lafayette River, the Western, Southern, and Eastern Branches, and the Mainstem which empties into Hampton Roads at the confluence of the James River and the Chesapeake Bay.

The Mainstem extends from Sewells Point and Craney Island, a man made dredge disposal facility, to Town and Pinners Point. The Western Branch, the least industrialized segment, extends from its headwaters in Portsmouth to Pinners and Lovetts Point where it enters the Mainstem. The Lafayette River is a shallow tributary off the Mainstem located within a dense residential section of Norfolk. The Eastern Branch extends from its headwaters in western Virginia Beach to its confluence with the Southern Branch between the cities of Norfolk and Portsmouth. The Southern Branch, the most highly industrialized segment, is an important commercial tributary which extends southerly from its confluence with the Eastern Branch and Mainstem for about 12 miles to the Army Corp of Engineers locks at Great Bridge in Chesapeake.

BACKGROUND

The Elizabeth River has served as the focal point for military, industrial, and commercial growth in the Hampton Roads area. The proximity of the port to the Chesapeake Bay and the Atlantic Ocean and the vast resources of nearby inland regions have contributed to make it an important maritime port.

The Elizabeth River was once home to the many diverse species of plants and animals which live and thrive in estuarine environs. Historical accounts of the Elizabeth River describe plentiful shellfish and "great stores" of fishes (Wharton, 1957). Unfortunately, the price of prosperity is great. A once bountiful estuary is now considered one of the most polluted rivers in the nation.

The region, from its inception, grew and prospered as an important maritime port. The growth of the region led to the establishment of the future cities of Norfolk and Portsmouth, and eventually Chesapeake, along the River's shore. The localities were important commercial trade centers during their early years. The processing and shipping of important trade items such as lumber, coal, tobacco, and agricultural and seafood products required the development of industrial and

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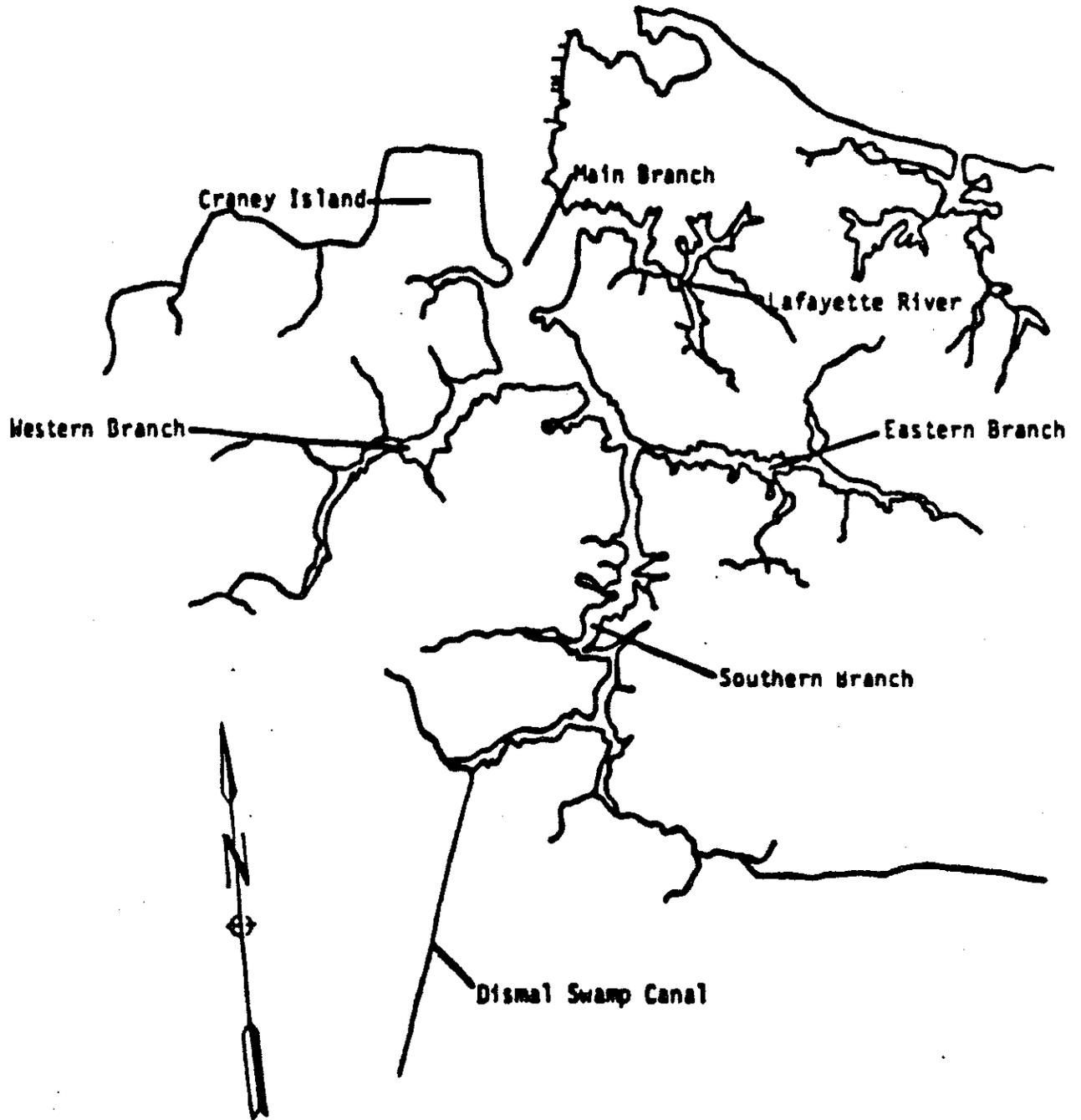
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Figure 1. The Elizabeth River system.



commercial facilities, transportation networks, and supported an ever growing work force.

The strategic location of the Elizabeth River made it an ideal port for naval installations. A Naval presence in the area began as early as 1801 with the establishment of the Naval Shipyard at Portsmouth. The military has continued to rely on the River, housing a major portion of the Navy's Atlantic fleet at its Sewells Point Naval Complex. The Navy's Craney Island Supply Center and St. Juliens Creek Annex are also located along the Elizabeth River. Many industries, such as shipyards, have developed along the River to support Naval operations.

After the Civil War, a dramatic increase in development of the Basin and the associated population growth continued to stress the River. The River began to reflect this condition in the early 1900's and by 1925 many areas were condemned for shellfish consumption due to high fecal coliform levels. The entire River is still closed to shellfish harvesting today. The natural resources of the estuary had been severely stressed as a result of declining water and sediment quality.

The population of the Basin grew dramatically from the 1920's to the present. By 1970, over 390 thousand individuals resided in the Elizabeth River Basin with a projected population of 480 thousand by the year 2000 (Fig. 2). Military, industrial, and commercial development have increased as well, with the major employment sectors of the Hampton Roads relying on the water related resources of the area. The major employment sectors are the federal government (military and civilian), manufacturing (especially shipbuilding and repair), tourism, and port-related commerce (coal and general cargo). In Hampton Roads, 28 percent of the work force are federal employees, primarily military or military related civil service employees. The Navy accounts for 80 percent of the active military in Hampton Roads. Undoubtedly, the military represents a major economic factor in Hampton Roads.

The environmental awareness that developed in the late 1960's and early 1970's resulted in federal legislation which focused national attention on restoring and preserving our natural resources. Studies, which are summarized latter in this report, were initiated to determine the effects of over 200 years of man's activities on the Elizabeth River. The consensus was that the Elizabeth River had serious water and sediment quality problems.

To insure that the Elizabeth River can continue as an economic and industrial facet of the region, yet be restored to an environmentally sound condition, it was realized that a comprehensive plan was required. The plan will serve to focus available resources on the issues and problems of greatest concern in the Elizabeth River Basin. The plan will require a coordinated effort among federal, state, and local authorities

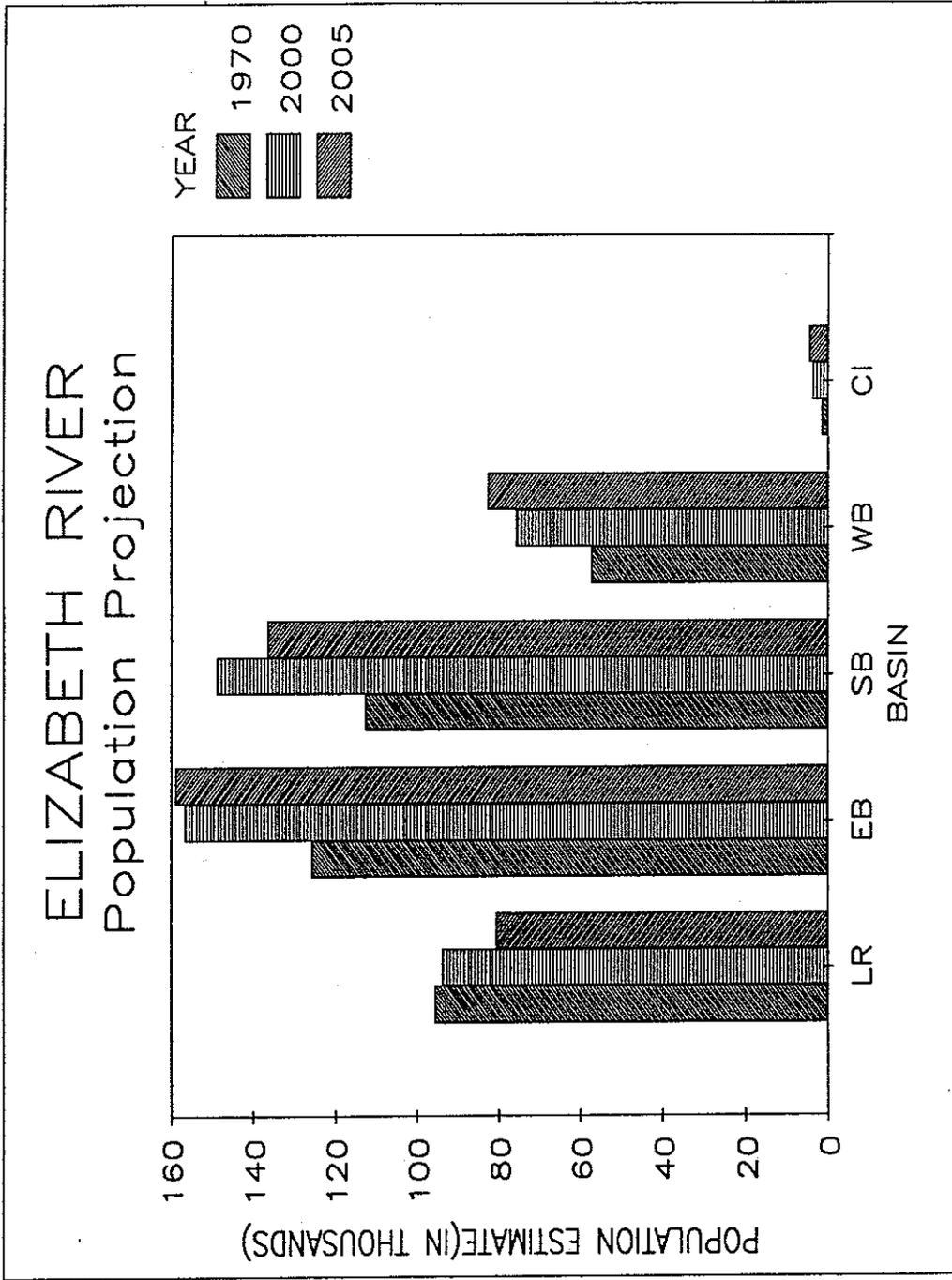


Figure 2. Elizabeth River population projections (SVPDC, 1986). LR-Lafayette River;EB-Eastern Branch;SB-Southern Branch;WB-Western Branch;CI-Craney Island Creek.

to provide for and implement actions directed at restoring the Elizabeth River.

The following sections present an overview of the River, its problems, recent efforts to restore it, and recommendations for continued efforts to restore and improve the environmental quality of the Elizabeth River.

WATER QUALITY GOALS

It is necessary to understand our current efforts to preserve or restore water quality in the Elizabeth River before additional or alternative approaches can be discussed. These efforts are part of federal, state, and local laws and programs which effect water quality. Laws, policies, statutes, and practices relating to water quality originate and are implemented at various levels of government and often result in a variety of programs, each with its own goals and objectives. Therefore, numerous programs affect, directly or indirectly, the water quality of the Elizabeth River. The following sections summarize the major laws and statutes, water quality programs, and agencies and organizations which are involved with water quality in the Elizabeth River Basin.

FEDERAL LAWS AND STATUTES

Clean Water Act

The Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.), commonly known as the Clean Water Act (CWA), was enacted by Congress in 1972 in response to environmental concerns raised during the 1960's and early 1970's. The CWA set as a national water quality goal, the elimination of pollution discharges into the nation's waterways by 1985. An interim goal of the CWA was "that where attainable... water quality [should] provide for the protection and propagation of fish, shellfish, and wildlife and provide for recreation in and on the water by July 8, 1983." This goal became known as the "fishable, swimmable" goal.

These goals were soon found to be unrealistic in the projected time frames, however they established national efforts towards reducing the discharge of pollutants into our nation's waterways and provided the framework for several water quality protection programs. Selected sections of the CWA which pertain to protecting marine waters are presented in Table 1.

NPDES Program

The CWA of 1972, and subsequent amendments, provided the regulatory framework for controlling pollution. A major component of the CWA was the establishment of the National Pollutant Discharge Elimination System (NPDES). Under section 402 of the CWA, the EPA was given the authority to require permits for any discharge of wastewater into navigable waters. The Act allowed the EPA to delegate the authority to administer and implement the NPDES program to states capable of meeting and enforcing the minimum requirements established by the EPA.

The State Water Control Board is the delegated authority in the Commonwealth of Virginia to administer the NPDES program (State Water Control Law 62.1-44 et seq. as amended). Effective July 1, 1988, the Permit Regulation (VR680-14-01) delineates the authority and general procedures for issuance of Virginia

Table 1. Major Sections of CWA Which Affect Pollution in Marine Waters.

- Sec. 104(n) Directs EPA to establish national estuaries programs to prevent and control pollution; to conduct and promote studies of health effects of estuarine pollution.
- Sec. 104(q) Establishes a national clearinghouse for the collection and dissemination of information developed on small sewage flows and alternative treatment technologies.
- Sec. 208 Authorizes a process for States and regional agencies to establish comprehensive planning for point and nonpoint source pollution.
- Sec. 301 Directs States to establish and periodically revise water quality standards for all navigable waters; effluent limitations for point sources requiring BPT should be achieved by July 1, 1977; timetable for achievement of BAT and other standards set. Compliance deadlines for publicly owned treatment works (POTWs) to achieve secondary treatment also set.
- Sec. 301(h) Authorizes waivers for POTWs in coastal municipalities from secondary treatment for effluent discharged into marine waters if criteria to protect the marine ecosystem can be met.
- Sec. 301(k) Allows industrial dischargers to receive a compliance extension from BAT requirements until July 1, 1987, for installation of an innovative technology, if it will achieve the same or greater effluent reduction than BAT at a significantly lower cost.
- Sec. 302 Allows EPA to establish additional water quality based limitations once BAT is established, if necessary to attain or maintain fishable/swimmable water quality (for toxics, the NRDC v. EPA consent decree sets terms).
- Sec. 303 Requires States to adopt and periodically revise water quality standards; if they determine that technology based standards are not sufficient to meet water quality standards, they must establish total maximum daily loads and waste load allocations, and incorporate more stringent effluent limitations into Sec. 402 permits.
- Sec. 303(e) Requires States to establish water quality management plans for watershed basins, to provide for adequate implementation of water quality standards by basin to control nonpoint pollution; Section 208 areawide plans must be consistent with these plans.
- Sec. 304 Requires EPA to establish and periodically revise water quality criteria to reflect the most recent scientific knowledge about the effects and fate of pollutants, and to maintain the chemical, physical, and biological integrity of navigable waters, groundwater, and ocean waters and establish guidelines for effluent limitations.
- Sec. 304(b) Outlines factors to be considered when assessing BPT and BAT to set effluent limitation guidelines, including accounting for "non-water quality impact," age of equipment, etc.

Table 1. Continued

- Sec. 305(b) Sets State water quality reporting requirements.
- Sec. 306 Sets new source performance standards for a list of categories of sources.
- Sec. 307 Requires EPA to issue categorical pretreatment standards for new and existing indirect sources; POTWs required to adopt and implement local pretreatment programs; toxic effluent limitation standards must be set according to the best available technology economically achievable.
- Sec. 308 Requires owners or operators of point sources to maintain records and monitoring equipment, do sampling, and provide such information or any additional information.
- Sec. 309 Gives enforcement powers primarily to State Authorities. Civil penalties, however, and misdemeanor sanctions can be issued by EPA in U.S. district courts for violation of the act, including permit conditions or limitations; EPA also is authorized to issue criminal penalties for violations of Sections 301, 302, 306, 307, and 308. EPA may take enforcement action for violations of Section 307(d) which introduce toxic pollutants into POTWs.
- Sec. 401 Requires states to certify that activities requiring a Federal license or permit that may result in a discharge into navigable waters will not violate state standards or regulations.
- Sec. 402 Establishes National Pollutant Discharge Elimination System (NPDES), authorizing EPA Administrator to issue a permit for the discharge of any pollutant(s) to navigable waters that will meet requirements of Sections 301, 302, 306, 307 and other relevant sections; States can assume administrative responsibility of the permit program.
- Sec. 403 Directs EPA to establish Ocean Discharge Criteria as guidelines for permit issuance for discharge into territorial seas, the contiguous zone, and open ocean.
- Sec. 404 Directs Secretary of the Army to issue permits for dredged or fill material; EPA must establish criteria comparable to Section 403(c) criteria for dredged and fill material discharges into navigable waters at specified disposal sites.
- Sec. 405 Requires EPA to issue sludge use and disposal regulations for POTWs.
- Sec. 504 Grants emergency powers to Administrator to assist in abating pollutant releases; establishes a contingency fund, and requires Administrator to prepare and publish a contingency plan to respond to such emergencies.
- Sec. 505 Citizen suit provision allows citizens to bring civil action in district court against any person in violation of an effluent standard or limitation of an order by the Administrator for failing to perform a nondiscretionary act.

Source: Wastes in Marine Environments, U.S. Congress, Office of Technology Assessment, OTA-0-334 (Washington, DC: U.S. Government Printing Office, April 1987).

Pollutant Discharge Elimination System (VPDES) and Virginia Pollution Abatement (VPA) permits by the State Water Control Board.

Water quality protection is achieved by placing effluent limits into issued permits. Categorical effluent limits promulgated by EPA, which for the most part are based on technological and economic considerations, were developed to produce a manageable and practicable system by which pollution discharges could be regulated. A description of the SWCB's VPDES/VPA Program is given in a following section.

Water Quality Standards

In addition to the technology-based standards, Section 303 of the CWA required that water quality standards be developed for all surface waters in the United States. Water bodies are designated as to use, and criteria are developed which are designed to preserve or achieve the designated use. Virginia's "Water Quality Standards" booklet contains standards for surface water and ground water in the Commonwealth. The SWCB develops the standards pursuant to the authority in Section 62.1-44.15(3) of the State Water Control Law. Standards are reviewed and updated every three years as required by the CWA. Water Quality Standards of the Commonwealth of Virginia are discussed in detail in later sections.

The approach of designating goals for a waterbody, developing numerical criteria to attain the goals, and putting limits on point and nonpoint sources to meet the criteria, is called the water quality-based approach to pollution control. The water quality approach was to supplement the other pollution controls (technology-based) and provide an additional control mechanism. This approach has not been systematically implemented and therefore has had only limited success. It has been suggested that in many instances the only effective control of pollution will be the implementation of an extensive water quality-based approach.

National Municipal Policy

The National Municipal Policy of 1984 states that compliance with Section 301 of the CWA must be achieved, without regard to the availability of federal grant funds, by July 1, 1988. The Act required all Publicly Owned Treatment Works (POTWs) to meet effluent limits based on secondary treatment or water quality standards, whichever were more stringent. Virginia developed a National Municipal Policy implementation strategy in 1984 that delineated the permit issuance and compliance schedule development actions of the SWCB to comply with the deadline.

404 Permits

Section 404 of the CWA, which authorizes the Army Corps of Engineers to issue permits for dredged or fill materials, is extremely significant with regard to the Elizabeth River. The Rivers and Harbors Act of 1899 requires the Corps to issue

permits for the "construction of structures or the excavation or filling or other modification of the bed or channel of the navigable waters of the United States". These permits are usually combined in the ACOE's permitting process and other federal, state, and impacted local agencies, review and comment on the ACOE's decision.

Federal Water Pollution Control Act of 1987

The Water Quality Act of 1987 reauthorized and amended the CWA. The Act provided funds for the capitalization of State Revolving Loan Programs for funding of sewerage construction; highlighted and provided funding for specific waterbodies, such as the Chesapeake Bay Program and the National Estuary Program; required states to identify waters that are toxic "hot spots" and develop strategies to meet water quality standards; prohibited the relaxation of requirements in reissued NPDES permits; and provided funding to states to develop nonpoint pollution control programs. Several of these amendments will assist in improving the water quality of the Elizabeth River.

Additional Programs

Several other federal statutes and programs have had substantial impacts, either directly or indirectly, on the quality of our nation's waterways. Some of the better known programs are discussed below.

The National Environmental Policy Act of 1970 (42 U.S.C. 4321 et seq.) requires environmental impact statements be prepared for all proposed legislation and all major federal actions which could significantly affect the quality of the human environment. The Coastal Zone Management Act of 1972 (16 U.S.C. 7401 et seq.) provided federal funding to develop plans that ensure a balance between economic development and environmental protection. The CZMA is currently supporting several projects in the Elizabeth River Basin. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA- 42 U.S.C. 9601 et seq.), better known as Superfund, provides for emergency response and cleanup of chemical spills. The Resource Conservation and Recovery Act of 1976 (RCRA- 42 U.S.C. 6901 et seq.) and the 1984 Hazardous and Solid Waste Amendments to RCRA regulates the generation, transport, treatment, storage, and disposal of hazardous wastes. The Toxic Substances Control Act of 1976 (15 U.S.C. 2601 et seq.) regulates chemicals which present significant risk to human health or the environment. These and other programs, such as the Endangered Species Act, contribute to the protection and restoration of our nation's waterways.

FEDERAL, STATE, AND LOCAL AGENCIES

Numerous federal, state, regional, and local agencies are involved with the environmental quality of the Elizabeth River. The following are brief descriptions of the role and authority of these agencies with regard to the Elizabeth River.

Federal Agencies

Several federal agencies are involved, directly or indirectly, with the water quality of the Elizabeth River. Most notable are the U.S. EPA, U.S. Navy, U.S. Army Corps of Engineers, and the U.S. Coast Guard. Several other agencies, such as the U.S. Fish and Wildlife Service and the National Marine Fisheries, are at times required to review and comment on projects occurring in the Basin.

Environmental Protection Agency

The Environmental Protection Agency (EPA) is required by Congress to administer the provisions of the CWA. As mentioned previously, the EPA has delegated many of its responsibilities in the Commonwealth of Virginia to the State Water Control Board. The EPA still maintains the authority to direct the SWCB in fulfilling the requirements of the CWA. The EPA sponsors the Chesapeake Bay Program Liaison Office (the program is administered through Region 3 in Annapolis, MD) and was a key participant in the 1983 and 1987 Chesapeake Bay agreements which included Virginia, Maryland, Pennsylvania, and the District of Columbia. Much of the federal funding for water quality related projects originates with the EPA.

Army Corps of Engineers

The U.S. Army Corps of Engineers (ACOE) has permit jurisdiction in and around navigable waters. The Rivers and Harbors Act of 1899 and Section 404 of the CWA requires the ACOE to issue permits for activities involving dredging, filling, or modification of navigable waters. The ACOE is also responsible for maintaining the primary channels in the Elizabeth. The ACOE has funded a significant number of projects to characterize the bottom sediments of the Elizabeth River in order to determine which segments of the River contain sediments which are suitable for open ocean dumping and those which must be disposed in a contained disposal facility. The ACOE also developed and maintains the Craney Island dredge containment facility. The facility, a man-made island located at the mouth of the Elizabeth, is the primary dredge containment facility in the region and receives most of the dredge material from the Elizabeth River and Hampton Roads Harbor.

U.S. Navy

Although not directly related with water quality management, the U.S. Navy has been a key factor in the development of the Elizabeth River. The Navy and Naval related activities are major sources of traffic on the River and support numerous industrial activities. The Navy is also a major customer of Hampton Roads Sanitation District with a significant amount of the discharge from the Army Base STP resulting from Naval operations. Naval facilities have over 130 permitted discharges to the Elizabeth. Sewells Point Naval Complex, Norfolk Naval Shipyard, and Craney Island Fuel Terminal (the largest military

fuel terminal in the world) are the major facilities impacting the Elizabeth. Recent reports by the Department of Defense indicate that the military is aware of the potential environmental impacts resulting from their facilities and are emphasizing efforts to reduce or eliminate such effects (Tetra Tech, 1987).

U.S. Coast Guard

The U.S. Coast Guard (USCG) has extremely important responsibilities in protecting the water quality in the Elizabeth and other navigable waters. The CWA assigned the USCG responsibility for programs to eliminate discharges of oil and other hazardous substances and the discharge of sewage from watercraft. The Coast Guard is the primary authority for the prevention, cleanup, and enforcement of pollution incidences on the nation's navigable waters. A U.S. Coast Guard Emergency Response Office is located on the Elizabeth River. The 1988 SWCB 305(b) report cites that the Coast Guard responded to 359 reported oil spills in Virginia's coastal waters between July 1, 1985 and June 30, 1987.

State Agencies

State Water Control Board

The State Water Control Board (SWCB) is the primary state agency responsible for water quality, although the responsibilities of several other state agencies parallel those of the SWCB in their efforts to preserve and protect the Commonwealth's natural resources. The SWCB prepares water supply plans, administers the NPDES program (VPDES/VPA permits), and has broad authority over water quality management programs as authorized by the Virginia Water Control Law.

State Department of Health

The State Department of Health (SDH) is responsible for the health and well being of the citizens of Virginia. The Bureau of Sanitary Engineering of the SDH is responsible for reviewing plans for and inspecting water and wastewater treatment facilities to insure safe drinking water supplies and compliance with sewerage treatment requirements. The SWCB and the SDH share responsibility for sewerage treatment plant inspections.

The SDH's Bureau of Shellfish Sanitation determines water segments which are suitable for shellfish harvesting. Fecal coliform levels are generally used as an indicator of suitability, though other considerations (high levels of metals or toxic organic substances) may be used in designating shellfish condemnation zones.

Virginia Marine Resources Commission

The Virginia Marine Resources Commission (VMRC) is responsible for enforcing the laws pertaining to the uses of Virginia's living marine resources. The Commission directs its efforts in regulating and managing commercial fish and shellfish. The

Commission is also responsible for the state's wetlands management program established by the Virginia Wetlands Act (VWA). The VWA authorizes local governments to adopt wetlands zoning ordinances and create wetlands boards for the purpose of reviewing and issuing permits for the use or development of wetlands. The VMRC administers the program for localities which elect not to adopt ordinances and the Commission also reviews local board decisions.

Division of Soil and Water Conservation

The Virginia Soil and Water Conservation Board (VSWCB), previously the Soil and Water Conservation Commission, supervises state programs for soil conservation and some water resource development projects in small watersheds. Through their development of erosion and sedimentation control ordinances, the VSWCB plays an important role in nonpoint source pollution control. Initially targeted at agricultural practices, erosion and sediment control ordinances are a substantial urban nonpoint source control mechanism.

Virginia Department of Transportation

The Virginia Department of Transportation (VDOT) is responsible for the construction and maintenance of highways, bridges, and tunnels. A new downtown tunnel passing beneath the Elizabeth was recently completed and another is being planned. EIS's are developed by the VDOT to ensure that highway projects do not significantly impact the surrounding environment. VDOT's adherence to established standards to control or prevent pollution resulting from their activities is essential.

Virginia Council on the Environment

The Council on the Environment (COE) was established to implement the Virginia Environmental Quality Act. The Council, comprised of citizen members and members of seven state boards and commissions, is required to report on the state of the environment and recommend alternatives to insure environmental quality in the Commonwealth. The COE also administers several of the Commonwealth's Coastal Zone Management grants which supports coastal resource management projects in environmentally sensitive coastal areas.

Department of Waste Management

The Department of Waste Management (DWM) is responsible for solid, hazardous, and low-level nuclear waste management in Virginia. The department also certifies hazardous waste facility siting, promotes resource conservation and recovery, and coordinates with other environmental agencies to protect human health and the environment.

Virginia Institute of Marine Science

The Virginia Institute of Marine Science (VIMS) is the primary state agency which performs basic and applied research on resource and environmental problems and provides technical and scientific advise to other state agencies.

Chesapeake Local Assistance Board

The Chesapeake Local Assistance Board (CLAB) and a department of the same name was created by the Virginia General Assembly in 1988 with the passage of the Chesapeake Bay Preservation Act. The CLAB will assist communities in the Chesapeake Bay watershed incorporate water quality protection measures into local land use plans. The CLAB will establish guidelines for protecting sensitive coastal areas and will help localities in adopting this guidance by providing technical and financial assistance.

Regional and Local Agencies

Hampton Roads Water Quality Agency

The Hampton Roads Water Quality Agency (HRWQA), a coalition of the Peninsula and Southeastern Virginia Planning District Commissions and the Hampton Roads Sanitation District, is responsible for regional water quality planning. The agency was responsible for the development of the Hampton Roads Water Management Plan (the plan was developed under the provisions of Section 208 of the CWA) in 1978 and its update in 1983. This plan was the first comprehensive water quality management plan developed for Hampton Roads. The agency has also been instrumental in water quality management planning for the Elizabeth River Basin, especially those elements dealing with nonpoint source pollution and land use and development.

Southeastern Virginia Planning District Commission

The Southeastern Virginia Planning District Commission (SVPDC) is one of 22 planning district commissions in the Commonwealth. The SVPDC provides planning and assistance to local governments and encourages consistent and conscientious development within the district's boundaries. The SVPDC has no authority over land use and development but has been a principal advocate, along with the HRWQA, in encouraging Basin governments to include water quality as a goal in their comprehensive plans and have participated in numerous water quality planning efforts in the Basin. The SVPDC is currently funded by a CZM grant to develop plans to assist local governments in the Basin with stormwater management, land use, and water quality management.

Hampton Roads Sanitation District

The Hampton Roads Sanitation District (HRSD), created in 1940, is responsible for the collection, transmission, and treatment of wastewaters originating within the District. The District includes over 1,600 square miles in Hampton Roads, including the Peninsula and most of Southeastern Virginia. The District currently operates two major STP's located on the River, Lamberts Point STP and Army Base STP, and took over operation of Portsmouth's Pinners Point STP on July 1, 1988. These three STPs are the only major municipal discharges to the Elizabeth. HRSD is in the process of constructing the Virginia Initiative Plant at Lamberts Point which will provide secondary treatment with advanced biological nutrient removal. Eventually, flow

from the Pinner's Point STP will be sent to the VIP for additional treatment before being discharged to the River.

Southeastern Public Service Authority

The Southeastern Public Service Authority of Virginia (SPSA) operates the regional solid waste disposal system and is involved in a regional hazardous waste management program. SPSA has initiated a collection and disposal program for household hazardous wastes.

Local Governments

The institutional framework of the Commonwealth of Virginia results in delegation of land use control, and thus nonpoint source pollution control, to local governments.

Local governments have regulatory control of nonpoint source pollution through several measures. The principal measures available to localities warrant discussion.

Current state law requires all localities to develop comprehensive plans. All the cities within the Elizabeth River Basin, Norfolk, Chesapeake, Virginia Beach, and Portsmouth, have adopted a comprehensive plan. A comprehensive plan is intended to establish goals and recommendations for the development of the locality. Water quality is not an implicit goal in any of the local plans, but certain general goals are environmentally compatible.

Recent legislation by the Virginia General Assembly requires ground water and surface water surveys for the preparation of local comprehensive plans and allows the implementation of ground water protection measures for designated areas to be included in local comprehensive plans.

Some of the goals adopted by Basin communities appear to conflict with an improvement in water quality. For example, an early draft of the City of Chesapeake's comprehensive plan revision stresses the importance of undeveloped lands along the navigable sections of the Elizabeth River for industrial development. Other apparently conflicting goals include increased port development, maximized utilization of waterfront sites for industrial, commercial, and public use, and intensified urban development (SVPDC, 1986). The SVPDC realized that several adopted goals conflict or have the potential to conflict with water quality. The SVPDC regarded land use and development goals as "areas of potential conflict rather than direct conflict, because of the potential for local management controls to mitigate areas of conflict and, thus, to achieve goals compatibility" and noted that most goals were "generally compatible with and mutually supportive of the Clean Water Act Goals."

All of the localities in the Basin have adopted erosion and sediment control ordinances consistent with the state guidelines

established in the "Virginia Erosion and Sediment Control Handbook, 1980". The guidelines were established by the Commonwealth for providing assistance to localities in implementing the Virginia Erosion and Sediment Control Law. The Erosion and Sediment Control Law was enacted to control soil erosion and subsequent sedimentation resulting from land disturbing activities. Any party engaging in a land disturbing activity must submit an erosion and sediment control plan and receive approval before any work can proceed. A 1986 amendment to the Erosion and Sediment Control Law authorizing an administrative stop-work order for those failing to comply with an erosion and sediment control plan has added substantially to the power of the law.

Zoning and Subdivision ordinances are additional regulatory mechanisms through which local governments can indirectly protect water quality. The City of Norfolk has as a provision of their zoning ordinance, a conditional use permit which evaluates the impact of a specific land use on the neighborhood. Although water quality is not a consideration at the present time, the provision has the potential of using water quality as a criteria in decision making. A summary of pertinent programs in each city is contained in SVPDC's 1986 report on land use and nonpoint source pollution (SVPDC, 1986).

WATER QUALITY PLANS AND ASSESSMENTS

The CWA contains provisions which require states to develop water quality management plans, periodically assess water quality, and address special water quality needs. The SWCB fulfills these requirements by developing water quality plans for major basins, periodic water quality assessments of state waters, and initiating special water quality projects. A summary of the SWCB's most recent water quality plans, assessments, and special plans which pertain to the Elizabeth River are presented.

Virginia Water Quality Assessments

Section 305(b) of the Clean Water Act requires states to prepare and submit to the EPA an assessment of the water quality of all navigable waters in the state on a biennial basis. The SWCB has recently completed its assessment of Virginia's waters for the period of July 1, 1985 to June 30, 1987. The major river basins were evaluated and an assessment of whether each segment met the 305(b) "fishable and swimmable" criteria was made. The following section is Virginia's 305(b) assessment of the Elizabeth River and its tributaries;

Segment 2-30 (Elizabeth River and Tributaries). The Elizabeth River and its tributaries are located in HUC02080208 and are recognized as having the most serious water quality problems as compared to the other segment tributaries of the lower James River. This 27 mile segment is among the most heavily urbanized and industrialized areas in the State. The upper reaches of the Eastern and Western

Branches of the Elizabeth, as well as the Lafayette River, consist of urban residential communities while the land areas surrounding the main stem of the Elizabeth and Southern Branch consist primarily of light and heavy industrial use. The Elizabeth River complex receives discharges from approximately 50 industrial and 15 domestic wastewater treatment facilities. There are also numerous facilities located on the main stem and Southern Branch which contribute both point and nonpoint source discharges to this segment. The most significant of these facilities are shipyards and Naval facilities. NPDES permits issued to these facilities also require compliance with Best Management Practices to reduce pollution from sources such as drydocks.

The trend over the past few years has been the elimination of many of the direct discharges by connection to central sewerage facilities operated by the Hampton Roads Sanitation District. Most facilities have exhibited no major compliance problems although the Board recently has required the City of Norfolk to control the discharge of sludge from the City's potable water treatment plant to Broad Creek, a tributary of the Eastern Branch of the Elizabeth River. The City has constructed a filter-press sludge treatment system. The new system was scheduled to be on-line in January 1986; however, due to unanticipated problems, the sludge discharges to the creek had not been totally eliminated by late 1987.

The Elizabeth River complex receives a wide variety of nonpoint source loadings from its 300 square mile drainage area, in which approximately one-half million people reside. All totaled, such loadings represent a tremendous impact. To complicate matters, the Elizabeth River has very poor flushing characteristics resulting from little freshwater input and a relatively flat topography. Any freshwater entering the system is a result of stormwater runoff and drainage from the Dismal Swamp. Poor flushing tends to increase the amount of sediment and associated pollutants that are trapped within the river system.

EPA's Chesapeake Bay Program classified the Elizabeth River complex as an area of high "toxics" contamination due to the presence of synthetic organics and heavy metals. Details of these findings are summarized in the Board's Basic Data Bulletin 61, The Elizabeth River: An Environmental Perspective. A problem assessment document (Information Bulletin 557) was prepared by the TRO staff to summarize recent research and management efforts which identify the water quality problems of the Elizabeth. Water quality and associated problems recognized in this bulletin include:

- Seasonal dissolved oxygen violations falling below the average 5 mg/l standard.
- Toxic organics in the sediments.
- Heavy metals accumulations in the sediments.
- Stressed fisheries and biological organisms.
- Prohibition of shellfishing due to bacterial contamination.
- Poor flushing characteristics.
- Sediment buildup resulting in increased dredging frequency.

With regard to fisheries data, the river's water quality is not considered suitable for shellfish nor are finfish populations large enough to support commercial fishing. Continuation of recreational crabbing and sport fishing in the system appears to be viable.

- Elevated levels of bacterial contamination and heavy metals in the water

column and sediments dictate that the river be condemned to shellfish harvesting. Approximately 1,329 acres are leased in the Elizabeth River complex, but the entire river and its tributaries have been condemned since the mid-1970s by the Bureau of Shellfish Sanitation.

- No active commercial finfishing is conducted in the Elizabeth River, but some recreational fishing is still enjoyed. Research not yet published by VIMS indicates finfish exposed to contaminated sediments resulted in adverse physiological reactions. These initial research results are alarming but, as of this time, are not adequate to specifically quantify the cumulative effects of toxic contaminants on fish populations.

The Board is initiating a special project to determine the overall extent of, and best remedial actions for, these problems. This should be completed in the next two years resulting in recommendations for solutions which will serve the mutual benefit of all users.

The 205(j) program has provided funds for the Elizabeth River Special Water Quality Project. Funded through this project, HRWQA has produced the following documents: 1) Comprehensive Elizabeth River Water Quality Management Plan (CERWQMP): Step One - Issue Identification, 2) CERWQMP: Step Two - Problem Agenda, and 3) CERWQMP: Preliminary Management Recommendations. Significant issues and problems associated with the Elizabeth River watershed were identified in the HRWQA documents, and preliminary management recommendations were presented to the State Water Control Board. Additionally, the Applied Marine Research Laboratory (AMRL) of Old Dominion University was awarded a contract to evaluate the effects of various land use activities on the river's water quality. The results of this study will be available in January, 1988. The State Water Control Board is currently drafting a water quality management plan for the Elizabeth River.

The Board currently maintains six ambient water quality monitoring stations in this river segment. The stations are located on Broad Creek, the Lafayette River, the Eastern and Southern Branches and the main stem. The Board's monitoring data indicate that levels of copper and zinc exceed EPA's salt water "acute" toxicity criteria for this river segment. Nickel levels exceed EPA's salt water "chronic" toxicity criteria. Additionally, analysis of sediments indicate slightly elevated levels of chromium and nickel. Arsenic, copper, lead, zinc, and mercury sediment levels are very elevated in accordance with EPA's sediment criteria.

The Elizabeth and Lafayette Rivers do not meet Water Quality Standards nor 305(b)(1)(B) criteria.

Virginia's Priority Water Bodies

The EPA encouraged states to identify "priority water bodies" (PWB) in its final rule on Water Quality Planning and Management in 1985. The term "priority water bodies" is a management concept originated by the EPA to encourage states to focus resources and control activities on those water bodies with the most significant water quality problems. PWBs documents are designed to aid in water quality planning and management programs.

The 1986 SWCB Water Quality Inventory-305(b) report was used to identify 128 water bodies with significant water pollution

problems. A ranking procedure, developed jointly with the EPA, was used to assign points to all 128 water bodies. A planning index which reflects water uses (public water supply, aquatic life, and primary contact recreation) and management questions was used to rank each water body.

The Elizabeth River and the lower James River both received scores of thirty-six which classified them as high priority water bodies (SWCB, 1986).

Water Quality Management Plans

The preponderance of high priority water bodies located in the James River Basin and the importance of this basin targeted it as one of the first basins scheduled for water quality management planning under section 303(e) of the CWA. The SWCB is in the initial phases of updating the water quality management plan for the James River and its tributaries which includes the Elizabeth River. The Plan is scheduled to be adopted by the Board in 1990.

Regional Water Quality Management Plans

The Hampton Roads Water Quality Agency (HRWQA) was established in 1974 for the purpose of preparing the Comprehensive Water Quality Management Plan for Hampton Roads in accordance with Section 208 of the CWA. The Hampton Roads Water Quality Management Plan (HRWQMP) was completed in 1978 and was the first comprehensive evaluation of pollution in the Elizabeth River Basin as well as other basins in the region.

The report concluded that nonpoint source pollution was a more significant problem than point source pollution. The report stressed the need for nonpoint source pollution control, especially the input of nutrients and toxic compounds into the already degraded Elizabeth River.

The HRWQA continued their effort in water quality planning and produced the "HRWQMP: 1983 Implementation Status Report and HRWQMP Plan Update". The update detailed the implementation efforts resulting from the 1978 Plan and highlighted those water quality needs which required greater emphasis. The plan update recommended that a comprehensive water quality management plan should be prepared for the Elizabeth River.

Elizabeth River Water Quality Reports

The SWCB, realizing that the Elizabeth River was a major water quality problem area, examined and compiled the existing information for the Elizabeth River in their report, "The Elizabeth River: An Environmental Perspective" in 1983. The report confirmed that the Elizabeth had serious water and sediment quality problems.

These reports were the impetus for a cooperative effort by the SWCB, HRWQA, and SVPDC in producing the report, "Background and Problem Assessment Report for the Elizabeth River" in 1984. The

report identified seven major issues confronting the state in developing a long-term strategy for improving the environmental quality of the Elizabeth River. The major issues identified were:

1. Water Quality Standards (WQS) - Are the Board's WQS set at appropriate levels? Do they include all necessary parameters?
2. Future Water Quality Goals - Due to toxicity present in bottom sediments and other water quality problems, is the "fishable/swimmable" goal achievable? Are the costs to do so within reason?
3. Point Source Controls - Should the "Urban Use Segment" as recommended by the Hampton Roads Water Quality Agency (HRWQA) be pursued? Should the SWCB continue and strengthen its support of the Hampton Roads Sanitation District's (HRSD) and Portsmouth's 301(h) applications?
4. Toxics - Are there significant on-going sources of toxics which can be identified/quantified, and can the problem of toxic contamination of River sediments be mitigated?
5. Non-Point Source Controls - Are voluntary Best Management Practices (BMP's) going to accomplish the projected overall reduction of 40-50 percent of oxygen demanding materials necessary to maintain present WQS as recommended by HRWQA?
6. Dredging - Are dredging and associated dredge spoil disposal practices helping to alleviate water quality problems caused by toxic contaminated sediments or are we simply spreading the problems to other areas?
7. Waterfront Development - What actions need to be taken to ensure that Norfolk's, Portsmouth's and Chesapeake's plans for waterfront commercial and recreational developments such as Waterside are compatible with the naval operations, ship building, coal terminals, and other heavy industry already dominating their waterfronts?

The SWCB and the HRWQA entered into a series of agreements in an effort to prepare a Comprehensive Elizabeth River Water Quality Management Plan (CERWQMP). The strategy was that HRWQA would concentrate on developing the nonpoint source pollution and waterfront development issues, while the SWCB addressed the remaining major issues. The HRWQA, through the use of a River Users Group, which included representatives of industry and business, governmental agencies, and research institutions, developed and refined the nonpoint source pollution and waterfront development issues. The initial report by HRWQA, CERWQMP: Step One - Issue Identification, specified key areas which needed development for each issue. The CERWQMP: Step Two - Problem Agenda further defined and clarified each issue.

The SVPDC, under contract to HRWQA, developed and analyzed the nonpoint and waterfront development issues for the SWCB in their 1986 report, "CERWQMP: Institutional Analysis and Land Use/Nonpoint Source Analysis." The SVPDC's findings and recommendations are summarized later in this report.

The HRWQA, under contract to the SWCB, developed preliminary management recommendations for inclusion in the CERWQMP (HRWQA, 1986). The recommendations are a result of the culmination of existing water quality information, pollution source information, and previous research and planning documents and recommendations. Thirty-four preliminary recommendations were developed by HRWQA and are presented in their 1986 report, CERWQMP: Preliminary Management Recommendations.

The SWCB has made substantial gains in developing several of the remaining issues. Special water quality standards have been developed (i.e. TBT and nutrient standards) and several programs were established to identify and evaluate potentially toxic discharges in the Basin. The SWCB also funded a major study to evaluate the toxicity of discharges from various land-use activities located on the Elizabeth. The major conclusions and recommendations resulting from these studies are presented in latter sections.

VIRGINIA'S WATER QUALITY STANDARDS AND CRITERIA

Water Quality Standards

The SWCB develops and adopts water quality standards as one method of fulfilling the requirements of the State Water Control Law. Virginia's water quality standards consist of narrative statements that describe water quality requirements in general terms and more explicit numeric limits for specific parameters affecting water quality. General standards establish broad requirements for the protection and maintenance of State waters. Where applicable or necessary to protect or maintain State waters, specific numerical limits are established to supplement the narrative standards. Virginia's water quality standards are intended to protect all State waters for recreational use and for the growth and propagation of a balanced population of fish and wildlife. Standards are periodically reviewed and updated to reflect the Board's current information and policies regarding water quality.

Water quality standards are important aspects of several of the SWCB's programs, especially the NPDES program. NPDES permits contain discharge limits which are formulated to maintain water quality standards in the receiving streams. Other programs, such as the SWCB's 401 Certificate program, also use water quality standards. Under Section 401 of the CWA, if a federal permit is required by any project which will or may result in a discharge to State waters, the project must first receive

certification from the SWCB that the project does not violate water quality standards.

In the absence of specific numerical limits, the SWCB established a general water quality standard that is flexible yet adequate to protect all State waters. The following is Virginia's General Water Quality Standard as published in the SWCB's "Water Quality Standards", VR680-21-00, effective November 25, 1987;

VR680-21-01.2 General Standard

- A. All state waters shall be maintained at such quality as will permit all reasonable, beneficial uses and will support the propagation and growth of all aquatic life, including game fish, which might reasonably be expected to inhabit them. Reasonable beneficial uses include, but are not limited to, recreational uses, e.g. swimming and boating; and production of edible and marketable natural resources, e.g., fish and shellfish.
- B. All State waters shall be free from substances attributable to sewage, industrial waste, or other waste in concentrations, amounts, or combinations which contravene established standards or interfere directly or indirectly with reasonable, beneficial uses of such water or which are inimical or harmful to human, animal, plant, or aquatic life. Specific substances to be controlled include, but are not limited to: floating debris, oil, scum, and other floating materials; toxic substances; substances that produce color, tastes, turbidity, odors, or settle to form sludge deposits, and substances which nourish undesirable or nuisance aquatic plant life. Effluents which tend to raise the temperature of the receiving water will also be controlled.
- C. Zones for mixing wastes with receiving waters shall be determined on a case-by-case basis; shall be kept as small as practical; shall not be used for, or considered as, a substitute for minimum treatment technology required by the Federal Water Pollution Control Act and other applicable State and Federal laws; shall be implemented, to the greatest extent practicable, in accordance with the provisions of subsections A and B hereof, and shall not contain toxic substances in acutely toxic concentrations. An area of initial dilution may be allowed. This area of initial dilution will be determined on a case-by-case basis and shall not at any time exceed the lethal concentration for appropriate representative species for time periods or exposures likely to be encountered by that species and likely to cause acute effects. Mixing within these zones shall be as quick as practical and may require the installation and use of devices which ensure that waste is mixed with the allocated receiving waters in the smallest practical area. The need for such devices shall be determined on a case-by-case basis. The boundaries of these zones of admixture shall also be such as to provide a suitable passageway for fish and other aquatic organisms. In an area where more than one discharge occurs and several mixing zones are close together, these mixing zones shall be so situated that this passageway is continuous.

The Elizabeth and its tributaries are designated as Class II estuarine waters and have Special Standard a. Class II waters have the following limits of a minimum of 4.0 mg/l and a daily average of 5.0 mg/l for dissolved oxygen and a pH range of

6.0-9.0. These values are considered adequate for the protection of aquatic life and for recreational use in estuarine waters.

Special Standard a (VR680-21-07.1) is specific to estuarine or ocean waters capable of propagating shellfish or in specific areas where public or leased private shellfish beds are present. The following standards apply to such areas;

The median fecal coliform value for a sampling station shall not exceed an MPN of 14 per 100 ml of sample and not more than 10 % of samples shall exceed 43 for a 5 tube, 3 dilution test or 49 for a 3 tube, 3 dilution test.

The shellfish area is not to be so contaminated by radionuclides, pesticides, herbicides, or fecal material that the consumption of shellfish might be hazardous.

Water Quality Criteria

Water quality criteria are developed to assist in protecting state waters. Water quality criteria differ from water quality standards because they are not mandatory, rather the SWCB may employ the criteria values when necessary to protect "beneficial uses". Virginia's water quality criteria are specific numerical values which are established to protect aquatic life. Water quality criteria have been adopted for 12 heavy metals, 16 pesticides/ herbicides, ammonia, cyanide, hydrogen sulfide, phenol, phthalate esters, and polychlorinated biphenyls (Virginia's Water Quality Standards, 1987).

Nutrient Policy

The State Water Control Board has proposed to amend its standards to include a new designation: "nutrient enriched". The James River from its confluence with the Chickahominy River to the mouth of the James River, including the Elizabeth River, has been included in the proposed list of nutrient enriched waters. In addition, the Board has proposed a point source policy for nutrient enriched waters. Part of the proposed policy reads as follows;

As specified herein, the Board shall reopen the NPDES permits of certain point source dischargers to "nutrient enriched waters" and shall impose effluent limitations on phosphorus in the discharges authorized by those permits and certain new permits.

1. All dischargers authorized by NPDES permits issued on or before July 1, 1988, to discharge 1 MGD or more to "nutrient enriched waters" shall be required to meet a monthly average total phosphorus effluent limitation of 2 mg/liter as quickly as possible and in any event within 3 years following modification of the NPDES permit.
2. All dischargers to nutrient enriched waters who at the time of designation of the "nutrient enriched waters" are subject to effluent limitations more stringent than 2 mg/liter monthly average total phosphorus shall be required to continue to meet the more stringent phosphorus limitation.

3. All new source dischargers as defined in Regulation 6 with a permit issued after July 1, 1988 and a design flow greater than or equal to 0.05 MGD who propose to discharge to "nutrient enriched waters" shall be required to meet a monthly average total phosphorus effluent limitation of 2 mg/liter.

The nutrient standard would affect all three major STPs on the Elizabeth River. It is estimated that upgrading the Lamberts Point facility to the VIP biological nutrient removal process would allow this plant to meet the phosphorus limit. Only HRSD's Army Base STP would require additional upgrading to meet the limit, since Portsmouth's STP is scheduled to connect with HRSD's VIP.

Toxics Management Regulation

The State Water Control Board has also developed a draft Toxics Management Regulation "for the purpose of controlling the levels of toxic pollutants in surface waters discharged from all sources holding NPDES (VPDES) permits or No-Discharge Certificates (VPA permits) issued pursuant to applicable State Water Control Board regulations." The regulation utilizes biological and chemical procedures to assure that toxic pollutants are not being discharged into surface waters at levels which are causing or may cause adverse environmental effects (i.e. toxicity, reduced viability). The regulation sets forth specific criteria for which effluents are deemed non-toxic or toxic (Table 2). If an effluent is deemed toxic, the SWCB will require that a Toxicity Reduction Evaluation (TRE) be performed by the permittee. The TRE should determine the source or sources of the observed toxicity and a comprehensive plan would be developed with alternatives for toxicity abatement. Once a TRE plan is accepted by the SWCB, an implementation and compliance schedule would be developed.

Regulation No. 5- Pollution from Boats

Heavy vessel traffic along the Elizabeth River has been targeted as a transient source of pollution. In the absence of an established control mechanism, Regulation No. 5 of the SWCB was developed to control pollution from boats. The regulation prohibits the discharge of pollutants, including but not limited to petroleum products, sewage, hazardous waste, and refuse, from any "documented or undocumented boat or vessel into the navigable or nonnavigable waters within this State." The requirements regulating the discharge of refuse, industrial wastes, and petroleum products are particularly pertinent with respect to the Elizabeth River. As a commercial highway, the River is subject to a variety of pollution problems resulting from vessel traffic. The Code of Virginia delegates authority to enforce this regulation to all law enforcement officers in the State, and the Coast Guard has the primary responsibility for oil pollution enforcement.

Table 2. Effluent Toxicity Decision Criteria. Data requirements include quarterly acute and chronic toxicity tests (one invertebrate and one vertebrate) and chemical analysis for priority and non-priority pollutants.

SWCB Toxicity Criteria

1. LC50¹ greater than or equal to 100 percent in six of the total of eight acute toxicity tests, or in at least 75% of the tests conducted if more than eight tests are conducted.
2. NOEC² greater than or equal to Instream waste concentration (IWC³) in six of the total of eight chronic toxicity test, or in at least 75% of the tests conducted if more than eight tests are conducted.
3. No instream exceedence of water quality standards or criteria for protection of aquatic life or human health, where applicable pursuant to the Virginia Water Quality Standards (VR 680-21-00), based on any of the samples required.

If the screen is passed, the effluent shall be considered to be non-toxic. If the effluent fails to meet any one of these criteria, it shall be deemed toxic and the permittee shall be required to proceed to a toxicity reduction evaluation.

1. LC50 - The concentration of a toxic pollutant or effluent, expressed as percent volume, that is lethal to 50 percent of the test organisms within the prescribed period of time.
2. NOEC - No observed effect concentration is the highest concentration of toxic pollutant or the highest percentage, by volume, of an effluent to which organisms are exposed in a full life cycle or partial life cycle test, which causes no statistically significant adverse effect on the observed parameters (usually survival and growth or reproduction).
3. IWC, instream waste concentration, is the percentage of effluent which occurs in the receiving waterbody after mixing.

CURRENT PROGRAMS

NPDES Program

Section 402 of the CWA requires all facilities, municipal and industrial, discharging into navigable waters be required to obtain National Pollutant Discharge Elimination System (NPDES) Permits. The EPA administers the NPDES programs or delegates authority to states to administer the program.

The NPDES program initially focused on the control of conventional pollutants. Conventional pollutants, such as TSS, oil and grease, pH, and BOD are conspicuous pollutants and were the first to receive NPDES control. However, an increasing emphasis has been placed on the regulation of nonconventional (i.e. nutrients) and toxic pollutants. The Water Quality Act of 1987 has placed even greater emphasis on the control of toxic discharges by requiring states to identify water bodies which will not meet water quality standards because of the discharge of toxic pollutants. The Act has also required the identification of waters which will not meet water quality standards due to pollutants resulting from nonpoint sources.

NPDES permits are issued with effluent limitations for specific pollutants that are present or are believed present in the discharge. Traditionally, effluent limitations were calculated from technology-based standards derived from estimates of pollutants removable through the use of various technologies. The best practicable technology (BPT) standards were designed to control conventional pollutants, with best conventional technology (BCT) designed to further control conventional pollutants. The best available technology (BAT) standards were designed for the control of nonconventional and toxic pollutants. The EPA has established technology-based effluent limits for 52 categories of industries. Permit writers are required to use their Best Professional Judgement (BPJ) to develop effluent limits for industries which have no established limits. These limits are developed on a case by case basis.

The use of technology-based standards to control the discharge of pollution is considered by many as insufficient in protecting our waterways. To supplement this approach, the CWA had provisions for the establishment of water quality-based standards (Section 303). Section 303 requires states to adopt and periodically revise water quality standards. If technology-based standards are insufficient to meet water quality standards, then more stringent limits must be placed on the discharge. The use of innovative water quality-based approaches are considered the best means to address various pollution problems.

The State Water Control Board is the delegated authority in the Commonwealth of Virginia to administer the NPDES program (State Water Control Law 62.1-44 et seq. as amended). Effective July 1, 1988, the Permit Regulation (VR680-14-01) delineates the

authority and general procedures for issuance of Virginia Pollutant Discharge Elimination System (VPDES) and Virginia Pollution Abatement (VPA) permits by the State Water Control Board. The Regulation prohibits the discharge of any pollutant (except for those excluded in the Regulation) "including sewage, industrial wastes or other wastes, into, or adjacent to State waters or otherwise alter the physical, chemical, or biological properties of State waters, except as authorized pursuant to a VPDES or VPA permit." VPDES permits authorize the discharge of pollutants from point sources, and the management of pollutants that are not point source discharges to surface waters may be authorized by a VPA permit.

The SWCB currently permits 47 industrial, 10 municipal, and 4 federal facilities which discharge in the Elizabeth River watershed (Table 3). Most dischargers are required to monitor for one or more conventional parameters and selected nonconventional or toxic pollutants which are believed present in their effluent. Discharge limitations are based on technology or water quality-based standards and Discharge Monitoring Reports (DMRs) are submitted on a regular basis for review by SWCB staff.

In the early 1980's, the SWCB initiated the inclusion of Toxics Management Programs (TMPs) into reissued permits of dischargers with potential for discharging toxic substances. The TMP's are tailored to each industry, but in general require biological monitoring of effluents and extensive chemical characterization. The goal of the program is to determine which outfalls are discharging toxicants and when possible, identify the compounds or class of compounds which are responsible for the observed toxicity. TMPs are required in permits of 12 dischargers on the Elizabeth River and several more are expected within the next two years (Table 3).

A Toxicity Reduction Evaluation (TRE) is required for facilities having outfalls showing a significant potential for impacting the system either by the identification of toxics compounds or through the biological assessment of toxicity. Currently, there are a few TREs being conducted within the Elizabeth River watershed, although no plans have been submitted. ✕

SWCB Compliance and Enforcement Program

The SWCB developed a new compliance and enforcement program in the spring of 1987 in an effort to increase the effectiveness of its NPDES program and the enforcement of the State Water Control Law. The program, using a computerized data base, is designed to identify all violations and violators of the SWCL and requires the issuance of monthly Notice of Violations (NOVs) by SWCB personnel to all violators. Violations, ranging from improper reporting of DMRs to illegal discharges, are assessed points based on the severity of the violation. Violations are tracked within a moving six month time frame to determine significant non-compliance. Dischargers with a record of

Table 3. Elizabeth River NPDES (VPDES) permitted facilities (March 1988).

Permit No.	Facility	I/M/F	Maj/Min	Outfalls	TMP	TOX	EFF	Remarks
VA0004189	Atlantic Wood Industries	IND	MAJ	3	Y	N	Y	Proposed EPA Superfund Site
VA0005487	Craney Island Fuel Terminal	FED	MAJ	9	Y	N	Y	
VA0025208	HRSD - Army Base STP	MUN	MAJ	2	N	Y	Y	
VA0025259	HRSD - Lamberts Pt. STP	MUN	MAJ	1	N	N	Y	
VA0025003	Pimmers Point STP	MUN	MAJ	1	Y	N	Y	
VA0004421	Sewells Pt. Naval Complex	FED	MAJ	78 **	N	N	Y	Permit is being modified
VA0005215	U.S. Gov't. - Navy Norfolk Shipyard	FED	MAJ	14	N	Y	Y	Permit is being modified
✓VA0003387	Va. Chemicals, Inc. <i>HDBEAST CEILING</i>	IND	MAJ	2	Y	N	Y	
VA0004081	VEPCO - Chesapeake Energy Center	IND	MAJ	15	Y	N	Y	
VA0053082	Amérada Hess Corp.	IND	MIN	2	N	N	Y	
VA0053473	Amoco Oil Co., Chesapeake Terminal	IND	MIN	2	N	N	N	
VA0074454	Atlantic Energy	IND	MIN	1	N	N	N	
VA0003638	BP Oil Corp.	IND	MIN	1	N	N	N	
VA0057533	B. P. North America Petroleum	IND	MIN	2	N	N	N	
VA0004448	Cargill, Inc.	IND	MIN	1	N	N	N	
VA0024601	Chesapeake Technical Center	MUN	MIN	1	N	N	N	
VA0004898	Chevron, Inc.	IND	MIN	1	N	N	N	
VA0003336	Chevron, Inc.	IND	MIN	2	N	N	N	Abandoned site clean-up
VA0074781	Cogentrix - Portsmouth Facility	IND	MIN	2	Y	N	N	
VA0051845	Colonial Pipeline Corp., Nflk. Del. Fac.	IND	MIN	1	N	N	N	
VA0051853	Colonial Pipeline Co., Hill	IND	MIN	1	N	N	N	
VA0051861	Colonial Pipeline Co., S. Nflk. Del. Fac.	IND	MIN	1	N	N	N	
✓VA0053813	Colonna's Shipyard, Inc.	IND	MIN	7	Y	Y	Y	
VA0053686	Conoco, Inc.	IND	MIN	3	N	N	N	
VA0058572	Crown Central Petroleum Corp.	IND	MIN	3	N	N	N	
VA0073792	Dome Of Canaan	MUN	MIN	1	N	N	N	
VA0053554	Ecolochem	IND	MIN	1	N	N	N	
VA0053911	Exxon Co. USA - Chesapeake Terminal	IND	MIN	1	N	N	N	
VA0003379	Exxon Co. USA - Norfolk Terminal	IND	MIN	2	N	N	N	
VA0005851	E. R. Tunnel Commission - Downtown	IND	MIN	2	N	N	N	
VA0005860	E. R. Tunnel Commission - Midtown	IND	MIN	2	N	N	N	
VA0004910	Ford Motor Co. - Norfolk Assembly Plant	IND	MIN	2	N	N	N	TMP preformed outside permit
VA0068411	HRSD - Norfolk Pump Station	MUN	MIN	1	N	N	N	
VA0003263	J. H. Miles & Co.	IND	MIN	1	N	N	N	
VA0055034	Lakeville Estates Water Corp.	IND	MIN	1	N	N	N	
VA0051268	Marpol, Inc. of Va.	IND	MIN	2	Y	N	Y*	
✓VA0094234	Metro Machine	IND	MIN	12	Y	Y	Y	
VA0053074	Mobil Oil Corp. - Chesapeake Terminal	IND	MIN	1	N	N	N	
VA0006721	Moore's Bridges WFP, City of Norfolk	IND	MIN	1	N	N	N	
VA0054828	Norfolk Oil Transit, Inc.	IND	MIN	2	N	N	N	
VA0061107	Norfolk Steel Corp.	MUN	MIN	1	N	N	N	

Table 3. Continued

Permit No.	Facility	I/M/F	Maj/Min	Outfalls	TMP	TOX	EFF	Remarks
✓VA0004383	NORSHIPCO, Berkley	IND	MIN	15	Y	Y	Y	
✓VA0004405	NORSHIPCO, Brambleton	IND	MIN	12	Y	N	N	
VA0004391	NORSHIPCO, Southern	IND	MIN	2	N	N	N	
VA0003409	N&W Railway - Lamberts Pt. Terminal	IND	MIN	1	N	N	Y	
VA0003174	Royster Agricultural Products Company	IND	MIN	3	N	N	N	
VA0058319	Sentry Petroleum	IND	MIN	1	N	N	N	Ungrnd gasoline leak clean-up
VA0004812	Sheller-Globe Corp.	IND	MIN	1	N	N	Y	
VA0056511	Southland Industries	IND	MIN	1	N	N	N	
VA0053902	St. Joe Paper Co.	IND	MIN	1	Y	N	Y	Connected to HRSD
VA0056138	Swan Oil, Inc.	IND	MIN	8	N	N	N	
VA0004206	Tarmac-Lonestar, Inc.-Campostella Plant	IND	MIN	3	N	N	N	
VA0064645	Tarmac-Lonestar, Inc.-Great Bridge Plant	MUN	MIN	1	N	N	N	
VA0054623	Tenneco Oil Co. (Portlock Branch)	IND	MIN	1	N	N	N	
VA0004821	Texaco, Inc.	IND	MIN	2	N	N	N	
VA0028894	The Miller Oil Co.	IND	MIN	1	N	N	N	
VA0006289	Thirty-Seventh St. Water Treatment Plant	IND	MIN	1	N	N	N	
VA0031828	U.S. Gov't-Deep Creek Nike Site STP	FED	MIN	1	N	N	N	
VA0063967	Wayside Motel	MUN	MIN	1	N	N	N	
VA0003875	Weaver Fertilizer	IND	MIN	1	N	N	N	
VA0072737	W. L. Baxter	MUN	MIN	1	N	N	N	

TMP-TOXICS MANAGEMENT PROGRAM IN PERMIT
 TOX-SWCB TOXICITY EVALUATION
 EFF-SWCB EFFLUENT, SEDIMENT, & TISSUE CHARACTERIZATION
 MUN-MUNICIPAL MIN-MINOR
 IND-INDUSTRIAL MAJ-MAJOR
 FED-FEDERAL

169 outfalls without Swells Point

*-Seahorse Marine evaluated
 **-most outfalls located in Willoughby Bay

significant noncompliance are referred to the SWCB's enforcement division for administrative or judicial actions.

SWCB Effluent, Sediment, and Tissue Characterization

The SWCB, in conjunction with VIMS, is characterizing effluents from municipal, industrial, and federal facilities to determine the environmental impact of these discharges. Over 40 facilities which discharge into the James and Elizabeth Rivers have been included in this program. Additional sites within these drainage basins and other sites in the state are being evaluated, or it is anticipated that they will be evaluated in the near future.

The ultimate goal of the program will be the early detection of potential hazards before they develop into full scale environmental disasters which affect aquatic resources and possibly human health. The program utilizes sophisticated analytical methods to identify and characterize potentially toxic pollutants. A computerized data base has been created which will help SWCB staff detect potential problems before an impact is realized.

During the initial sampling regime, 3 POTWs, 7 industrial, and 4 federal facilities which discharge into the Elizabeth River were included. In summary, many sites showed a potential for degrading water and sediment quality in the region of the outfall and were recommended for additional testing, including testing of effluents for toxicity (TMPs) and bioaccumulation potential (deFur et. al., 1987).

SWCB Toxicity Evaluation

The SWCB has implemented a biological monitoring program to evaluate toxic and/or chronic effects resulting from effluent discharges. A mobile "toxicity testing" facility is transported to an area close to the test site so that water samples may be delivered quickly and efficiently to the facility. Effluent toxicity testing is used to assess the lethal and/or sublethal effects of the effluents. When possible, a chemical characterization of the toxic effluent is performed to further identify the toxic nature of the effluent. The toxicity testing provides an assessment of the impacts of an effluent on the water and sediment quality and living resources in the vicinity of the discharge. This information assists staff in reviewing the impacts of discharges in specific water bodies, assists in permit reissuance, and is instrumental in developing toxicity control strategies.

The SWCB has completed toxicity evaluations at 5 facilities which discharge into the Elizabeth River (Table 3). A summary of these results is presented elsewhere in this document.

SWCB Ambient Monitoring Program

The SWCB's Ambient Quality Monitoring Program (AQM) was designed to provide data to assess the water quality of Virginias' bays,

rivers and streams. Until 1979, ten AQM stations were located in the Elizabeth River. Presently only four stations are located in the Elizabeth. Stations are located at the mouth of the Lafayette River, and in the Eastern and Southern Branches.

Conventional parameters, as well as nutrients, are monitored monthly. Water column and sediment herbicide/pesticide and metals samples are collected annually. Tissue samples are collected sporadically at the Eastern and Southern Branch locations. Additionally, a Chesapeake Bay Tributary Monitoring Initiative station has been established near the mouth of the Elizabeth River. Bottom and surface samples are collected 20 times a year for physical and chemical parameters.

USGS Elizabeth River GIS Project

Environmental and technical data have been and are being collected for the Elizabeth River Basin for formatting and entry into the United States Geologic Survey's Geographic Information System (GIS). As many as 15 federal, state, and local agencies are contributing information to the data base. For example, the USEPA's Environmental Photographic Interpretation Center (EPIC) has analyzed current and historical aerial photography to compile an inventory of potential hazardous waste sites dating from 1937. The National Mapping Division is contributing cartographic information such as hypsographic data, hydrographic data, and transportation data.

Data from these and various scientific studies, cartographic and thematic sources, and administrative and regulatory files are being entered into the computerized data base. The data base is designed to serve as an analytical and managerial tool for scientists and administrators involved in environmental quality. The Elizabeth River data base is scheduled for completion in 1988.

SWCB Pollution Remediation Program - PReP

The State Water Control Board's PReP Program is designed to provide a means of rapid response to emergency situations involving contamination of State Waters. SWCB staff members provide a 24-hour service to respond to pollution complaints and are instructed in the appropriate procedures to respond to pollution incidences.

Pollution complaints usually fall into four major categories: fish kills, raw sewage overflows, oil and hazardous material spills, or a general pollution category.

An examination of pollution complaints in the Elizabeth River Basin indicates that raw sewage overflows (RSO) are the most commonly reported pollution incident (Fig. 3). Sewage overflows occur when storm events increase the volume of sewage/water and exceed the pipes capacity to handle the excess flow or during emergency overflows at pump stations during power outages or other emergencies. Raw sewage overflows prevent the overload of

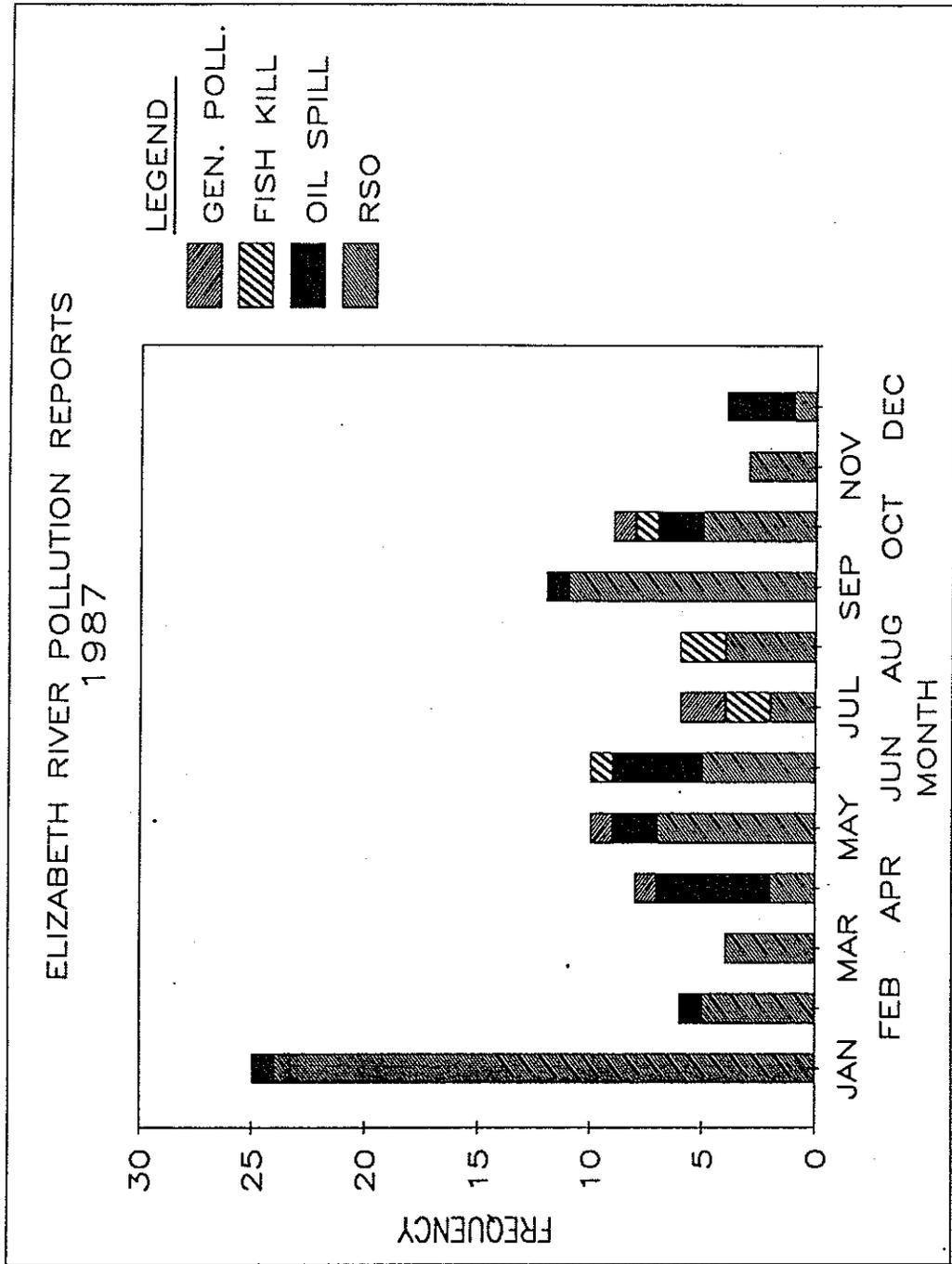


Figure 2. Elizabeth River pollution reports for 1987. (RSO-Raw Sewage Overflow)

treatment plants as well as backup into homes, industries, and streets. The excess sewage and/or stormwater contains raw (untreated) sewage, industrial wastes, and urban runoff which is discharged directly into the Elizabeth River. Several options to reduce or eliminate raw sewage overflows are presented in later sections.

Fish kills usually occur in the summer in small creeks when elevated temperatures and reduced dissolved oxygen levels occur. Fish kills may also be the result of contamination by toxic/hazardous materials which have entered the River.

The Elizabeth River Basin houses several oil storage tank farms and other hazardous waste storage facilities, especially along the Southern Branch, which are potential sources of pollution. Fortunately, the U.S. Coast Guard's emergency spill response office is based near the Elizabeth River. The Coast Guard responded to 359 reported oil spills in Virginia's tidal waters during the period from July 1, 1985 to June 30, 1987 (SWCB 305b Report, 1988). It is considered by most authorities that sufficient resources and plans are available to respond to and contain large scale spills that may occur in the Basin. Current programs administered by the State Water Control Board, U.S. Coast Guard, and other agencies are designed to prevent large scale disasters if such spills should occur.

Pretreatment Program

Hampton Roads Sanitation District (HRSD) and the SWCB, under authority of Section 307 of the CWA and the requirements of Chapter 66 of the Acts of the Virginia General Assembly, have established an Industrial Waste Control Program for regulating industrial and commercial discharges into the municipal sewerage systems located along the Elizabeth River. Such programs are generally referred to as Pretreatment Programs. The program provides guidelines for the pretreatment of industrial wastes which are discharged into sewerage systems. Pretreatment programs help prevent industrial wastes from disrupting the function of the treatment system, and reduce the discharge of pollutants which will ultimately contaminant sludge or be discharged into receiving waters.

HRSD's program requires industrial dischargers to obtain permits from the District and to comply with established discharge limits and monitoring requirements. HRSD may deny or revoke permits if the requirements established are not met. HRSD implements a surcharge program to recover the additional costs associated with the handling and treatment of "high-strength" wastes.

Over half of the industrial waste generated within the region served by HRSD comes from military installations. The remainder is generated by a variety of commercial and industrial operations. These facilities include shipyards, radiator shops, hospitals, and film processing shops. Within the Elizabeth

River Basin, HRSD currently permits 67 industrial dischargers, of which 55 discharge to Lamberts Point STP and 12 discharge to Army Base STP. Each facility may have multiple discharges combined under one permit. A significant amount of industrial wastes discharged to the Army Base STP originate from the Navy's Sewells Point Complex.

The Industrial Pretreatment Program helps reduce the amount of toxic pollutants which enter municipal treatment systems, and ultimately the amount entering the Elizabeth River.

Chesapeake Bay Program

The Chesapeake Bay Program was created by an act of Congress in 1976 to develop a comprehensive understanding of the Chesapeake Bay and to provide a central plan for managing and restoring the Bay. The program pooled the resources of federal, state, and local agencies, and academic and public groups. Their task was to elucidate the problems of the Bay and provide for innovative solutions and programs to resolve the complex problems. A Chesapeake Bay Agreement was signed by State and Federal entities in 1983 and was targeted at the comprehensive management of the Bay. The Agreement resulted in "The Chesapeake Bay Restoration and Protection Plan" in 1985. The Governors of Virginia, Maryland, Pennsylvania, the Mayor of the District of Columbia and the Administrator of the EPA signed a Chesapeake Bay Agreement on December 15, 1987. This agreement has specific goals, objectives, and commitments for addressing living resources, water quality, population growth and development, public involvement, public access, and comprehensive management of the Bay.

The Chesapeake Bay Program has identified the Elizabeth River as a significant source of toxic pollutants to the lower Chesapeake Bay. An emphasis of the current agreement is to develop and implement plans to control the introduction of toxic compounds from point and nonpoint sources and bottom sediments. The agreement will provide the resources and management required to meet these goals. Undoubtedly, the Elizabeth River, as the "hot spot" for toxic compounds in the lower Chesapeake Bay, will be the center of research, management, and control strategies which are developed for the Chesapeake Bay.

HRSD's VIP Construction and Estuarine Monitoring

To meet the requirements of the CWA and the National Municipal Policy, both HRSD's Lamberts Point STP and Portsmouth's Pinnars Point STP, which discharge into the Elizabeth River, were faced with upgrading to secondary treatment, possibly without federal funding assistance. The City of Portsmouth and HRSD applied for 301(h) waivers which would have eliminated their requirement to upgrade to secondary treatment. Both waivers were denied by the federal government, thus requiring the facilities to upgrade to secondary treatment. Portsmouth has since entered into a consent decree with the SWCB to join the HRSD system. HRSD plans to expand and upgrade the Lamberts Point facility into the Virginia Initiative Plant (VIP).

The VIP will provide secondary treatment with advanced biological nutrient removal at a cost similar to secondary treatment alone. The Pinnars Point facility will be connected to the VIP by a pipeline running beneath the Elizabeth River. The VIP is scheduled to be on-line in early 1992. Once on-line, only two major STP's (Army Base and the VIP) will be discharging into the Elizabeth River. Several small treatment plants (less than 1 MGD) still exist in the Basin, but a significant number of facilities have connected to HRSD since the early 1970's.

HRSD, as part of their estuarine monitoring program, is collecting baseline data for physical and chemical parameters in the Elizabeth River. A total of 17 stations are monitored from May to October each year. The program concentrates on conventional parameters and nutrients. Heavy metals and organics are not currently included in the scope of the program. The program will establish baseline data for water quality prior to the start up of the VIP and is planned to continue several years after the plant is on-line. Scientists and managers will be able to use this data to evaluate the effectiveness of the VIP in improving the water quality of the Elizabeth River and the applicability of VIP treatment facilities in other regions.