

**REPORT OF THE**

**STATE WATER COMMISSION**

**TO THE GOVERNOR AND  
THE GENERAL ASSEMBLY OF VIRGINIA**



**SENATE DOCUMENT NO. 56**

**COMMONWEALTH OF VIRGINIA  
RICHMOND  
2000**

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# **REPORT OF THE STATE WATER COMMISSION**

**to**

**The Honorable James Gilmore, Governor  
and  
the General Assembly of Virginia  
Richmond, Virginia**

## **I. AUTHORITY FOR STUDY**

The State Water Commission is a permanent agency of the Commonwealth directed by statute to (i) study all qualitative and quantitative water supply and allocation problems in the Commonwealth, (ii) coordinate the legislative recommendations of other state entities responsible for water supply and allocation issues, and (iii) report annually its findings and recommendations to the Governor and the General Assembly. (Va Code §9-145.8) In 1998, in response to concerns raised by several local governments and the Hampton Roads Planning District Commission, the State Water Commission undertook a review of the state's water supply and water resources planning policies. In its review, the Commission received testimony from (a) the Hampton Roads Planning District Commission on ground water supplies in eastern Virginia, (b) several localities on water supply development and the need for regional planning, and (c) the Department of Environmental Quality (DEQ), Dr. William Cox and Dr. Leonard Shabman regarding the importance of water supply planning.

## **II. SUBCOMMITTEE DELIBERATIONS**

### **A. THE STATE'S ROLE IN WATER SUPPLY ACTIVITIES**

#### **1. Water Supply Resources**

The drought of 1999, which resulted in water supply shortages throughout the Commonwealth, focused greater attention on the state's role in providing needed water supplies. DEQ recognized the problem in its latest biennium budget request when it noted that "(t)hese short-term water supply shortages, along with the increasing demand for water supplies highlight a need within the Commonwealth to better manage and plan for current and future supply needs."

Code of Virginia § 62.44.36 assigns responsibility for planning the development, conservation, and utilization of Virginia's water resources to the State Water Control Board (SWCB) and its administrative agency--DEQ. The Board is to formulate a coordinated policy for the use and control of all water resources of the Commonwealth and issue a statement thereof. The vehicles for implementing water supply policies are plans and programs prepared by the Board for the management of the Commonwealth's water resources (§ 62.1-44.38). These plans have as their objective to encourage, promote, and secure the maximum beneficial use and control of the state's water resources and are to be prepared for each of Virginia's major river basins. In addition to the preparation of these plans, the Board, upon the request of local government, is to provide water supply planning assistance, including assistance in preparing drought management strategies, water conservation programs, and evaluation of alternative water sources (Subsection F of § 62.1-44.38).

In the late 1980s, a provision of the State Water Control Law required the SWCB to engage in water supply planning, which consisted primarily of data collection and formulation of water quality plans for various regions of the state. These plans have not been updated but water resources data continue to be collected and provided to interested parties upon request. Currently, there is one DEQ staff person with responsibility for water resources planning, using the data contained in the various basin plans and recent withdrawal figures.

Using this data, Mr. Dennis Treacy, director of DEQ, presented a profile of Virginia's water resources. There are 49,350 miles of streams and rivers in Virginia, divided into nine major basins. In 1998, 1,452 million gallons per day of water were withdrawn (excluding power generation) from Virginia waters. Of the total amount of water withdrawn, 87 percent was withdrawn from surface water sources and 11 percent was withdrawn from ground water sources. More than one-half (53 percent) of the withdrawals were for public water supply, followed by manufacturing (40 percent), mining (three percent), irrigation (two percent), and agriculture and commercial (one percent each). Seventy-five percent of Virginian's are served by central public water supplies and 25 percent are self-supplied. The appendix presents the annual water withdrawals by river basins for the period 1985-1998.

## **2. Management Tools**

The SWCB has several tools available to manage the Commonwealth's ground water and surface water supplies. Under state law (Ground Water Management Act), in order to regulate the withdrawal of ground water in regions where the resource is limited the SWCB can declare an area a ground water management area. If such a designation is made, permits are required for withdrawals of ground water. Two such areas (Eastern Virginia and the Eastern Shore) have been designated as management areas. There is a similar statutory procedure for designating areas as surface water management areas. Such designations would be made for those areas with historically low stream flows. One area, the James River in Richmond, is in the process of being designated a surface water management area.

Another management tool is the water protection permit. Typically, withdrawing water from a river or stream involves the placement in the water of an intake structure. A water protection permit is required by DEQ for such a structure. In granting the permit, DEQ usually stipulates that certain water flow levels must be maintained in the vicinity of the withdrawals. During 1998-1999, two significant water protection permits were issued for municipal water withdrawals. One permit was issued to the City of Harrisonburg for an intake on the South Fork of the Shenandoah River, and the other was issued to the Nelson County Service Authority for an impoundment on the Black Creek.

Apart from these statutory tools, DEQ is also involved in the Virginia Drought Monitoring Task Force, which meets periodically. Because of the severe drought conditions in 1999, the Task Force met eight times during the year. It developed five statewide drought status reports and held several meetings with the Governor's cabinet to brief them on the 1999 drought situations; other water supply planning activities in which the agency participates are the Washington Council of Governments Task Force on Regional Water Supply issues and the Interstate Commission on the Potomac River Basin.

### **3. Ground Water Supply Management**

In response to the Commission's request to identify critical water supply issues, Mr. Treacy identified three ground water supply management concerns:

- An increasing demand for ground water;
- The continued decline of ground water levels; and
- A lack of understanding of the ground water flow system due to inadequate flow models. There is more information for the southeastern part of the state and Eastern Shore and less information for the Coastal Plain, the Northern Neck, and Middle Peninsula. There is even less information available for other regions of the state.

Currently, DEQ uses two regional ground water flow models, cooperatively developed with the United States Geologic Survey (USGS), to make ground water withdrawal decisions in the Virginia Coastal Plain. These models were developed in the early 1980s. Since then, additional stress has been placed on the region's aquifer system and scientific understanding of the system has changed. Thus, according to Mr. Treacy, revisions will have to be made to the comprehensive models if the state is to be assured that appropriate tools are available to make defensible management decisions in the future. The fact that there is little ground water data available for the Northern Neck and Middle Peninsula, combined with the recent discovery of a bolide impact crater, radically alters the previous assumptions that were used to develop the existing coastal plain ground water flow model.

During the past year, DEQ has established working relationships with the USGS and planning district commissions to develop a strategy for increasing ground water management capabilities. The strategy provides for the collection of hydrogeologic information and the incorporation of this information into regional ground water flow models. The data will document the current ground water situation and serve as the basis

for the creation of new ground water management areas where needed. It will also enable DEQ to determine whether the Ground Water Act of 1992 is having the desired results.

Several activities will have to be undertaken if the state is to increase its knowledge of the ground water situation in this region. Mr. Treacy suggested that three interrelated efforts will be necessary. One should focus on the development of a DEQ ground water research-drilling program. This program would provide hydrogeologic information necessary to support revisions to the existing hydrogeologic model for the coastal plain. It will involve drilling a series of ground wells (research stations) in aquifers in the Northern Neck and Middle Peninsula. Hydrogeologic information would be collected from the research stations. The initial equipment costs will be approximately \$725,000, plus \$280,000 for annual operating costs. A second component of the program is to increase the state's ground water management capabilities by completing the USGS, DEQ, and Hampton Roads Planning District Commission (HRPDC) cooperative study of the impact of the Chesapeake Bay Bolide. The analysis of the meteor's impact on the ground water aquifers could begin this spring and would involve the drilling of four to five deep core holes. The total project cost is \$6.5 million over five years, with USGS contributing \$5.8 million, the HRPDC contributing \$365,000 and DEQ funding \$300,000 of the total costs. The third activity is a Coastal Plain ground water model study. This would be a cooperative DEQ/USGS effort. It represents an expansion of the existing cooperative effort, with the objective of revising the hydrogeologic model of the Coastal Plain through the collection of improved ground water data. The project would take six years to complete at a total cost over this period of \$2.4 million, with each agency contributing \$1.2 million. The agency had requested \$2.4 million over the next biennium to complete the various ground water studies; however, no funds were allocated in the Governor's budget.

The effort to update the ground water models for Eastern Virginia was strongly supported by Mr. John Carlock, Deputy Director for Physical Planning for the HRPDC. He informed the Commission that the HRPDC and its member local governments have long recognized the critical importance of ground water and the effective management of the resource to the region. Since 1986, the region's local governments, through HRPDC, have participated in a comprehensive regional ground water management program. This program involves (i) joint funding and technical collaboration with USGS on studies of the region's ground water resources, (ii) cooperation with DEQ in the development and refinement of the State's ground water management regulations and analytical tools, and (iii) regional technical support for local ground water development and management activities. The region's localities have expended in excess of \$1 million, plus staff time during the past 15 years in direct support of the regional program.

Specific concerns about saltwater intrusion and the lack of data about this potential problem caused the HRPDC and its member localities to work with the USGS to delineate the ground water flow in the coastal plain. In 1999, the USGS determined that the assumptions used to characterize ground water flow in the Coastal Plain are not adequate to evaluate the movement of salty ground water on the York-James Peninsula. Concurrently, the USGS evaluated the effects of the recently discovered Chesapeake Bay Impact Crater on the geology of the lower York-James Peninsula. These studies have, in conjunction with the ground water management experience of DEQ, led to the conclusion, according to Mr. Carlock, that the existing computer model of the Coastal



Plain is not adequate for proper management of the ground water resource in the region. He cited the following limitations of the current USGS flow model:

1. The model under-predicts the impacts of ground water withdrawal in Southeastern Virginia, which eventually may result in the misuse of a limited resource.
2. The recently discovered Chesapeake Bay impact crater changes some of the basic assumptions incorporated into the existing model. Ground water flow is much different than previously thought.
3. The northern and southern portions of the Coastal Plain aquifer system are experiencing impacts from increased pumping in both North Carolina and Maryland. The existing model does not account for the increased stresses from these regions.
4. Agricultural and domestic ground water uses, which may account for nearly 20 percent of the total ground water withdrawal from the Coastal Plain aquifer system, are not included in the existing model withdrawal database.
5. Ground water withdrawal in the Middle Peninsula and the Northern Neck is increasing. However, the hydrogeology of these two areas is not as well defined in the model as is the hydrogeology of the Lower Peninsula and Southeastern Virginia.
6. The existing model was designed to assess the regional impact of multiple large ground water withdrawals. The current DEQ ground water withdrawal regulations require ground water systems using an average of 10,000 gallons per day or more to operate under a permit. The scientific community recommends that the current model not be used to assess withdrawals of less than 1,000,000 gallons per day.
7. The current ground water flow model cannot be used to predict the change in ground water quality that may result from increased pumping of the aquifer system. This is an increasing concern to Southeastern Virginia as more water utilities rely on brackish ground water to meet community needs.

He concluded his presentation by requesting the Commission to recommend that state funds be allocated to assist in the financing of a five-year cooperative effort among the USGS, DEQ, and local communities to improve the ground water flow model for Eastern Virginia.

## **B. LOCAL WATER SUPPLY PLANNING AND FINANCING**

Several local government officials were given the opportunity to discuss their concerns regarding the planning for, and development of, drinking water supplies. Mr. Ray Lonick, Mayor of the Town of Orange, stated that the recent drought has focused attention on how the Town and County of Orange can protect and supplement its drinking water supplies. The current multi-jurisdictional system services in excess of 8,000 people. Approximately 2,800 jobs are dependent upon this system. The water system consists of a plant that withdraws 2 million to 3 million gallons per day of water from the Rapidan River. About 500,000 gallons per day is used by the Town of Orange and its residents and businesses. The water is transported down the Route 15 corridor through two 12-inch pipes for approximately 12 miles. Some of the industries served by the system include American Woodmark (300 employees), Liberty Fabrics (600 employees), American Press (270 employees), and Ridged-Kollman (225 employees). During the 1999 drought, the community came within two days of losing its only source of drinking water because the tributaries that feed the Rapidan River began drying up. On August 9, 1999, the water level actually dropped below the water pipe inlet, according to Mr. Lonick.

To address the water supply problem, for the short term, the town is examining the feasibility of drilling three wells at a cost of \$80,000-\$100,000. It is also looking at the option of working with other communities, particularly the Town of Culpeper, which would allow Orange to truck water from Culpeper's impoundment during emergency situations. However, this is a very expensive alternative. Rather than settle for such short term solutions, the town has been investigating long-term options. Various alternatives have been studied as far back as 1978. The one option that would ensure an available water supply to meet the needs of increasing population is the construction of an impoundment. Such an effort would require the cooperation of the Town of Orange, Orange County, the Rapidan Service Authority, and the Town of Gordonsville. Land would have to be acquired, the system designed, and management established. The project would have to be implemented in phases. The cost of such a project would be approximately \$15 million. Mr. Lonick indicated that there is 600 acres available as a reservoir site at a cost of \$750,000. By acquiring the land now, they would be protecting the areas ground water sources, and with proper planning, design, and construction, a system could be built that consisted of an impoundment and water treatment plant. However, the Town of Orange does not have the financial capacity to develop such a system and requested that the Commission recommend a budget amendment of \$500,000 per year to capitalize the newly created Water Supply Assistance Grant Fund (§ 32.1-171.2).

Mr. Gary Christie, executive director of the Rappahannock-Rapidan Planning District Commission, echoed many of the concerns raised by Mayor Lonick. The region represented by the PDC (Culpeper, Fauquier, Madison, and Rappahannock Counties) is rural, with the prominent activities being farming and other agricultural enterprises. The 126,000 people in the region are spread across a number of small communities and villages, with no local jurisdiction having a population of more than 10,000. The communities that have public water systems withdraw water from local rivers or use a system of wells to meet the public's water needs. As long as there is abundant rain, the water will be provided by these systems. However, during the summer of 1999, the

Rapidan Service Authority, which serves Madison, Green, and Orange Counties, was forced to impose mandatory water restrictions for more than 30 days, which prohibited nonessential water use throughout its service area. The drought raised awareness among elected officials and citizens regarding the need to ensure adequate water supplies. This has resulted in jurisdictions within the region to begin meeting to discuss regional water supply issues. Agreement has been reached on the importance of developing a regional master plan for source water management. A technical committee of water plant and authority managers has been formed with the aim of improving communication among utility providers. Mr. Christie suggested that (i) water supply, especially in rural areas, is and ought to be, a multi-jurisdictional regional issue, and (ii) regional water supply inventories and a regional plan for new supply sources be developed. He encouraged the Commission to make regional water supply planning assistance available by providing matching grants to localities and regions.

### C. VIRGINIA'S WATER SUPPLY: AN ASSESSMENT OF THE RESOURCE AND ITS MANAGEMENT

The attention focused on last summer's drought provided an opportunity to examine Virginia's system for managing its water resources. Dr. William Cox of the Department of Civil and Environmental Engineering at Virginia Polytechnic Institute and State University presented the following table, which he characterized as showing generally favorable water supply conditions:

**Comparison of Virginia's Water Supply and Water Demand**

Basin/Area	Supply (mgd)		Demand (mgd)	
	Avg.	1Q30	1980-86	2030
<b>Big Sandy</b>	832	6	7	15
<b>Chowan</b>	2,195	21	76	91
<b>Eastern Shore</b>	40	-	15	30
<b>James</b>	7,964	285	1,470	1,647
<b>New</b>	2,617	457	461	462
<b>Potomac</b>	2,481	159	308	401
<b>Rappahannock</b>	1,075	10	23	44
<b>Roanoke</b>	3,900	217	134	187
<b>Shenandoah</b>	1,644	151	98	121
<b>Tennessee</b>	2,605	179	45	61
<b>York</b>	2,036	27	37	69
<b>Total for State</b>	27,389	1,512	2,674	3,128

He injected a note of caution that water demand would increase despite efforts to mitigate the increase through water conservation measures. With increasing demand will come water-use conflicts, particularly in times of major drought conditions. Such conflicts will take place not only among those who want to take water out of the streams and rivers, but probably more often will occur between those who want to take water out of the streams and those who want the water to remain in the streams. These conflicts will result, according to Dr. Cox, in demands for such water resource development initiatives as the construction of reservoirs and water transfers across watershed or

political boundaries. He predicted that reservoir construction will not be in the form of major dams across large tributaries but rather off-stream impoundments that store floodwaters for future use. He suggested that these activities would be controversial and cause legal conflicts to arise, resulting in greater attention being paid to the state's current water supply management system.

He described the water management system as consisting of a number of components. The first of these is the provision of water supplies, which is essentially the role of local government. The effort to supply water should be based on water supply planning, which Dr. Cox characterized as "episodic" in Virginia. He noted that while water resources planning is conducted at all levels of government, it is particularly important at the state level. The second component of the management system is the allocation of water and the assigning of water rights. This is the responsibility of state government. However, other than in the two ground water management areas, water is allocated in Virginia through the passive approach of allowing water users to sue each other to resolve questions of who owns the water. Unlike Virginia, other states exercise regulatory authority over the use of their surface and groundwater resources. According to Dr. Cox, merely having an abundant flow of water resources does not guarantee that water needs will be met. The third component involves regulation of the construction and operation of facilities. All levels of government provide some type of regulation, whether it's in the form of (i) a locality's consent for its water supply to be used outside the locality's boundaries, (ii) the Virginia Health Department's drinking water regulations, (iii) the Department of Environmental Quality's Water Protection Permit, or (iv) the federal Clean Water Act's 404 permit.

Dr. Cox suggested that Virginia's "somewhat passive" approach to water supply planning and management has led to the federal government aggressively administering several environmental protection measures that, in effect, significantly constrain water supply development and results in an increase in the number of recent water allocation conflicts. He informed the Commission that enhanced state water supply planning is a necessary first step toward reversal of these undesirable trends. According to Dr. Cox, the state's role in water supply planning should be expanded beyond the traditional role of determining the amount of ground water available and the kinds of surface water developments that are feasible but should also include advanced warnings of potential supply problems. This means that the state should project water demand on a continuing basis. By comparing demand and supply needs, the state could develop necessary remedial actions. He emphasized that "the single most important factor affecting attainment of a desirable water supply future for Virginia (is) enhanced state water supply planning."

Dr. Cox suggested that, in addition to the state enhancing its ability to develop better water supply information, it should also assist public water supply providers by establishing performance standards for water systems. Currently, there are no guidelines to (i) measure the yield of existing supplies and (ii) determine the level of demand reduction that should be achieved before supply expansion can be justified. Without the benefit of standards or guidance regarding the acceptable levels of services, local utilities have been left to negotiate water supply issues with the federal government. It is Dr. Cox's contention that state government should act as a facilitator in resolving conflicts that may arise among local governments, between a locality and another state,

and between a locality and the federal government. In other words, after determining that a specific project is consistent with state guidelines and in the best interest of the public, the state should be an aggressive advocate on behalf of the locality's position.

#### **D. FUNDING FOR WATER SUPPLY AND WATER QUALITY INFORMATION**

Dr. Leonard Shabman, Director of the Virginia Water Resources Research Center, reported his efforts to bring the academic community, with its expertise in water resources, into the state's decision-making process. During 1999, the Center and DEQ, with the support of the Secretary of Natural Resources, developed a plan to initiate a partnership, with the goal of involving the scientific talent of the university community in providing water supply and water quality management information. The rationale for such a relationship is that staff resources at the state agencies are limited and can not develop and conduct all the studies and information needed to address the continuing competition for water supplies and the water quality management challenges posed by population and economic growth. Dr. Shabman believes a small investment of funds would be a cost-efficient means to substantially increase the information needed by the legislative and executive branches to make water-related policy decisions. Funding of \$170,000 over the biennium was proposed in the budget that the Secretary of Natural Resources forwarded to the Governor. However, the Governor's budget did not include the requested funds. Dr. Shabman asked the Commission to consider endorsing such a partnership and recommend a budget amendment of \$170,000 to fund such activities.

Dr. Shabman also presented an update on his study of the alternatives for providing drinking water supplies to isolated communities in Southwest Virginia (See House Document No. 67, 1999). The study examined the feasibility of various options of providing water supplies employing such techniques as use of mine-cavity water, water hauling, rainwater harvesting, and cistern collection. Dr. Shabman recommended that the Commission endorse the creation of a water specialist position in the coalfield counties that would provide technical assistance in these techniques. In its 1999 report to the Governor and General Assembly, the Commission recommended that the position be funded. The final budget did not include funding for the position and Dr. Shabman was again asking the Commission to endorse such funding.

### **III. RECOMMENDATIONS**

The Commission is charged, by statute, with examining water supply and allocation problems in the Commonwealth. Essential to any examination of these issues is to have information available, which provides the basis for establishing water policy for Virginia. During this year's deliberations, the Commission received testimony on the status of Virginia's water resources. The Commission believes that economic growth and development depends upon identifiable sources of adequate and safe water supplies. The effort by the state not only to identify reliable sources of water but to plan for the proper and best use of this resource has been limited, with one expert correctly characterizing it as "episodic." A greater commitment of resources will be required if the state is to address such priorities as (i) refining models of the ground water resources in Eastern Virginia, (ii) providing drinking water to isolated communities in Southwest Virginia, (iii) assisting local governments in the development of water systems, and (iii) resolving conflicts between water users. Therefore, the Commission recommends:

**Recommendation #1:** *That the General Assembly support a budget amendment of \$754,190 to establish seven positions to perform water supply planning. These persons would be responsible for developing models of water supply source capacities, developing water supply demand projections, determining safe yield of water supply sources, and performing cost estimates and environmental analyses on potential alternative water supply sources. The budget amendment should also include an additional \$64,750 for the purchase of computer and modular office workstations for the new positions.*

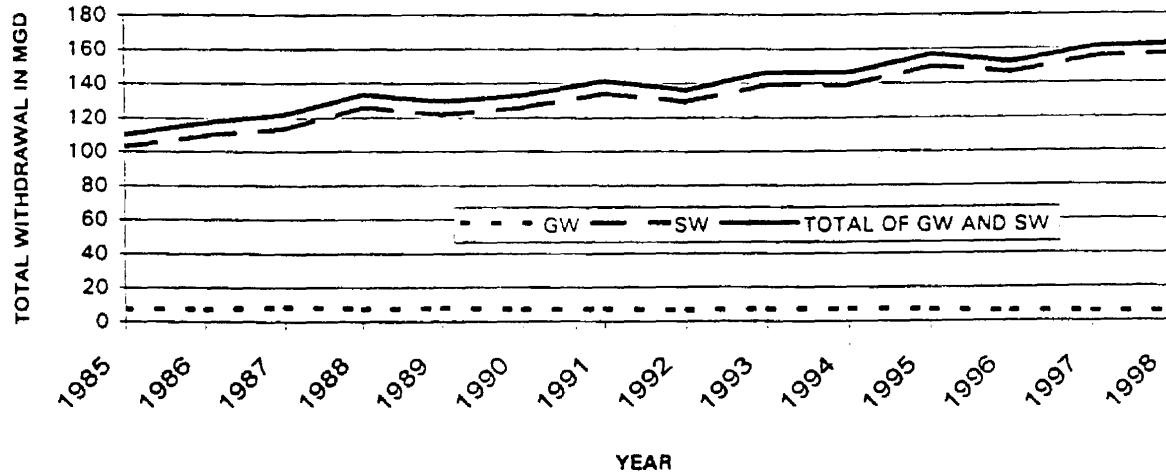
**Recommendation #2:** *That the General Assembly support a budget amendment of \$100,000 to the Virginia Resources Research Center for development and dissemination of technology to provide safe drinking water to isolated communities in Southwest Virginia and other areas of the state.*

Respectfully submitted,

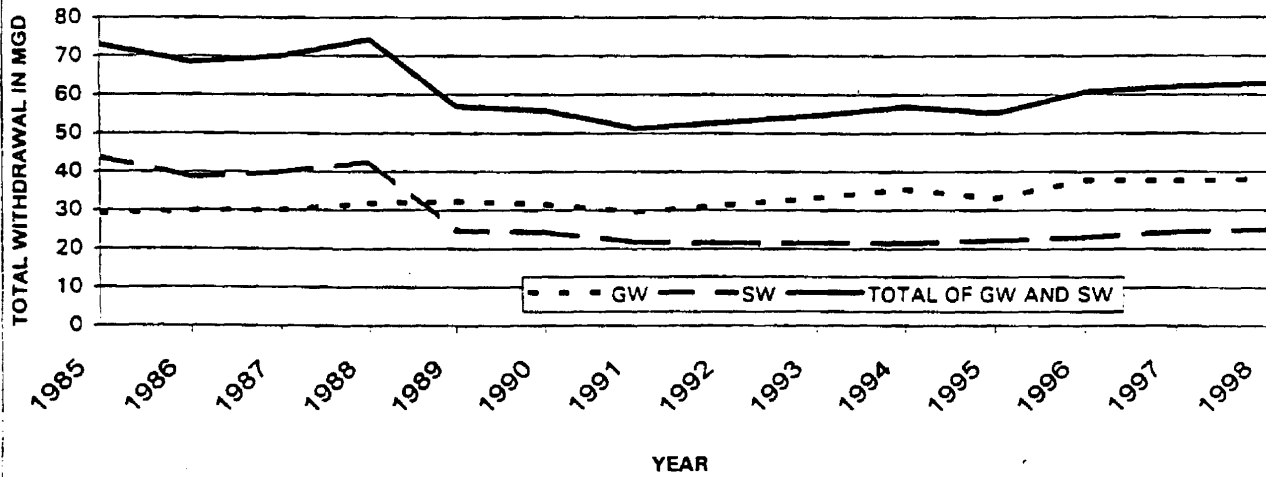
Senator Charles J. Colgan, Chairman  
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The Honorable Charles W. Ahrend  
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# Appendix

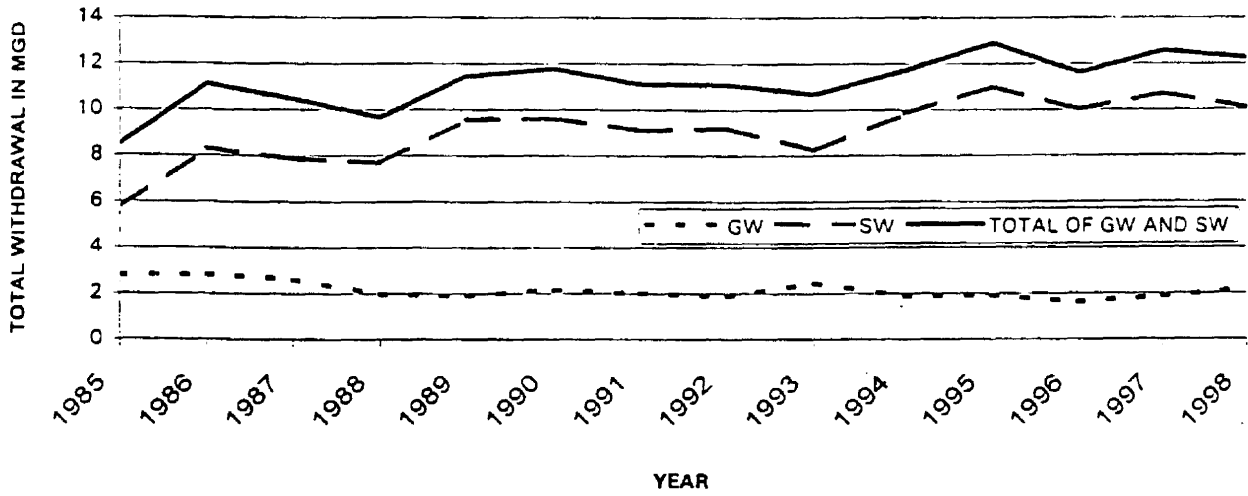
## FIGURE 4 - POTOMAC RIVER BASIN WITHDRAWALS FOR 1985-1998



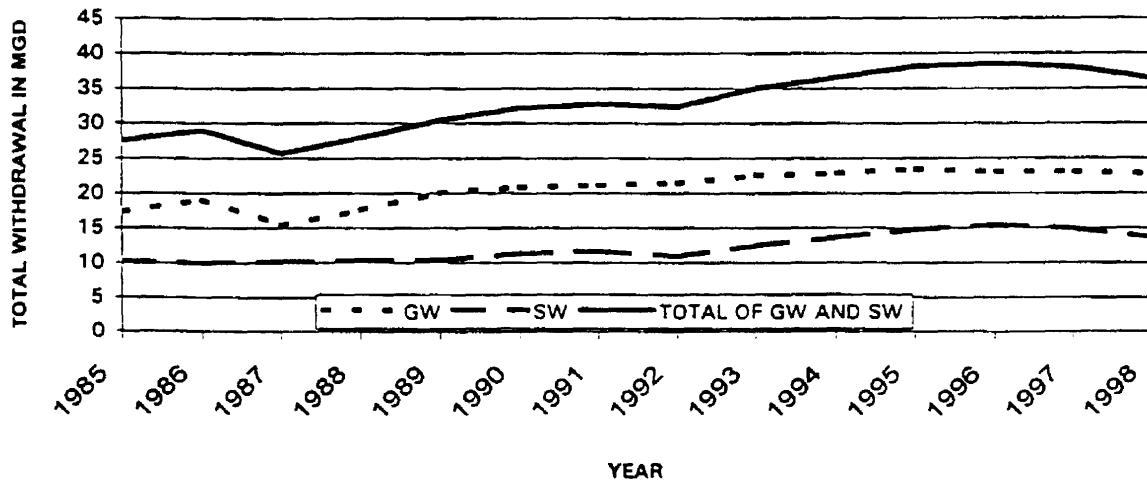
## FIGURE 5 - SHENANDOAH RIVER BASIN WITHDRAWALS FOR 1985-1998



**FIGURE 6 - RAPPAHANNOCK RIVER BASIN  
WITHDRAWALS FOR 1985-1998**

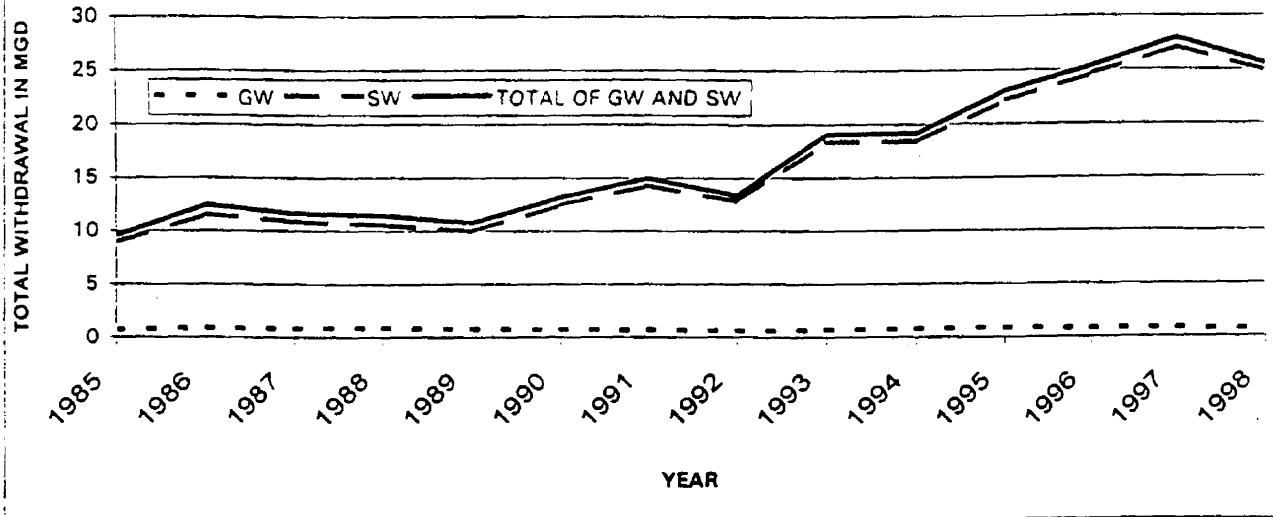


**FIGURE 7 - YORK RIVER BASIN WITHDRAWALS FOR  
1985-1998**

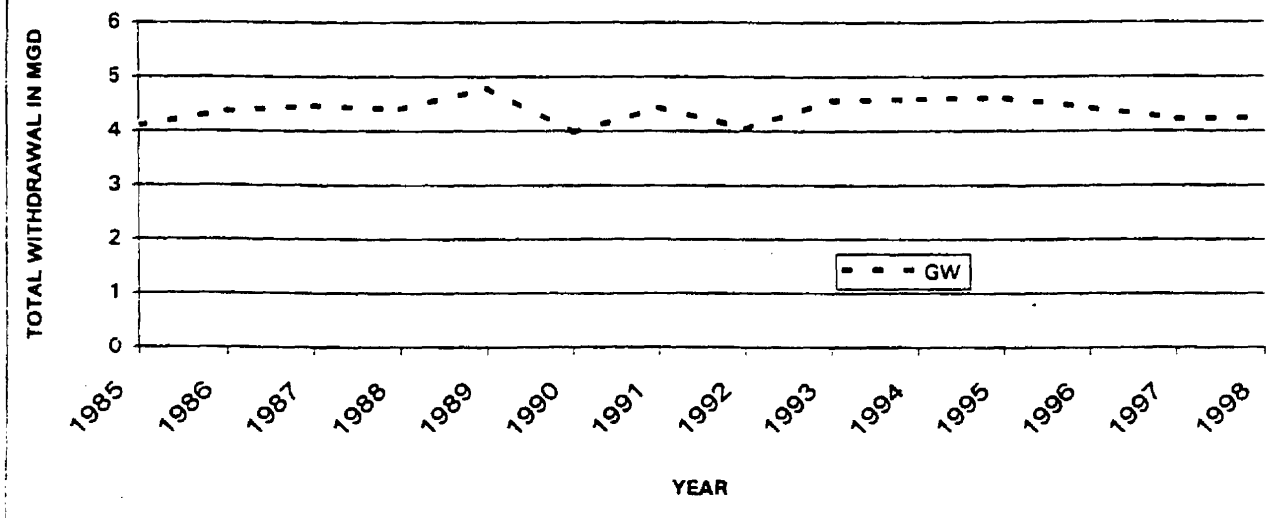




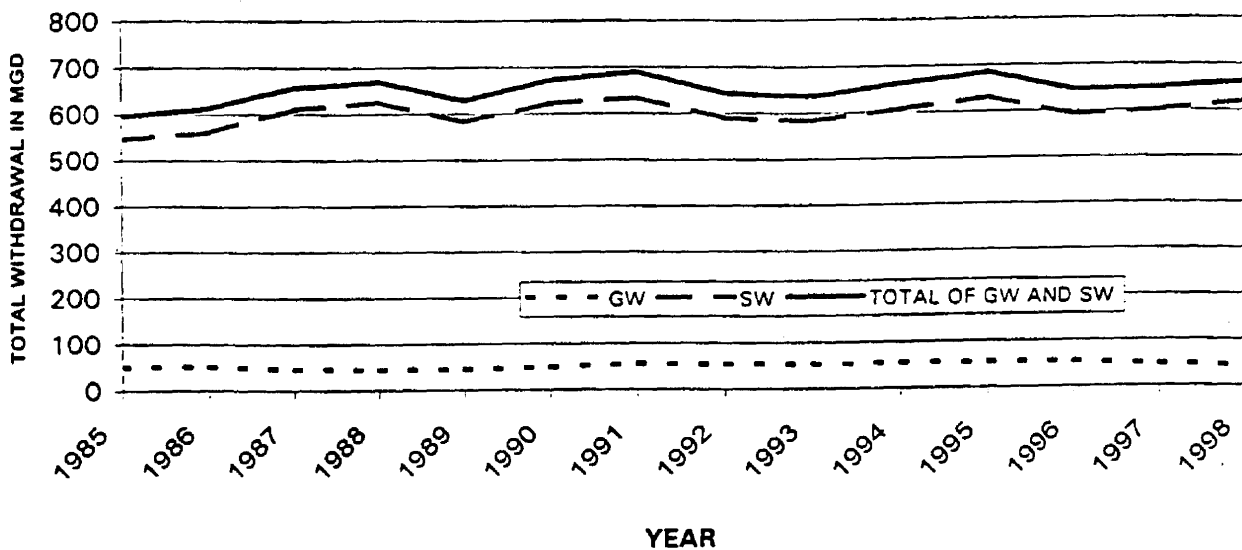
**FIGURE 8 - SMALL COASTAL RIVER BASIN  
WITHDRAWALS FOR 1985-1998**



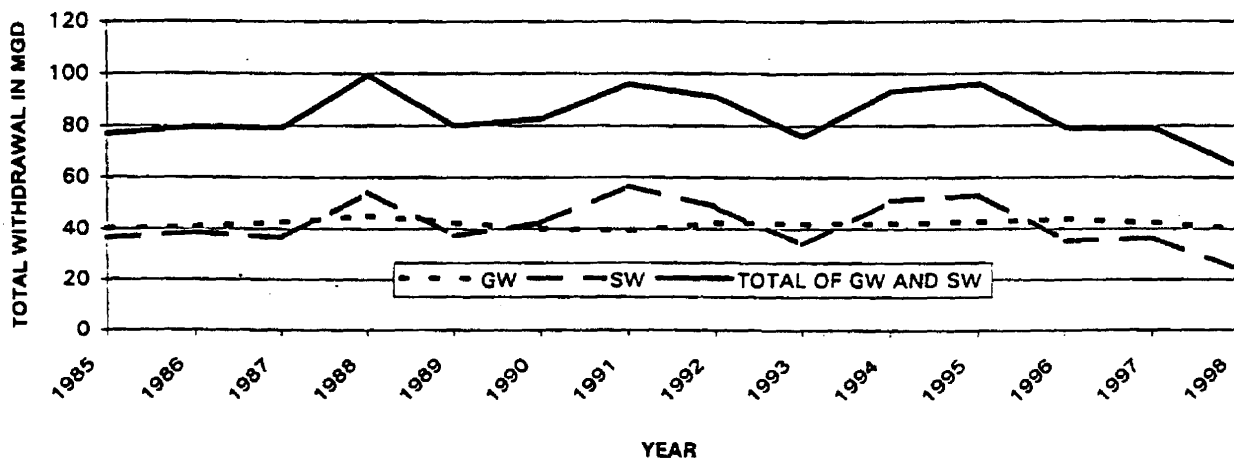
**FIGURE 9 - EASTERN SHORE WATER WITHDRAWALS  
FOR 1985-1998**



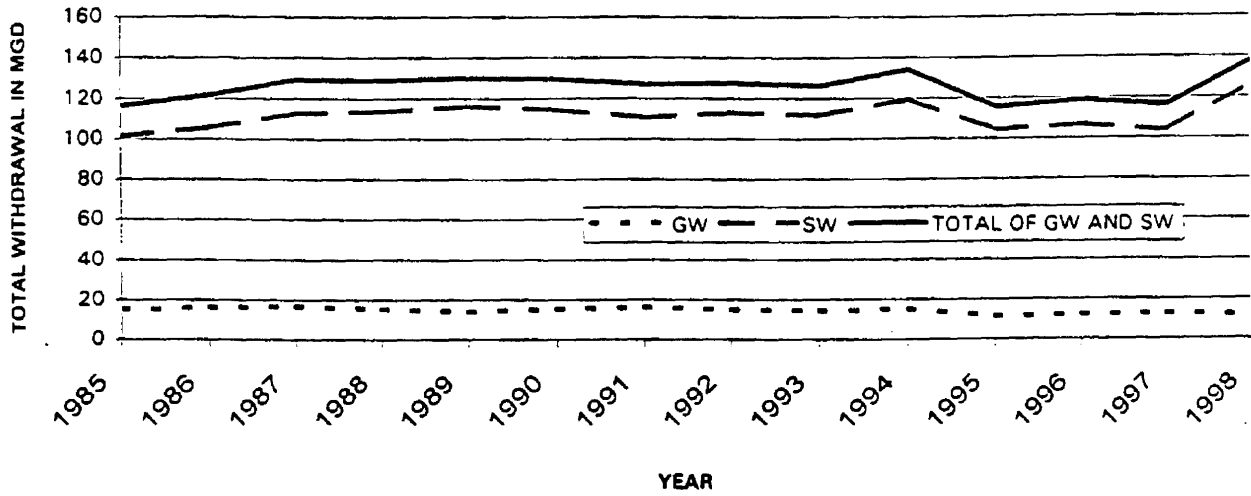
**FIGURE 10 - JAMES RIVER BASIN WITHDRAWALS FOR 1985-1998**



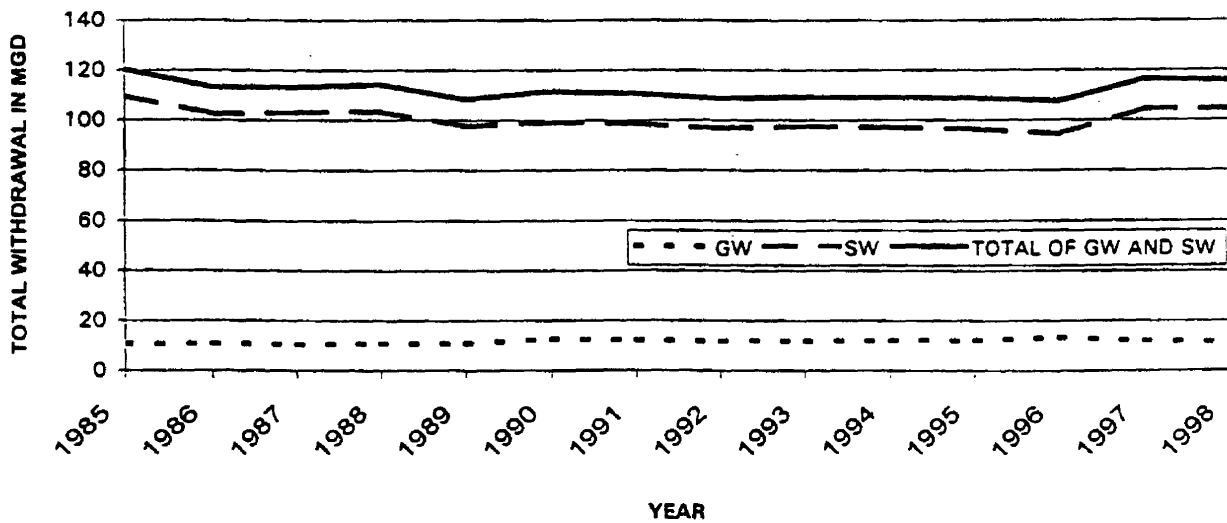
**FIGURE 11 - CHOWAN RIVER BASIN WITHDRAWALS FOR 1985-1998**



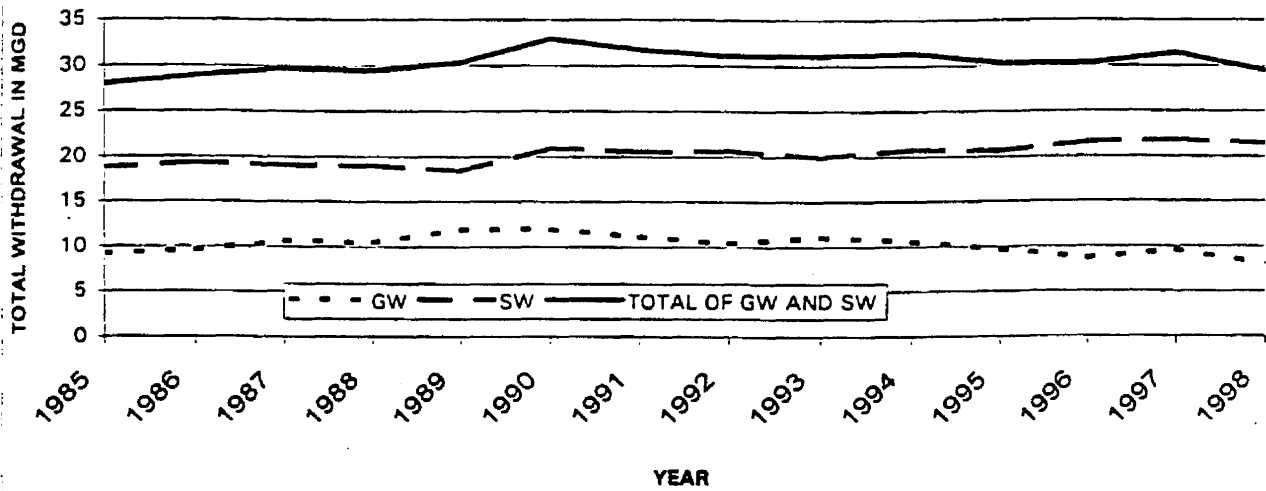
**FIGURE 12 - ROANOKE RIVER BASIN WITHDRAWALS FOR 1985-1998**



**FIGURE 13 - NEW RIVER BASIN WITHDRAWALS FOR 1985-1998**



**FIGURE 14 - TENNESSEE RIVER BASIN WITHDRAWALS  
FOR 1985-1998**



**FIGURE 15 - BIG SANDY RIVER BASIN WITHDRAWALS  
FOR 1985-1998**

