INTERIM REPORT OF

STATE WATER STUDY COMMISSION

TO

THE GOVERNOR

AND

THE GENERAL ASSEMBLY OF VIRGINIA

SENATE DOCUMENT NO. 21

COMMONWEALTH OF VIRGINIA
DIVISION OF PURCHASES AND SUPPLY
RICHMOND
1979

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Interim Report of the

State Water Study Commission

To

The Governor and the General Assembly of Virginia

Richmond, Virginia

December, 1978

To: Honorable John N. Dalton, Governor of Virginia

and

The General Assembly of Virginia

I. STATEMENT OF CHAIRMAN

The 1978 General Assembly adopted Senate Joint Resolution No. 1 which calls for the continued study and analysis of the water supply and allocation problems of the entire Commonwealth, with a report, including recommended solutions and such implementing legislation as deemed necessary and advisable. A 12-member State Water Study Commission was appointed to accomplish this task.

The Commission has held eight public hearings and has heard more than 20 hours of testimony in an effort to identify and evaluate possible alternatives for the water supply problems of the State. However, the magnitude and complexity of the work presents a formidable task and the Commission recognizes that it indeed has much additional inquiries, analyses, and investigations yet to be accomplished in the preparation of its final report due no later than December 1, 1979.

This interim report presents the status of the work of the Commission subsequent to its report December, 1977.

Respectfully submitted,

J. Lewis Rawls, Jr.

II. INTRODUCTION

The 1978 Session of the General Assembly adopted Senate Joint Resolution No. 1 which assigned responsibility to analyze ways to resolve water supply and allocation problems of the entire Commonwealth and to report such measures as will promote the public interest, making such recommendations, including legislation, as necessary and desirable. The resolution is set out as follows:

SENATE JOINT RESOLUTION NO. 1

WHEREAS, surface and groundwaters are recognized as an important and essential resource vital to the health, safety and economic welfare of the people of the Commonwealth; and

WHEREAS, the State Water Study Commission was created in nineteen hundred seventy-seven pursuant to House Joint Resolution No. 236 to recommend to the General Assembly ways to address water supply and allocation problems, particularly in Northern and Southeastern Virginia; and

WHEREAS, the effects of the drought of the summer of nineteen hundred seventy-seven and Commission findings during that period have shown that water supply and allocation problems exist throughout the State and are not confined to any geographical section; and

WHEREAS, the State Water Study Commission has observed that many of the present laws, doctrines, policies and administrative practices of the Commonwealth applicable to the use and allocation of the water resources of the Commonwealth may be inadequate to assure economically, environmentally and socially effective management; and

WHEREAS, there exist critical present and potential water shortages in various areas of the Commonwealth; and

WHEREAS, although the Commission worked diligently, much work remains to be done; now, therefore, be it

RESOLVED by the Senate of Virginia, the House of Delegates concurring, That the State Water Study Commission is hereby continued. The Commission shall continue its study and shall thoroughly analyze the water supply and allocation problems of the entire Commonwealth, making such recommendations, including legislation, as it deems necessary and advisable. The State Water Control Board is directed to provide staffing and such other assistance as is deemed necessary by the Commission in order to complete its task. All agencies of the State shall assist the Commission upon request.

The Commission shall be composed of twelve members to be appointed as follows: the Committee on Privileges and Elections of the Senate shall appoint three persons from the membership of the Senate; the Speaker of the House of Delegates shall appoint five members from the membership thereof; and the Governor shall appoint four persons from the State at large. If a vacancy occurs for any reason, it shall be filled in the same manner as the appointment of the original members. When filling appointments, the appointing authority shall recognize that the water supply and allocation problems are interrelated and are Statewide in scope rather than being confined to any specific region or area.

All members of the Commission shall be entitled to such compensation as is set forth in § 14.1-18 for each day or part thereof devoted to their duties as members of the Commission. In addition to such compensation, all members shall be reimbursed for the actual and necessary expenses incurred in the performance of Commission duties. For these purposes and for such consultants and other services as the Commission may require, there is hereby allocated from the general appropriation to the General Assembly the sum of three hundred twenty-five thousand dollars.

The Commission shall make an interim report to the Governor and the General Assembly no later than December one, nineteen hundred seventy-eight and a final report no later than December one, nineteen hundred seventy-nine, and shall set forth in each report such measures as will promote the public interest and be conducive to the needs and well-being of the Commonwealth.

III. THE COMMISSION

J. Lewis Rawls, Jr. of Suffolk, a member of the Senate of Virginia, continued as Chairman. James H. Dillard, II, of Fairfax, continued as Vice-Chairman.

In addition to the Chairman and Vice Chairman, Charles J. Colgan of Manassas, and Wiley F. Mitchell, Jr. of Alexandria, members of the Senate, were appointed to the Commission. Also appointed to serve from the House of Delegates were Gerald L. Baliles of Richmond, J. Paul Councill, Jr. of Franklin, Glenn B. McClanan of Virginia Beach, Gary R. Myers of Alexandria, and Lewis W. Parker of South Hill.

The following citizens were appointed pursuant to the resolution to serve on the Commission:

Louis L. Guy, Jr. of Annandale, Robert R. Peters of Norfolk, and George W. Williams of Charlottesville. George M. Cornell of Suffolk serves as an ex-officio member. Bragdon R. Bowling, Jr. and Sieglinde F. Nix of the Division of Legislative Services, and members of the State Water Control Board served as staff to the Commission.

Following appointment and organization of the Commission, it was agreed that in order to make the most effective use of the membership of the Commission, and to insure that the major items of the resolution charge would be dealt with properly, the Commission decided that it should be divided into three subcommittees. Subcommittees were assigned responsibilities for investigation and recommendations under the followiing major headings: Northern Virginia Water Supply and Allocation Problems, Middle Virginia Water Supply and Allocation Problems, and Southeastern Virginia Water Supply and Allocation Problems. In addition, a Statewide Water Supply and Allocation Problems Committee was established. A legal Problems Committee was established to give consideration to questions pertinent to implementation of solutions to satisfy water supply and allocation problems identified.

As a result of the expanded task assigned by Senate Joint Resolution No. 1, the 1978 Study Commission held eight public hearings throughout the State to learn of water resource problems that may not have received attention by the 1977 Commission. Beginning on June 19, 1978 the Commission held public hearings in Wise, Roanoke, Harrisonburg, Fredericksburg, Accomac, Danville, Virginia Beach, and in Annandale.

The subjects that seemed most prominent in the minds of those attending the hearings concerned finance issues and interbasin transfer (with advocates for and against), and problems relative to compliance with a multiplicity of administrative measures required in the environmental protection of streams associated with potential water supply sources.

IV. STATUS OF STUDIES AND ANALYSES

A. Statewide

General subjects of concern throughout the State include need to define policy regarding transfer of water from one geographical area to another, need for assistance in funding water projects, and need to protect groundwater recharge areas. Citizens in rural and urban areas appear to hold diverging opinions regarding interbasin transfer of water; however, desire for financial support and assistance is almost universal. Conflicts arising from scenic river and wilderness uses of streams are of concern to rural groups while execessive population growth is a subject of urban concern. Scenic river designation seemed to be favored by recreationalists while riparian land owners held opposing views. The various subjects of concern manifest themselves in markedly different ways depending on the area of the State involved.

In summary, water supply and allocation problems with statewide significance appear in most part, with notable exceptions, to be those associated with the financing of treatment, storage, and distribution systems. The availability of raw water sources appears to be of lesser significance.

The final report of the State Drought Emergency Task Force, which reported activities during the 1977 drought in Virginia, contained a list of twenty-six public water systems that were then thought to have experienced serious drought-related problems. Although this list of twenty-six has been very frequently referred to since then, it is recognized to be incomplete, and it does not reflect consistently, serious drought-related problems. Table I contains a list of the localities and respective problems resulting from the 1977 drought as reported by the Statewide Water Supply and Allocation Problems Committee.

B. Abstract of Testimony Presented during Hearings held by the Commission

1. Wise. At the June 19, 1978 hearing held at Wise, testimony received included an expression of need by Mr. William Thompson of Thompson and Litton, Inc., for financial assistance to implement a proposed regional water supply plan. The need for financial assistance to provide water supply systems to low income areas was brought to the attention of the Commission by Ms. Betty Spencer of the Mountain Community Action Program, Division of Neighborhood Development, Marion, Virginia, by Mr. Millard Eddy of the Community Action Center in Marion, by Mr. Bill Stoltz of the

John Flannagan Water Authority, by Mr. J. T. Guin of Dungannon, and by Mr. Tom Taylor of the Mount Rogers Planning District. Mr. Thompson and other witnesses presented testimony giving an account of heavy demands being placed upon water supply systems by expanding coal mining activities. Note was made of the late summer and early autumn lack of rainfall in Southwest Virginia which adversely affected streamflow, groundwater levels, and water supply systems dependent on them as sources of raw water supply in that area.

2. Roanoke. Testimony received June 22, 1978 during the Roanoke hearing included recommendations by Colonel J. Leo Bourassa of Huddleston, Virginia, relating to

TABLE I

LIST OF TWENTY-SIX PUBLIC WATER SYSTEMS EXPERIENCING SERIOUS PROBLEMS DURING THE DROUGHT OF 1977

(As listed in the final report of the State Drought Emergency Task Force dated January 18, 1978)

Water Supply	Approximate Population Served	SOURCE Surface (S) Ground (G Mixed M	Problems Identified*
City of Norfolk			Distribution to localities dependent upon the Norfolk System for water supply
Mineral	1,200	G	Period water shortages during drought conditions
Louisa	1,200	G	Period water shortages during drought conditions
Dilwyn	500	G	Inadequate source capacity
Gretna	2,026	S	Inadequate finished water storage facilities limit future industrial growth and require longer hours of operation of water plant
Stuart	1,800	M	A new treatment plant is being designed to replace two spring-fed ponds that feed directly into the Town's distribution system
Glenn-Aire	146	G	Periodic water shortages
Rivanna Water & Sewage Authority		S	Periodic water shortage during extreme drought conditions
Charlotte Court House	680	G	Need additional source
Collinsville	7,200	G	Need additional sources and storage
Fairfax County Water Authority	400,000	M	A limited source of water supply is available in the Occoquan Reservoir resulting in mandatory water use restrictions during drought conditions.

TABLE I (Continued)

Water Supply	Approximate Population Served	SOURCE Surface (S) Ground (G) Mixed (M)	Problems Identified*
City of Manassas Park	7,000	G	The concentrations of sulphate and total residue in water from the City wells often exceeds the recommended esthetic limits
Stanley	1,208	G	No significant problems
Warrenton	4,027	M	No major problems identified
Washington	460	G	No major problems identified
Rapidan Service Authority	1,340	M	No significant problems
Woodstock	2,388	S	No significant problems
Strasburg	2,431	M	No significant problems
Monterey	1,056	G	Lack of sufficient water supply during dry weather. Poor conditions of water system.
City of Buena Vista	6,800	G	Lack of sufficient water supply to serve the City
Grottoes	1,840	G	No significant problems identified
Russell County Water Sewer Authority (Banner's Corner Area)	200	G	High turbidity in spring after rain, inadequate storage capacity
Mutter Subdivision	75	G	No major problems identified
Lebanon	4,600	G	Water shortage frequently occurs during summer droughts. Springs and well generally unreliable (construction of water treatment plant underway)
Cedar Bluff	2,000	G and Purchased	Unknown groundwater source, inadequate supply
Hilton No. 2	250	S	Inadequate (no) treatment

*Problems as identified in the condensed lists of public water supplies and their problems that were prepared by the Bureau of Water Supply Engineering of the Virginia Department of Health in early 1978 for the Statewide Water Supply and Allocations Problems Committee.

the reuse of treated wastewater as an alternative to increasing demands upon water supply sources by additional withdrawals. Preference for all water supply problem solutions at the local level with minimal State and Federal administrative and legal intermix was emphasized with strong feeling and intense expression by Mr. Lou Rossie, Executive Director of the Roanoke County Public Service Authority and Utility Department Director for Roanoke County, and by Mr. Sluss, head of the Roanoke City Water Department. Reservation of surface water impoundment sites for future use was cited as a water supply problem in need of satisfaction by Mr. Rossie and by Mr. Parks of the Roanoke County Board of Supervisors. They, as well as Mr. Sluss, also expressed concern relative to potential conflicts with respect to intra-agency interests, authorities and responsibilities in water supply and water pollution control regulatory matters.

3. Harrisonburg. The hearing held July 6, 1978 brought forth testimony from Mr. James W. Givens, representing the Winchester City Council, that expressed misgivings relative to transfer of water from one geographic area of the State to another to the detriment of the area from which water is exported. Testimony was offered by Mr. E. Lewis Garrett, Jr., Senior Engineer of the Environmental Control Group representing DuPont Textile Fibers Company of Waynesboro, concerning the adverse effects on downstream areas of consumptive uses further upstream. The need for utilization of headwater reservoirs planned with cooperation and funding from Federal and State sources was expressed by Mr. Marvin Milam, City Manager of Harrisonburg and Mr. Harry Parrott of the Forest Service. Mr. Milam's testimony expressed apprehension relative to the diminution of local control over water supplies in the event of water allocation by an entity at the State level.

4. Fredericksburg. Diverse views were heard in testimony received at the July 10, 1978 hearing held in Fredericksburg. State agencies were urged by Mr. Lawrence R. Quarles, Chairman, Board of Directors, Rivanna Water and Sewer Authority, to be more active in water supply matters while at the same hearing the view was expressed that local communities should not be encumbered by State regulatory agencies in matters of water supply and local community growth. Testimony was presented in favor of (Mr. Quarles and Mr. Daniel V. Poppen, Stafford County Planning Commission) and in opposition to (Dr. John Spivey, MD of Fredericksburg, Dr. F. B. Harrington, MD of Fredericksburg, and Mr. Frank E. Brooks of Fredericksburg) impoundments for water supply with divergent views concerning water supply and recreational values associated with freeflowing streams versus that provided by water supply impoundments. The view was expressed by Mr. Daniel Poppen in testimony that provision of large supplies of water in advance of need may engender the adverse effects of unwanted growth in industry and population, while control of water resources may discourage population concentrations.

In addition to the hearing held by the Commission in Fredericksburg, on August 2, 1978, the Middle Virginia Subcommittee of the Commission held a meeting during which, among other subjects, a progress report was heard concerning the Water Supply Study authorized by the Rappahannock Service Authority and during which a request was made for funding in the amount of $80,000 to assist localities in completing the last two phases of the three-phase study authorized by the Authority. At that hearing, the Corps of Engineers gave a progress report of studies of the area conducted under provisions of the Water Resrouces Development Act of 1974.

5. Accomac. Testimony presented at the hearing held in Accomac on July 19, 1978 was delivered principally by Mr. John C. Poulson, Accomac's Commonwealth Attorney, speaking for the Accomac Board of Supervisors, and by Mr. Harry L. Palmer, Maryland-Virginia Complex Manager for Perdue, Incorporated. The speakers revealed dissatisfaction with Accomack County having been designated a groundwater management area under the provisions of the Groundwater Act of 1973. Testimony inconsistent with that view was expressed by Mr. Eugene Siudyla, Geologist of the State Water Control Board, by Mr. Allen R. Hamner of the State Health Department, and Mr. Eugene Taylor of the Eastern Shore Soil and Water Conservation District, and by area residents, Mr. Sheppard Davis and Mr. C. B. DeGavre. They were concerned with the reduced yields in wells caused by increased pumpage from adjacent wells. Testimony included expressions by area residents of grave concern relative to the paucity of basic data available to assess groundwater occurrence, availability, quantity and quality.

6. Danville. On July 26, 1978 at the hearing held in Danville, testimony was presented by Mr. G. B. Adams, Jr., of E.I. DuPont de Nemours and Company, Martinsville in favor of legislation to require the determination of consequences of interbasin transfer of water with opportunity for those who would be affected by such transfers to be heard, prior to the implementation of a proposal to

transfer water from one geographic area to another and to include provision for judicial review of administrative determinations involving the interbasin transfer of water. Concern was expressed by Mr. R. C. Gourley and Mr. B. C. Dungan of Dan River, Incorporated, by Mr. Robert L. Thomas of Lorillard Company, by Mr. B. M. Cox of Goodyear Company, by Mr. Ken Bowyer of U. S. Gypsum Company, and by Mr. Herbert Dawson representing the city of Danville in testimony presented relative to the diminution in quantity and quality of water in Virginia streams caused by diversions in North Carolina of interstate waters, and to the introduction in North Carolina of spent water into interstate streams flowing into Virginia. There was testimony presented at that hearing by Mr. G. B. Adams of the DuPont Company relative to the adverse effects of varying river flows caused by variable flow release rates from hydroelectric power generating reservoirs. Testimony by Mr. Adams of the DuPont Company also brought out the spectre of the potential adverse effect on industry of interbasin transfers and the ability of industry to comply with State and federal clean air and water standards.

7. Virginia Beach. At the August 7, 1978 Virginia Beach hearing, Virginia Beach Mayor Pat Standing urged the State to move affirmatively to manage, allocate, and distribute the water resources of the State. Mayor Standing expressed his opinion that the growth of the City of Virginia Beach would be curtailed in the absence of available water and that growth would be largely involuntary with water available in sufficient quantity. Interconnection of existing water supply sources was advocated in testimony by Mr. Norman Massey, Norfolk's Assistant City Manager, while opposing views also were presented relative to the benefits of regional water systems. Growth management, as opposed to growth accomodation, was advocated by Delegate Evelyn M. Hailey of the City of Norfolk. She also expressed strong objections to the interbasin transfer of water. Concentrated development in coastal areas was viewed by Delegate Hailey as adverse to the limited natural resources available in such areas.

8. Annandale. At the hearing held in Annandale on September 19, 1978, Mr. J. J. Corbalis, Jr. of the Fairfax County Water Authority, presented testimony advocating the position that water supply alternatives in that area had been defined adequately and efforts now should be directed toward legislation which would provide for: (1) a state water appropriation permit system, including interbasin transfer; (2) expansion of the procedure for State review and approval of water supply impoundments; (3) the delegation to a State agency of responsibility for the non-federal share of federally funded water projects; and (4) the establishment of a State authority to acquire lands to reserve for future water impoundment projects. Mr. V. Allen Young, Jr. of the City of Manassas Park recommended the careful assessment of costs involved in regional water supply systems with the opinion voiced that such systems may not be as cost effective as alternative local systems. Opposition to interbsin transfer was voiced by Ms. Shirley Zeinith of Alexandria, who stated a preference for water users locating where water supplies are as opposed to exporting water to areas outside water supply areas. Several witnesses presented testimony with opposing views relative to this question. Marie B. Travesky of the Fairfax County Board of Supervisors testified in support of the efforts of the Commission and urged the Commission to consider recommending legislation to protect groundwater recharge areas.

V. WATER SUPPLY ASSESSMENT IN

SELECTED AREAS OF THE STATE

A. Northern Virginia

The Northern Virginia Subcommittee met numerous times during the year and brought together those entitites invloved with trying to solve the water supply problems of Northern Virginia and fulfill the recommendations of the 1977 report to the General Assembly. Several groups have undertaken an in-depth analysis of the Commission's 1977 recommendations in order to determine and implement short and long range alternatives toward supplying adequate water to Northern Virginia. The Northern Virginia Subcommittee has taken positions regarding such issues as population demand, water usage rates, the hydrologic flow periods, and conservation means. These criteria will be used by the Subcommittee to analyze the pending studies to determine which alternatives will best resolve both the short-term and projected long-term water supply needs of Northern Virginia.

There are three major supply systems serving the Northern Virginia jurisdictions. Those systems are the Goose Creek Reservoir which supplies Fairfax City, the Town of Herndon and portions of eastern Loudoun County; the Washington Aqueduct System which supplies Potomac River water to Arlington County, northeastern Fairfax County and the City of Falls Church; and the Occoquan Reservoir which provides treated water by the Fairfax County Water Authority to the City of Alexandria, most of Fairfax County, and the eastern portions of Prince William County. In the past year, the Fairfax County Water Authority has expanded finished water interconnections which will allow a maximum of eighteen million gallons per day of added supply to their systems through arrangements with Falls Church and Arlington County. This action provides an added degree of defense for the area against the chance of severe droughts, or drought restrictions should there be an occurrence of the 1977 low flow experienced in the Occoquan Reservoir. However, it should be noted that a severe drought over the Virginia, Maryland, and West Virginia drainage areas of the Potomac River Basin in concert with a severe drought in the Occoquan Watershed would essentially eliminate the availability of the additional eighteen million gallons per day.

The Fairfax County Water Authority's water interconnections with Arlington County and Falls Church are one of several approaches either implemented or under analysis for alleviating the short term drought problem. The 1977-1978 General Assembly approved House Bill No. 469 which allows localities to mandate the use of water saving devices and appliances in new construction. The Fairfax County Water Authority is pursuing adoption of such codes and has already implemented rate structures to encourage water conservation. The Northern Virginia Water Cooperative Association was formed during the summer of 1978 with the intention of preparing for adequate finished water for all Northern Virginia jurisdictions during drought or emergency situations. The Association is made up of eight Northern Virignia jurisdictions and agencies and is served by the Northern Virginia Planning District Commission as secretariat. Currently, they are working on the development of a standard water sharing agreement and a regional water system map.

The long term solutions can be achieved by implementation of one or more of the four recommendations for raw water augmentation made in the 1977 Commission report. These recommendations include the Shenandoah Pumpover, a one-way pipe from the Potomac River to Cub Run, and a reversible pipeline from the proposed Herndon treatment plant to the Occoquan plant. The fourth alternative for increasing the regional raw water supply is raising the Occoquan Dam by five feet. The following is the current status of studies involving the Commission's four recommended solutions for providing long-term raw water supplies as well as several other alternatives and alternative components. The Northern Virginia Subcommittee recognizes the urgency of augmenting Northern Virginia's raw water supply and will make its final recommendation pending completion of the studies.

1. The U.S. Army Corps of Engineers has undertaken the study of the Shenandoah Pumpover, the reversible pumpover from the Potomac River to the Occoquan Reservoir, and the augmentation of the Occoquan via pipeline from the Potomac River to Cub Run in order to determine how to best augment the raw water supplies of Northern Virginia. The Corps is expected to have a draft of their final report on this project by August, 1979. The Corps of Engineers will also incorporate work completed by the Interstate Commission on the Potomac River Basin, concerning both raw and finished water interconnections. The Corps has also been requested by the State Water Control Board to determine the groundwater potential of the western slope of the Blue Ridge Mountains in the Warren-Clarke County area; however, the Corps has advised that inadequate funding will most likely cause this study to receive a low priority.

2. The Fairfax County Water Authority has obtained permission from regulatory authorities to construct a raw water intake on the Potomac River. The last remaining permit was issued by the Corps of Engineers on July 21, 1978, and actual construction is expected to begin in the spring of 1979. On-site grading has begun and an archeological survey is beng developed. Potomac River water is anticipated to be available by the summer of 1981 and will relieve substantial demand placed on the current Occoquan system. In addition, the Fairfax County Water Authority has hired consultants to determine the feasibility of raising the Occoquan Reservoir Dam to provide additional storage. The report is due to be completed in December, 1978. The Fairfax County Water Authority has completed a feasibility study of the Cedar Run Reservoir as proposed by Prince William County. The report concludes that a dam elevation of one hundred eighty feet and a release rate of 0.2 cfs per square mile with priority given to release rate will increase the water supply in the Occoquan Reservoir, but will not meet Prince

William County's year 2000 raw water needs. All other options analyzed either reduced the safe yield of the Occoquan and/or did not meet Prince William County's water needs. Also, the Fairfax County Water Authority is evaluating the possible use of the Vulcan Quarry, adjacent to their water treatment plant on the Occoquan for settling of their back-wash water from the Occoquan water treatment plant. This will allow for use of the clean water for recycling through their treatment system. Additional storage sites are also being inventoried and analyzed for their availability and usage as storage facilities to augment available water supplies.

3. The U.S. Geological Survey is undertaking a program for testing the groundwater potential of the aquifers which are closer to the Potomac River and in the eastern part of the Northern Virginia area. It should also be mentioned that the Fairfax County Water Authority has undertaken the drilling of some wells to determine the potential for use of groundwater in some areas of their county.

4. The Interstate Commission on the Potomac River Basin of which Virginia is a member has provided studies on raw water interconnections and finished water interconnections applicable to the entire Washington Metropolitan area, a significant portion of which Northern Virginia comprises. It is the purpose of these reports to investigate the feasibility of interconnections and operating rules as alternatives for meeting the water demands of the Washington Metropolitan area. A thorough analysis of these reports has not been made nor comments provided, pending completion of the Corps of Engineers Metropolitan Washington Area Water Supply Study.

In summary, the current work by the Corps of Engineers, Fairfax County Water Authority, U.S. Geological Survey, and the Northern Virginia Water Cooperative Association will provide the data necessary for the Northern Virginia Subcommittee to make its final recommendations for meeting the areas short-term and projected long-term water supply needs. The Subcommittee has been very active in pursuing the 1977 report recommendations with the assistance of the State Water Control Board staff regarding planning issues. The Subcommittee looks forward to completing a plan for the short and long term water supply problems of Northern Virginia and report thereon in December, 1979. This timetable is dependent on the detailed analysis of alternatives contained in the Corps' report being available for the Commission's review.

B. Southeastern Virginia

This section of the report dealing with water supply and allocation problems in Southeastern Virginia forms the basic data section of the study effort in that area and includes a description of the study area, definition of the water supply problems in the study area, alternative programs for the long-term problem solution, and early action alternatives available for application to the short-term problem solution.

The geographical area under study includes that land area within the boundaries of Planning District Commmission 20 in which lie the Counties of Isle of Wight and Southampton and the Cities of Chesapeake, Franklin, Norfolk, Portsmouth, Suffolk and Virginia Beach. The water supply demand area embraces the eight political subdivisions situated within the boundaries of Planning District Commission 20.

The water supply areas involved in the study vary depending upon the particular alternative considered. Potential supply areas include surface water, ocean water, and groundwater from interbasin, intrabasin, interstate and intrastate sources.

Characteristically, the water supply demand varies among political subdivisions, from less than 100 gallons per capita per day to more than 150 gallons per capita per day, while the percentage of population served by public water supply systems varies from about 50 percent in less urban areas to 100 percent in urban communities of considerable population density.

The Cities of Norfolk and Portsmouth operate and maintain the two major public water systems within the boundaries of Planning District Commission 20. Surplus potable water is delivered on a contractual basis by these two cities to the Cities of Chesapeake, Suffolk, and Virginia Beach. It is noted that the contract between Norfolk and Virginia Beach to supply surplus water to Virginia Beach expires July 1, 1993. The remaining population in the study area is served by numerous private water supply systems and several public systems which utilize groundwater sources.

The communities which lie within the boundaries of Planning District Commission 20 have created the Southeastern Public Service Authority of Virginia, an inter-jurisdictional areawide governmental entity, one purpose of which is to serve the water supply needs of those political subdivisions desirous of participating in such an arrangement.

Upon its creation in 1969, Planning District Comission 20 undertook the study of water supply problems in Southside Hampton Roads. That study was completed in 1970 and identified water supply problems in the area together with a recommendation that immediate steps be taken toward solving the problems identified.

A subsequent study, completed in 1972, identified an impending water supply shortage and recommended the creation of a regional authority to implement a solution. The solution recommended in that study was the use of the Blackwater and Nottoway Rivers. Based on data available at the time, there were indications that the Chowan River Basin could supply adequately the water needs of Southside Hampton Roads through the turn of the century without damage to the environment.

Subsequent to its creation in January 1973, the Authority expended considerable effort in attempting to obtain regulatory approval for use of the Blackwater and Nottoway Rivers. The Authority was advised that the U.S. Army Corps of Engineers could develop a study on the Basin, that sufficient study of other alternatives had not been done and must be included, and that additional but unspecified information was required on the environmental effects of the project. Due to the need for a complete environmental assessment, the Corps of Engineers was requested to assist in the planning process.

The average daily water supply demand projected for the area for the year 2030 in the Corps of Engineers' study amounts to 206 million gallons. Existing systems currently provide 107 million gallons per day with an additional 10 million gallons per day raw water capacity from the Northwest River planned to be available to the City of Chesapeake by February 1980. The Corps' study assumes that the City of Suffolk (year 2030 demand projected to be 11.2 million gallons per day) will be self-sufficient and assumes that demands of the Counties of Isle of Wight and Southampton and the City of Franklin may be served in an areawide program should they desire to participate, notwithstanding the fact that the demands of these three entities (7.1 million gallons per day projected for the year 2030) are not specifically included in the year 2030 projected deficit of 71 million gallons per day. The total average daily demand for the year 2030 (excluding demands for Franklin, Isle of Wight, Southampton and Suffolk) consequently was set by the Corps of Engineers at 188 million gallons per day. With the existing dependable capacity of 107 million gallons per day and the additional 10 million gallons per day capacity now programmed by the City of Chesapeake for early availability, the average daily deficit in the year 2030 for the area was fixed at 71 million gallons. The available dependable supply of 117 million gallons per day, according to the projections of demand, is anticipated to be sufficient to meet the needs of the study area through about the year 1986.

Water Supply Activities of Political Subdivisions in the Study Area

Chesapeake - The City is building a water treatment plant and water withdrawal station on the Northwest River with both to have a capacity of 10 million gallons per day. The facilities are expected to be operational in February, 1980. A water conservation ordinance has recently been adopted by the City.

Norfolk - The City is also planning new raw water transmission mains from its reservoirs in Suffolk, safe yield from which is approximately 80 million gallons per day.

Suffolk - The City is developing a system of wells and old borrow pits as its initial step in the development of an independent water supply system. Although some elements of the system have been completed, use of the system is awaiting resolution of agreements between Suffolk and Portsmouth.

Virginia Beach - The City is actively pursuing the establishment of a small scale brackish water desalting plant with assistance from the federal government. If efforts are successful the plan would utilize the local brackish groundwater or surface water from Back Bay. Plant capacity would have an initial capacity of 2 million gallons per day. The City has also adopted a water conservation

ordinance which requires use of water conserving plumbing fixtures in new construction.

The Norfolk District Engineer in the initial phase of the Corps' study outlined an array of 36 alternative potential solutions to alleviate the projected water supply deficit. Twenty-four of the alternatives initially considered were eliminated due to one or more of the following reasons: low hydrologic capability; public health reasons; transitory problem solution; and technical feasibility.

The twelve alternatives not eliminated in the initial phase of the District Engineer's study were examined more fully and dollar costs assigned. Four alternatives were considered using the Roanoke River: withdrawal below Roanoke Rapids; withdrawal from Roanoke Rapids Reservoir; withdrawal from Lake Gaston; and withdrawal from John H. Kerr Reservoir. Each of these four alternatives would involve withdrawal from a regulated stream without constructing additional impoundments. Withdrawal below Roanoke Rapids was not eliminated initially because it would result in less pipeline construction and less hydroelectric power production loss.

Direct withdrawal from the Chowan River near Winton, North Carolina, was not initally rejected because it was the least costly alternative, required the least pipeline construction, and would not require additional impoundments.

The Blackwater impoundments alternative was retained because it appeared to be the most compatible with existing water supply systems and all construction would be within the boundaries of the Southeastern Public Service Authority of Virginia.

Lake Genito, Appomattox River, was selected because no impoundment would be required initially, treatment would be at the source, and the impacts of developing this alternative would be limited to one state.

Four alternatives were considered for withdrawing water above Richmond. One alternative would involve transmitting water by pipeline to the Tidewater area. The other three would involve the transfer of water to the upper part of the Chowan River watershed, withdrawal at a lower point in the watershed, and subsequent transmission of water to the Tidewater area. It has been shown that only 10 million gallons per day of natural flow would remain in the James River under minimum flow of record conditions in the year 2030 if the projected Richmond area and Southside Hampton Roads demands are met by withdrawal above Richmond. This withdrawal would leave little additional water for other water supply needs and would impact on the recreational facilities below the point of withdrawal. In addition, mosquito breeding and algal growth in stagnant ponds below the withdrawal would tend to increase during periods of low stream flow. Because of the described impacts, the four alternatives involving withdrawal from the James River above Richmond were eliminated.

The desalting alternative in Virginia Beach was eliminated by the Corps of Engineers because of the large power requirements and subsequent instability of operation costs which could lead to financial difficulties. In order to produce 71 million gallons per day of water, 1,111,000 tons of coal would be required annually. Annual electrical power requirements would be 153 million kilowatt-hours.

On March 22, 1978, the Norfolk District Engineer announced that the following alternatives were under consideration:

1. Withdrawal from the Pea Hill Creek tributary of Lake Gaston near the Route 626 bridge in Brunswick County, Virginia.

2. Blackwater impoundments supplemented by pumping from the Nottoway River.

3. Combination of purchashing treated water from the Appomattox River Water Authority and construction of Lake Genito for the withdrawal of raw water.

On August 21, 1978 the Norfolk District Engineer found significant differences in these alternatives in terms of economic, social, environmental, and institutional considerations, each with sufficient merit to be considered as a potential long-range source of water for the Hampton Roads

area at that time.

Studies completed after March 22, 1978 revealed that adequate flow is not available in the Blackwater and Nottoway Rivers to meet the future needs of the Hampton Roads area because of previous water resource allocations. The two alternatives on the Blackwater and Nottoway Rivers were no longer considered viable alternatives. A comparison was made of the environmental, social, and economic impacts of the two remaining alternatives, Lake Gaston on the Roanoke River and Lake Genito on the Appomattox River.

When comparing the economics of these alternatives, it was necessary to view implementation of the Appomattox River differently than it had been presented earlier.

Originally, the conceptual plan for developing the Appomattox River was based on the assumption that the needs of the Appomattox River Water Authority and the Hampton Roads area would be met by Lake Chesdin until the full capacity of that facility was utilized. When the combined needs of the two areas approached the safe yield of Lake Chesdin, Lake Genito would be constructed. Based upon this conceptual plan, the Appomattox River would be a less costly source of water for the Hampton Roads area than Lake Gaston; however, it was decided that this plan could not be implemented due to the almost universal objection to reservoir construction.

The Appomattox River Water Authority has a need for the excess capacity in Lake Chesdin within the foreseeable future and has requested assurance that sources will be developed to meet its future needs before any portion of its existing capacity is committed to the Hampton Roads area. Considering the uncertainties that surround the construction of impoundments today, the only way this assurance can be given is by constructing Lake Genito when the plan is implemented. If Lake Genito is constructed initially, then Lake Gaston becomes the less costly source.

After comparing the two alternatives, it was concluded that Lake Gaston was the more desirable alternative because it could be implemented without construction of a major impoundment. Construction of this alternative would involve only intake structures, pumping stations, pipelines, and treatment facilities; therefore, it is not anticipated that any families would be displaced or that any highways would be abandoned. The impacts upon agriculture, wetlands, and other fish and wildlife habitats, including that of rare, threatened, or endangered species, would also be minimized.

The District Engineer in his August 21, 1978 announcement, stated that it was then his plan to recommend Lake Gaston as the future source of water supply for the Hampton Roads area when he forwards his report and draft Environmental Impact Statement to higher authority.

Assuming the Corps of Engineers' study will lead to the provision of a solution to the projected long-term water supply deficit, the immediate concern then would be meeting the short-term water supply demand expected to occur during the next ten to fifteen years.

The Corps of Engineers projects an average daily demand for public water supply in the study area in the year 1990 of about 127 million gallons per day. Using this projection developed by the Corps of Engineers, the study area will need about 10 million gallons per day additional water supply about the year 1990. Since the yields are based on drought years, the additional water supply would be needed only in the event of drought.

Assuming a drought occurs before implementation of the long range solution around 1990, a short-term contingency plan could be employed to deal with the water shortages. Potential components of such a plan are described in the following paragraphs:

Water Conservation

Data from drought areas across the country show that voluntary cuts in "convenience" water can reduce demand by 10 percent. This is especially effective for systems where industrial and commercial use contitutes only about 10 percent of the public water supply demand such as exists in the study area. A 10 percent reduction in demand brought about by conservation would reduce the 1990 projected demand of 127 million gallons per day to 114 million gallons per day which is 3 million gallons per day less than the current 117 million gallons per day yield of the 1980 combined Chesapeake-Norfolk-Portsmouth water supply systems.

Interconnect Existing Systems

In addition to conservation, the Norfolk and Portsmouth systems could be connected to obtain optimum use of existing storage. Safe yield of Norfolk's system is about 80 million gallons per day. Safe yield of the Portsmouth system currently is about 27 million gallons per day. Portmouth's current demand is about 20 million gallons per day. The surplus could be used in a combined system in emergencies. It is understood that the City of Chesapeake is planning to connect the Deep Creek area to the Portsmouth system which would relieve some of the demand on the Norfolk system now exerted by Chesapeake. The following table summarizes the existing and projected yield of water supply systems in Southeastern Virginia:

POLITICAL SUBDIVISION	WATER SUPPLY SOURCE(S)	YIELD IN MILLION GALLONS PER DAY
City of Norfolk	5 Reservoirs 4 Wells Blackwater River and Nottoway River Diversions	80
City of Portsmouth	4 Reservoirs 2 Wells	27
City of Chesapeake	Northwest River (To be operational in 1979-1980)	10
City of Suffolk	2 Wells; Development of Quarries and other surface sources in planning stage	11
City of Virginia Beach	Planning stages for desalting of suitable brackish water (Date to become operational unknown)	2

Development of Available Sources

Development of additional sources should be encouraged where practical. Suffolk's proposed development of the Lone Star Quarries could provide an additional 5 million gallons per day to the safe yield of existing systems. This is one-half of the projected 1990 deficit of 10 million gallons per day.

Desalting

A small desalting plant of about two million gallons per day capacity is being investigated by the City of Virginia Beach, possibly to be developed as a demonstration project with assistance from the Office of Water Resources Research and Technology. In the event that such a project is successful, there is reason to believe that additional increments of desalting capacity could be installed prior to implementation of the long term solution envisioned by the Corps of Engineers.

Interjurisdictional cooperation, together with conservation measures, interconnecting existing systems, developing existing available sources and desalting will minimize the water supply and allocation problems in Southeastern Virginia which are anticipated to occur within the coming ten to fifteen year period. The desalting early action alternative would probably rank low in priority due to the costs involved, with conservation and interconnections assuming first and second priority respectively.

The importance of an expeditious implementation of a long-range solution, even in a water-rich state such as Virginia, becomes evident when one realizes that a fifteen to twenty year lead time is required to implement a program of such magnitude as that envisioned in the Corps of Engineers' recommendation to utilize Lake Gaston as a source of future water supply for Southeastern Virginia. It is of utmost importance to begin now in order to assure a water supply sufficient to meet needs expected fifteen years hence.

C. Middle Virginia (Fredericksburg Area)

Extensive data acquisition and analyses have been made of water supply questions applicable to the Fredericksburg, Spotsylvania, and Stafford areas by local, State and federal agencies.

The safe yield of existing raw water supply sources is estimated to be about 23 million gallons per day. Projected demand for public water supply will exceed this capacity some time after the turn of the century necessitating development of additional raw water. Note must be made of the existence of some divergence of opinion relative to whether water should be provided in excess of that which is projected to be needed to supply usual domestic and commercial demands to insure adequate water for future growth. This is a subject which undoubtedly involves economic, environmental and social considerations which are nearly impossible to ascertain with assurance that those affected would be in agreement with any projection which is made.

Fredericksburg suffered from a short-term shortage during the drought of 1977, caused by a leak in their old impoundment. The impoundment has meanwhile been repaired. The treatment plant is a rather old system, and the City has joined with Spotsylvania and Stafford Counties to form a service authority to solve their water and wastewater problems on a regional basis.

The Fredericksburg area is putting forth efforts to reach solutions to the water supply problem and have expended considerable amounts of local funds on a planning program being conducted for the localities by the Rappahannock Service Authority. Fredericksburg and the Counties of Spotsylvania and Stafford are making commendable efforts in voluntarily joining together to solve mutual problems through the Rappahannock Service Authority. On October 10, 1978, during a meeting with members of the Middle Virginia Subcommittee of the Commission, representatives of the Rappahannock Service Authority again requested the subcommittee to pursue funding of the second and third phases of the three-phase study which would lead to a long-range regional water supply plan to serve the region.

D. Chesterfield, Henrico, Hopewell, Petersburg, and Richmond Area

The raw water source for the City of Richmond and a major portion of Henrico County is the James River. Chesterfield County obtains water from reservoirs on Swift Creek and Falling Creek, supplemented with water from the Appomattox River Water Authority. Water is supplied to the City of Petersburg by the Appomattox River Water Authority. The City of Hopewell utilizes the Appomattox River as a source of raw water supply downstream from Lake Chesdin, which is owned by the Appomattox River Water Authority. The combined 1978 average rate of water use for the five jurisdictions in this area approaches one hundred million gallons per day from sources with a combined safe yield in the order of 300 million gallons per day. Projections show collectively that these five jurisdictions have sufficient raw water to meet needs to the year 2030 and perhaps beyond that date, provided the necessary interconnections are made.

E. Hampton, Newport News, Williamsburg, James City, and York County Area

There are numerous water supply systems within this area, the largest of which are the City of Newport News system and the system supplying the City of Williamsburg. These two systems utilize five existing reservoirs. A sixth reservoir is under construction. With completion of the Little Creek Reservoir now under construction, these systems are expected to have a safe yield approaching sixty-five million gallons per day. Currently the Newport News water system supplies treated water to Newport News, Hampton, Poquoson, portions of York County and James City County, several federal government installations, industrial users, and supplements the Williamsburg City system during drought periods. The safe yield of the existing raw water systems is projected to be adequate to meet projected needs to the year 2005 with an additional increment of seventeen million gallons per day anticipated to be required to meet the year 2030 projected water supply needs.

F. Danville, Martinsville Area

Currently these two communities utilize approximately fifteen million gallons of water per day for domestic purposes, with additional larger amounts devoted to cooling water uses and industrial purposes. The City of Danville has estimated that safe yields of existing water treatment systems will not be equalled or exceeded until the year 1995, with the projection 2030 combined domestic, industrial and cooling water requirements reaching an average daily requirement of seventy-five million gallons. Flow records of the yield of the Dan River at Danville indicate a yield in excess of the projected year 2030 water supply needs. The projected domestic water supply for the Martinsville area in the year 2030 is in the order of 10 million gallons per day, a need which the yield of the Smith River will be sufficient to provide. Variable releases from Philpott Reservoir due to electric power generation can be ameliorated by construction of a re-regulating reservoir on the Smith River downstream from Philpott Reservoir.

G. Roanoke Area

The greater Roanoke area currently uses approximately 30 million gallons per day from surface water and groundwater sources. The projected requirements for the year 2030 should approach 60 million gallons per day. Existing sources are expected to need augmentation in about the year 1995, which augumentation could be made available through raw water storage of waters from the Roanoke River. Adequate sources of water are available to serve the future needs of the Roanoke area; however, there are inadequate institutional arrangements among Roanoke, Roanoke County, Salem, and Vinton to serve as a vehicle for proper impoundment, production, and transmission of water for the future. Roanoke has been transferring water between the James and Roanoke River since 1939.

H. Lynchburg Area

The greater Lynchburg Area is supplied raw water from the Pedlar River and James River to meet a current total average daily demand in the order of 15 million gallons per day. The projected year 2030 demand can be met with additional needed increments withdrawn from the James River.

I. Pulaski, Radford Area

Current water usage in the Pulaski area is in the order of 2 million gallons per day with raw water sources at Hogan and Gatewood reservoirs capable of providing a safe yield in the order of 5 million gallons per day, a supply which is sufficient to meet the projected 2030 year need of 4-1/2 million gallons per day. The City of Radford currently uses water at a rate of about 3 million

gallons per day with a projected usage rate in the year 2030 of 5 million gallons per day. The New River is the source of Radford's raw water supply and will adequately yield any foreseeable needs for water supply at Radford.

J. Blacksburg, Christiansburg Area

This geographic area, served by the Blacksburg-Christiansburg-Virginia Polytechnic Institute Water Authority, currently utilizes water at a rate of about 4 1/2 million gallons per day with a projected year 2030 usage rate of 20 million gallons per day, a water demand which is capable of being satisfied by the New River, the current source of raw water utilized by the Authority. This area has created a regional water authority to serve a rather large area from a large river source with a dependable supply.

K. Bluefield, Bristol and Wytheville

The current rate of water use at Bluefield from the Bluestone River is about 1 million gallons per day with the year 2030 need projected to double.

The City of Bristol's raw water source from the Holston River approximates 30 million gallons per day, a figure which far exceeds the current daily use rate of 4 million gallons per day and the projected year 2030 demand of 7 million gallons per day.

Wytheville's raw water supply source from Reed Creek currently has a safe yield of 6 1/2 million gallons per day with a 4 million gallon per day use rate projected for the year 2030.

L. Harrisonburg, Staunton, Waynesboro and Winchester

The current water use rate in the Harrisonburg area is about 40 percent of the safe yield of its raw water source. The situation at Staunton is essentially the same where the current safe yield is expected to be reached during the year 2000. Waynesboro relies primarily upon the yield of water from groundwater wells, the current domestic use rate from which is about 60 percent of the capacity of existing well fields. The current water use rate at Winchester is 5 million gallons per day, about one-third of the safe yield of the North Fork of the Shenandoah River, its raw water source, which is not expected to be exceeded until subsequent to the year 2030.

M. Charlottesville-Albemarle

The City of Charlottesville and County of Albemarle formed the Rivanna Water and Sewer Authority in 1972. This was done in response to a State Water Control Board request that a regional authority be established for the administration, construction and operation of facilities for production of potable water and treatment of waste water necessary to serve the two political subdivisions. This cooperative arrangement has functioned adequately and the regional authority manages sufficient water supplies to provide water well past the turn of the century.

VI. LEGAL CONSIDERATIONS

In several cases, notably in Southeastern Virginia and in Northern Virginia, it was found that communities have outgrown the readily available water supply in their immediate area, and that planning is needed to bring water from a greater distance, a process which often involves a transfer from another basin. Although the common law does not recognize an interbasin transfer as one of the rights to water use which a riparian can exercise, interbasin transfers have been used in the past.

To delineate the constitutional, legal and practical problems likely to be caused by additional interbasin transfers, a study to be conducted by Virginia Polytechnic Institute and State University (hereafter referred to as VPI and SU) was commissioned and co-funded by the Virginia Environmental Endowment and the State Water Study Commission. The study will focus on water use conflicts in Virginia and the likely effects of interbasin transfers, and on the constitutional and legal problems needing resolution before such transfer, including the compensation, or method of compensation, which would be required for those riparians suffering damage.

Also scrutinized was the question of whether there exists or should exist any community rights to a local water supply in addition to, and different from, the rights of individual riparian owners. In other words, should communities having an abundance of water not needed in the foreseeable future be given an ownership interest in that resource sufficient to deny its use to anyone else, and if so, how? Or, should areas which now need additional supplies be allowed to import such water from other areas? What compensation, if any, should be provided to the area from which the water is to be transported? If some water is to be transferred, how much should be retained for the future growth of the losing area? How much should be retained in the stream for environmental and aestheic reasons? Should withdrawals be permitted only in seasons when the excess flow would normally be completely unused?

In some cases the area with excess water also has existing impoundments. In other areas it appears that impoundments would substantially increase the amount of available water. Since water supply is a very important governmental function, should the Commonwealth assist in the planning and construction of water supply facilities to provide for future needs? Since only a few sites are naturally suited for reservoirs, should the Commonwealth finance a bank of reservoir sites, to be withheld from development until such time as they are needed for water supply purposes?

While no policy was adopted on the question of moving water from one basin to another as available supplies become insufficient in more and more locations, this is clearly a subject of the highest interest which will have to be addressed in the future, either on a Statewide basis or for specific locations.

In the course of deliberations concerning legal matters relating to the subject of water, there was prepared a Guide to Virginia Water Rights Law which appears as Appendix I to this report.

VII. HOUSE JOINT RESOLUTION NO. 97

As requested by the 1978 General Assembly's House Joint Resolution No. 97, the Commission has studied the possibility of interconnecting major systems supplying water to Northern Virginia and has found that although there is laudable progress being made in this direction, it will not be possible to make sound recommendations before the completion of several key studies that are scheduled for completion early in 1979.

VIII. HOUSE JOINT RESOLUTION NO. 88

As mandated in the 1978 General Assembly's House Joint Resolution No. 88, the Commission has studied the problems and needs of communities with respect to funding needs to assist localities in constructing, modifying, extending, or enlarging reservoirs and other water impoundments.

The Commission has been repeatedly reminded in the public hearings this summer that in many communities the costs of using water may be creating new hardships on many customers because of greatly increased costs that result from compliance with state and federal regulations that have been promulgated to protect environmental values and public health.

The funding needs of the localities for water impoundments is only a part of the larger overall problem of federal and/or state regulations for meeting the Clean Water Act (PL 92-500), as amended, the Safe Drinking Water Act (PL 93-523), the Dam Safety Program (PL 92-367) and state impoundment regulations. The cost of meeting the federal requirements for 134 wastewater projects in Virginia is currently estimated to be $1.1 billion of which the local share will be $276 million and the federal share will be $828 million. Virginia's share of the federal authorization will only provide some $425 million, leaving a shortfall of $400 million.

The immediate impact of the Safe Drinking Water Act has been increased monitoring and notification. The Commonwealth of Virginia has been enforcing the interim primary drinking water standards which are the 1962 USPHS standards as now are required by Safe Drinking Water Act regulations .

If and when additional primary drinking water standards are promulgated, new treatment requirements may be placed on Virginia water works, the cost of which cannot be evaluated at this

time.

Many dams throughout the state, especially older, non-federal dams owned by individuals and localities, do not meet current safety standards. It is estimated that 10 percent or more will require remedial work. The cost of the work can only be guessed at this time but will present problems to the State and localities.

It is the belief of the Commission that funding for water supply projects should continue to be the primary responsibility of the users. Should future federal or state regulations cause undue hardships beyond the locality's financial capabilities, a Statewide mechanism to make funds available to the localities either on a loan or grant basis may be necessary.

IX. AGREEMENT BETWEEN THE GOVERNORS OF VIRGINIA AND NORTH CAROLINA CONCERNING WATER RESOURCES

On April 27, 1978 the Govenors of Virginia and North Carolina entered into a formal written agreement which recognizes that programs and activities for water resources management and water quality control in watercourses common to both states generate issues of mutual concern which should be resolved through collective continuing consideration on the part of their designated representatives.

As a result of the agreement, a committee was appointed by the Governors of Virginia and North Carolina to study and develop joint policy, devise institutional arrangements, and to develop and implement procedures for the resolution of water resources matters of mutual interest to the two states.

Since its establishment the Committee, four members of which serve on the State Water Study Commission, has considered the subject of water supply sources to meet the projected water supply needs of Southeastern Virginia. Those alternative sources which are potentially viable as sources of water supply to meet the projected needs of Southeastern Virginia and which involve watercourses common to both states have been subjects of consideration by the Committee. North Carolina representatives on the Committee apparently consider the waters of the Roanoke River at and downstream from Buggs Island Lake (John H. Kerr Reservoir) to be reserved solely for the use of North Carolinians despite the fact that Virginia contributes more than 65 percent of the total yield of water in the Roanoke River at its mouth. North Carolina's committee members unceasingly have been most unyielding and obdurate in their opposition to the use of these water courses as a source of water supply for Southeastern Virginia, notwithstanding the fact that political subdivisions in North Carolina utilize Buggs Island Lake (John H. Kerr Reservoir) as a source of water supply. These facts notwithstanding, deliberations are continuing in an effort to resolve differences to the mutual benefit of the two states.

X. GROUNDWATER IN SOUTHEASTERN VIRGINIA

The Commission retained Geraghty & Miller, Incorporated, Consulting Groundwater Geologists and Hydrologists, to make a study of groundwater availability in a region covering about 3,000 square miles of the Atlantic Coastal Plain in Southeastern Virginia. The study area included the Counties of Surry, Sussex, Isle of Wight, Prince George, and Southampton, and the Cities of Virginia Beach, Suffolk, Chesapeake, Portsmouth, Norfolk, Hopewell, and Franklin, bounded on the north by the James River, on the east by the Atlantic Ocean, on the south by the Virginia-North Carolina border, and on the west by the Fall Zone region of the Piedmont Province. The essential objective of the study, which was conducted over a four-month period in late 1978, was to determine the quantity of groundwater which is available for withdrawal without causing adverse environmental impacts.

A. Principal conclusions resulting from the investigation made are as follows:

1. The average rate of replenishment of groundwater from precipitation in the study area is roughly 1,400 mgd (million gallons per day), compared with a total pumping rate of about 100 mgd.

The difference, or 1,300 mgd, represents a natural loss of water from the system through evapotranspiration, surface water flow, and groundwater underflow to the sea.

2. Pumpage from the lower artesian aquifer (about 88 mgd) has caused a regional decline of the groundwater level for that aquifer, with the greatest decline (roughly 160 feet) centered at Franklin.

3. The observed or inferred adverse impacts of the water level decline are a very slow rate of regional salt water encroachment, an increase in the cost of pumping water from wells, and the need to repair or replace some wells whose method of construction does not allow for a lowering of pump intakes. Essentially no information exists on whether or not the water level decline is causing land subsidence.

4. In general, the only adverse impact that has given rise to complaints by the public at large is related to damage to some wells caused by the falling water level. Little or no evidence of this kind is available to indicate that the salt water encroachment has caused any significant problems thus far.

5. Artificial recharging to offset the groundwater level decline in the lower artesian aquifer, while technically feasible, may not be an acceptable procedure because it would impact the river systems of the area to some degree, especially those flowing into North Carolina.

6. Greater use can probably be made of the water table aquifer and the upper artesian aquifer system, in order to minimize further water level declines in the lower artesian aquifer, but a further investigation would be needed, involving test drilling and pumping, to back up this belief.

7. Changing or modifying the present policy with regard to further development of groundwater in the study area cannot be accomplished on the basis of hydrogeologic considerations alone. Different philosophies of environmental protection must be taken into account, along with political, legal, social and economic factors.

B. Recommendations Generally

It is the professional opinion of Geraghty & Miller, Inc., that 150 to 200 mgd of fresh groundwater (which is roughly 1.8 to approximately 2.3 times the current rate of withdrawal of 88 mgd) could be pumped from the Lower Artesian Aquifer in the study area without causing an intolerable level of adverse impacts. This increased pumping rate is well within the theoretical maximum rate of recharge to the aquifer within the pumping cone of influence in Virginia and North Carolina.

Increasing the allowable pumping rate to as much as 200 mgd will of necessity cause problems to some existing well owners, but the cost of overcoming these problems will undoubtedly be far less than the cost of obtaining water for the region from sources other than the local groundwater resources. To minimize the adverse impacts, new centers of pumping should be spread out as much as possible in the study area.

Geraghty & Miller, Inc., recommends that the study area be divided into two separate zones for purposes of defining how increased groundwater development is to be permitted. These zones are (1) the region to the west of the toe of the saltwater interface, where the aquifer system contains only fresh groundwater, and (2) the region east of the toe of the interface to a line running approximately north-south through the City of Portsmouth, where the lower part of the aquifer system contains brackish to salty water. These two zones are identified on the map contained in Appendix II to this report.

In the westerly zone, where the threat of saltwater encroachment is minimal and where the potential for increased recharge is the greatest, the State should be very flexible in allowing increased development of groundwater, within the overall limitation stated previously. In the easterly zone, where the threat of lateral and upward intrusion of salty water is greater and where the potential for increased recharge is not as large as in the west, caution should be exercised in allowing additional withdrawals. All new wells installed in this zone, for example, should tap zones as shallow as possible in order to minimize the threat of upward movement of salty water. Also, the State Water Control Board should be authorized to install deep saltwater monitor wells at each new

large-capacity well field in this zone so that the potential for upward migration of salty water can be defined.

Any change in policy to allow increased pumping in the area must be accompanied by additional technical and scientific studies of the groundwater system and its behavior. These studies would evaluate such matters as differences in the water-bearing characteristics of the aquifers from one locality to another, the potential for vertical and lateral migration of salty water, the relationships between declines of groundwater levels and pumping and recharge rates, and the numbers of wells that might be harmed by further declines of groundwater levels. To date, the State Water Control Board has not been able to finance such detailed investigations, and Geraghty & Miller, Inc., therefore recommends that the Board be given increased funding to allow such work to proceed.

C. Technical Recommendations of Geraghty & Miller, Inc.

1. Expand pilot drilling and testing investigations at from five to ten new sites to demonstrate the feasibility and costs of developing water from the water-table aquifer and the upper artesian aquifer system.

2. Conduct controlled aquifer tests in existing or new wells to acquire needed information on the hydraulic properties of the lower artesian aquifer and its confining units in different parts of the region.

3. Set up a network, using existing production wells and from six to ten new monitor wells, to better define the position of the interface between fresh and salty groundwater and the potential for its long-term rate of movement both laterally and vertically.

4. Make a detailed well inventory based on office records and field data to allow predictions to be made of possible future well damage due to lowering of water levels by pumping.

5. Require that all new household or domestic wells be constructed so that pump intakes are either set deeper than normally or are capable of being set deeper, to allow for possible further declines of groundwater levels.

6. Undertake an investigation (including test drilling and test pumping) to define the potential for developing one or more large-capacity well fields in the western part of the study area, with the water to be transported by pipeline to centers of demand. Consider use of rights-of-way along existing or proposed pipelines for possible interconnection.

7. Expand water quality and water level monitoring programs in both shallow and deep aquifers.

D. Policy-Related Recommendations

1. Define the legislative, regulatory, and environmental policy changes that would be needed in Virginia to allow additional impacts to be incurred as a result of increased use of groundwater.

2. Create the framework for a damage-reimbursement program, so that well owners harmed by declining water levels could be compensated.

3. Require permitting of all withdrawals of groundwater, including those by public water supply systems, above 50,000 gallons per day and require filing of completion reports for all new wells and registration of old wells now in use.

4. Require submission of annual pumpage reports by all users except domestic users.

5. Continue and expand cooperative studies with North Carolina of mutual impacts of groundwater development and management in adjoining parts of both states.

6. Organize a series of workshops (with water users, business and banking interests, governmental bodies, elected officials, environmentalists, and others) to discuss the findings of the Geraghty & Miller report and the trade-offs involved in developing additional amounts of groundwater.

XI. COST OF IMPROVEMENTS FOR PUBLIC

WATER SUPPLIES IN VIRGINIA

The cost of improvements needed by public water supply systems include only those small systems with major problems and the "hardship" impact on small communities. The estimates were compiled by the Virginia Department of Health and are as follows:

Approximately eighty publicly owned water systems have current needs amounting to $39,600,000.00 of which $2,100,000.00 would provide flouride removal facilities for 21 systems. Approximately ninety privately owned water systems have current needs of $10,000,000.00, of which $5,800,000.00 would provide fluoride removal facilities for 78 systems.

If designs were for the year 2030, it is estimated that publicly owned systems would need $120,000,000.00 and privately owned systems would need $40,000,000.00. Currently, if all systems were to be included rather than only those small systems with major problems and "hardship" impacts, then the estimated cost for publicly owned systems would be $200,000,000.00, while the cost for privately owned systems would be $50,000,000.00, with $600,000,000.00 and $150,000,000.00 respectively if the designs were for the year 2030 AD.

Estimated costs would be applied to regionalized water systems, large and small transmission mains, expanded finished water storage, disinfection, turbidity removal, and iron/manganese removal treatment equipment, and fluoride removal facilities with new systems in a few cases developed in areas without service or with inadequate service.

Respectfully submitted,

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George W. Williams

STATEMENT OF DELEGATE GLENN B. McCLANAN

I approve this interim report of the State Water Study Commission with certain reservations, which include the following:

1. The Commission must recognize its duty to recommend to the 1980 Session of the Virginia General Assembly a plan for water resources management and distribution in Virginia.

2. An existing agency must be designated or a new one created to assure water resources management and distribution to guarantee adequate water supplies to all Virginians throughout the state, while providing adequate safeguards for the areas from which the water is to be withdrawn.

3. The report states that the available dependable supply of water for southeastern Virginia is 117 million gallons per day. However, it must be recognized as the report recites that this supply exists as follows:

   Norfolk - 80 million gallons per day

   Portsmouth - 27 million gallons per day

   Chesapeake - 10 million gallons per day

   Suffolk - 11 million gallons per day

   Virginia Beach - 2 million gallons per day

   The 2 million gallons per day available to Virginia Beach will exist only upon the completion of a tentative desalinization facility sometime during the 1980's. The City of Virginia Beach presently uses 22 million gallons per day and the projected need for that city by the year 2000 is 50 million gallons per day.

4. For the available dependable supply of water to truly be 117 million gallons per day for all the southeastern Virginia localities the system must be interlinked, and it is of utmost importance that this be done. It is understood that the cities of Norfolk, Portsmouth, Chesapeake and Suffolk should receive fair compensation for the facilities that should become a part of the Southeastern Public Service Authority of Virginia.

5. The only public water supply for the City of Virginia Beach is pursuant to the terms of a contract with the city of Norfolk to purchase *surplus* water, which contract expires in 1993.

6. It must be recognized that it will take a minimum of 15 years to provide additional needed water to southeastern Virginia. It is patently evident that we can affort to wait no longer.

APPENDIX I

GUIDE TO VIRGINIA WATER RIGHTS LAW*

I. Context

Water rights in Virginia are governed by two bodies of law: (1) common or judge-made law, and (2) statutory law. Common law rules or principles on water use have been developing since pre-Magna Carta days in England and then in this country through individual case decisions where private disputes arose over competition for scarce water resources. These disputes were settled by the court. Under common law tradition, the decision of the court will be followed by any court that must resolve a very similar dispute. This body of common law is called riparian (from *riparia* , meaning river bank) law.

Statutory law are those rules of law enacted by the legislature to guide future conduct and procedures. Statutes may change the common law. Courts may interpret statutes in handling disputes, but they are not common law rules. Both state and federal statutes can affect water rights, but because virtually all of the federal statutes bear only indirectly on the subject, this paper will only deal with State statutes.

II. Surface Waters

A. Common Law - Riparian Rights

1. Description of Riparian Rights

The riparian doctrine holds that water rights are real property rights, which belong to the owner of land bordering a natural watercourse. The riparian landowner does not own the water in which he has riparian rights. Rather, he has the right to use that water subject to restrictions which protect all riparian owners entitled to its use. Each riparian owner has an equal right to make a reasonable use of the water running in a natural course by his land for any purpose. Those purposes may include domestic use, agricultural use, and manufacturing. The use must be reasonable, it must be on riparian land, and it must be located within the watershed of the stream. If a parcel is severed from the tract which borders the stream, the severed parcel is no longer riparian, and use of water on it is not permitted.

The riparian owner's use may not result in any important change in either the quantity or quality of the water. This general rule is subject, as one might expect, to exceptions. First, the riparian owner may do what he wishes until another riparian owner complains to a court and proves that he has been damaged. Second, because riparian rights are real property rights, they can be sold, rented, or lost by non-use. Also, they may be condemned by any entity with the power of eminent domain. Third, where a dispute occurs between riparian owners, one use may be more reasonable than another under Virginia common law, which appears to favor domestic use and watering of cattle ahead of other uses. Indeed, these cases (which are old) suggest that such uses could exhaust the entire flow of the stream.

2. Unlawful Diversions

A riparian owner may not divert water beyond the limits of his riparian tract of land, nor may he even use it on those parts of that tract which are outside of the riparian watershed, if by so doing he injures another riparian owner's use. The theory is that any surplus water not consumed on the riparian land of the first owner would find its way back into the stream and be available for use by the downstream riparian owner.

3. Enforcement of Riparian Rights

Riparian rights are enforceable in the courts. To enforce them, somone must complain to the court and must be able to show damage. If the court finds that the riparian is exercising his riparian rights in a reasonable way, it will not interfere with the use. If, however, the court finds that his use would not be permitted by common law riparian theory (such as a diversion to

non-riparian land or a diversion into another river basin) the court may order him to pay damages or to stop his unlawful use.

If no complaint is lodged against a use which violates the rules of the riparian theory, that use could later become a right. To qualify, that hostile use must be known generally, if not to the riparian owner who could complain, and must persist continuously for twenty years. The damaged riparian owner could sue at any time before the twenty-year period runs and prevent the hostile use from being converted into a right. Before the suit is decided, the dispute could be resolved on any mutually-agreeable basis, including an agreement to rent or buy the water rights in question.

4. Uncertainty of Riparian Rights

The quantity of water to which any riparian owner may be entitled at any point in the future cannot be definitely ascertained. This results from the principle that each riparian owner has an equal right to make a reasonable use of the water in the stream. The riparian doctrine does not protect the earliest use aginst later uses. For example, one farmer might withdraw one-quarter of the flow of a small stream to irrigate his land. This may be a reasonable use because no one else then requires that water. However, when six other riparian farmers wish to withdraw quantities of water to irrigate their riparian lands, the first farmer's use may be unreasonable, and he must cut back his use so that each riparian owner has a reasonable amount of water.

5. Municipal Needs

The riparian theory does not directly address the problem of municipal use. A public water supply utility must necessarily remove water from riparian land. In some instances, no riparian objects to this use. Where objection is made, the utility may purchase or condemn all of the water rights needed to permit it to divert the water to non-riparian land, and to remove it from the watershed to another basin.

6. Summary

Each riparian owner has an equal right to make reasonable use of the water which runs in a natural course by his land, so long as that use is on the riparian property within the watershed of that stream. So long as no one complains he may make whatever nonriparian use of the stream he wishes, and he may obtain the right to continue that use if he is not stopped within twenty years. Upon a complaint and a showing by another that he has been damaged, however, a court may restrain any unreasonable use and/or require him to pay damages to compensate the injured party. Short of the suit, disputes can be settled by transferring these real property rights by lease, purchase or otherwise.

B. Statutory Law

1. State Policy as to Waters

There is very little Virginia statutory law relating directly to the allocation of water among competing uses. State policy as to waters is set out in §§ 62.1-10 through 62.1-13 of the Code of Virginia (1950), as amended. This chapter states that the waters of Virginia are a natural resource which should be regulated for all purposes beneficial to the public, and that the right to use any water shall not extend to waste or unreasonable use thereof.

2. Conservation of Water Resources

a. Water Use Criteria

Sections 62.1-44.35 through 62.1-44.44 of the Virginia Code instruct the Water Control Board to formulate a coordinated policy for the use and control of all the water sources of the State according to certain specified principles: Existing water rights are to be protected and preserved subject to the principle that all state waters belong to the public for use by the people for beneficial purposes without waste; adequate and safe supplies are to be preserved for human consumption while conserving maximum supplies for other beneficial uses; there should be maximum economic development of existing supplies for the benefit of the whole State; preference is given to human consumption; sufficient stream flows should be maintained to support aquatic life and minimize

pollution; watershed development policies should permit balanced multiple uses; and drainage policies should consider possible harmful effects upon groundwater.

b. Water Resource Plans

The Board must devise plans and programs for the development of the water resources of the State in a manner to encourage the maximum beneficial use and control thereof. These plans may include comprehensive water and related land resource plans for each major river basin in the State. The Board has no power, however, to implement these plans; rather, it may only recommend to the General Assembly any legislation necessary or desirable to accomplish such plans. The chapter states that it is not to be construed as altering in any way any existing riparian rights or other vested rights in water or water use.

c. Water Use Conflicts

The chapter empowers the Board to recommend a plan to resolve any conflict concerning actual or proposed water use when the conflict is between State agencies or political subdivisions.

3. Impoundments of Surface Waters

§§ 62.1-104 through 62.1-115 of the Code creates a statutory procedure by which riparian owners may receive court approval to capture flood waters for later use. Court approval under this statute may bar a later challenge by another riparian of the right to make a reasonable use of the captured flood waters.

4. Municipal Consent

At common law, municipalities had no special status with respect to waters within their jurisdiction. They enjoyed only those rights they had as riparian landowners. This has been modified by statute in Virginia. In §§ 15.1-37 through 15.1-37.1:7, the General Assembly has given local governments the right to disapprove the construction of a dam in their jurisdiction. Since most water supplies involve dams, these statutes give local jurisdictions some control over the export of water. If approval is denied, the party seeking approval may petition the Supreme Court to convene a special court which must balance the equities in the case and enter an order resolving the dispute upon what it deems fair and reasonable terms and conditions.

5. Water Pollution Control

As noted above, the common law riparian doctrine grants a remedy to a private riparian owner against another who pollutes the water he uses and thereby injures him. Long ago, many legislatures, including Virginia's, elected to supplement this common law remedy with a statutory regulatory program. The State Water Control Law (§§ 62.1-44.2 through 62.1-44.34) has evolved from an initial registration program into a sophisticated permit program. Public hearings were held to determine what uses individuals, as well as municipal and corporate entities, made of each State stream, and quality criteria which those waters must exhibit to permit the desired uses were established. To get a permit, any waste discharge must meet a two-pronged test: the pounds of waste must not exceed (1) a norm for that type of industry or municipality, or (2) the pounds at which the water quality cannot be satisfied (i.e., at which pollution prevents other uses).

Only so many pounds of pollutants can be assimilated at a given flow in the stream if other uses are to be maintained. Waste treatment works are designed with a stated stream flow in mind. If water is withdrawn from this stream for water supply purposes and discharged elsewhere, and as a consequence the stream flow is reduced below the design treatment flow, pollution of the stream will result.

III. Groundwater

A. Common Law

Under common law, groundwater belongs to the owner of the land. There are two views of the owner's rights. The English view is that the owner may make any use of groundwater. The American view is that the owner may make any reasonable use of his groundwater. A reasonable

use is limited to a use on the land from which it is taken. This would mean that an owner of a well site could not export water off the site without being responsible for any damage caused to other wells. By contrast, if he made a reasonable use of the same or a greater quantity of water on his own property, he would not be responsible for any resulting damage to his neighbors' wells. If the water table dropped thirty feet, it would be his neighbors' responsibility to deepen their wells so they could still reach the water. The Virginia courts have not made clear which rule they would follow; because substantial competition for groundwater exists, however, it is more likely that they would follow the American view.

B. Statutory Law

1. Provisions of Groundwater Management Act

The General Assembly has modified common law groundwater rights in those areas of the Commonwealth where demands on groundwater appear to be approaching the amount that could be produced on a sustained yield basis. The Groundwater Management Act provides that when an area appears to be close to exhausting its groundwater resources, the State Water Control Board can designate it as a groundwater management area. At that point, the landowners lose their common law right to make an unlimited withdrawal of groundwater from their property. This right is replaced by several provisions. First, everyone using groundwater is given a grandfathered right to the amount of groundwater he was using. Secondly, anyone wanting to increase his use of groundwater, acquire a new use of groundwater, or dig a new well, must get a permit from the Water Control Board.

In granting certificates for a new groundwater right or to construct a new well, the Board can impose conditions to protect existing wells or provide compensation not available at common law. If if appears that the groundwater resources have been totally allocated, a certificate for additional withdrawals will not be granted. Therefore, the applicant would have to make other arrangements or purchase a certificate of groundwater right from someone who needed it less than he did.

2. Exemptions in the Groundwater Management Act

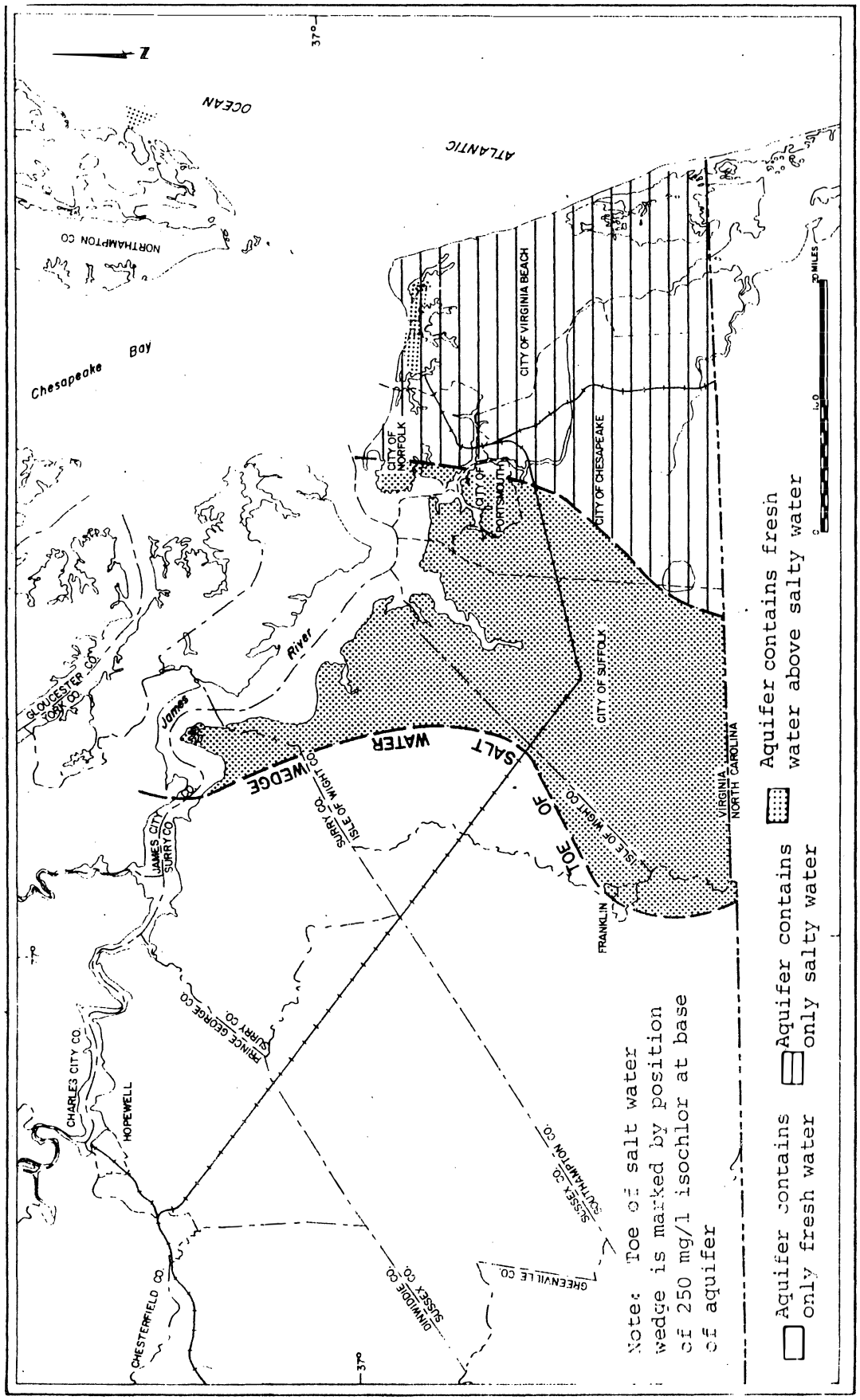
The present version of the Groundwater Management Act contains a number of significant exemptions. All agricultural uses are exempt. Also, all uses for domestic purposes, including all municipal uses to the extent they are used for domestic purposes, are exempt. Further, any withdrawal of less than 50,000 gallons per day is exempt. Given the large municipal needs for water, and the growing interest in irrigation, it may be that the present version of the Act is insufficient to protect all users of the resource.

IV. Interstate Water Rights

A. General Principles

When small demands are made on available water resources, interstate conflicts are unlikely. When, however, large demands are made in one state, an interstate dispute is likely, especially if a new use is proposed which is not sanctioned by riparian law. Even if in conformity with riparian law, however, large competing demands would probably lead to a dispute that someone was getting more than his fair share. A number of interstate water disputes have reached the Supreme Court of the United States. Rather than following local water law, whether riparian or prior appropriation, the Supreme Court usually relies on the doctrine of equitable apportionment. Basically, this requires that each state must get a fair share of the water. Before any State authorizes any major withdrawal, an attempt should be made to reach agreement on the proposed project with states that might be affected. If no agreement is reached, a suit must be anticipated. It is likely that any reasonable use which takes into account the needs of the other affected states could be defended under the doctrine of equitable apportionment, even if it were not a use sanctioned under riparian law.

* Adapted from a paper titled Guide to Virginia Water Rights Law , prepared by Frederick S. Fisher, Assistant Attorney General, Commonwealth of Virginia.



Distribution of Fresh and Salty Water in Lower Artesian Aquifer.