REPORT OF THE

STATE WATER STUDY COMMISSION

TO

THE GOVERNOR

AND

THE GENERAL ASSEMBLY OF VIRGINIA

SENATE DOCUMENT NO. 14

COMMONWEALTH OF VIRGINIA
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1980

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Report of the

State Water Study Commission

To

The Governor and the General Assembly of Virginia

December, 1979

To: Honorable John N. Dalton, Governor of Virginia
and
The General Assembly of Virginia

I. STATEMENT OF THE CHAIRMAN

In response to the mandate of the 1978 General Assembly as expressed in Senate Joint Resolution No. 1, the State Water Study Commission has continued its study of the water supply and allocation problems of the Commonwealth, having initiated in-depth studies and analyses of basic water policies and water laws of the Commonwealth in an effort to determine their suitability for conditions of the present and for the foreseeable future.

Virginia is blessed with a plentiful supply of water even though it is not always in the right place at the right time. Because of the plentiful supply of water, the State's Water Policy and Water Laws have evolved as if water had no limit as to its availability. The Commission sees that, as demands increase, and in some areas exceed local sources of water, it becomes necessary to seek ways to ensure that water is available to all Virginians for use in sustaining and satisfying the needs and wants of our people for goods, services and a healthful and pleasing environment.

As a reult of the response to our investigations and inquiries, the Commission, in looking to the future, is faced with the reality that conditions have changed since the evolution of our present water policies and water laws. The Commission is compelled to conclude that these changed conditions call for amendment of the present laws and water policies of the Commonwealth. This conclusion provided impetus to the Commission to embark upon a course of action which will leads to the development of a comprehensive water policy and recodification of water laws which will provide a mechanism for dealing with water quantity and quality in a manner such that efficient use and equity among all users will be promoted.

Two important analyses of the water laws and water problems of Virginia are under way at V.P.I. and S.U., one funded in conjunction with the Virginia Environmental Endowment and the other funded solely by the Commission.

The completion date for the first of these is March 31, 1980, and the second is to be received by the Commission on or before June 30, 1980.

The Commission is of the opinion that, until it has had the benefit of studying these treatises, and holding extensive hearings, it would be premature to recommend new legislation.

The Commission will submit a final report with specific recommendations for needed legislation to shape water policy more suitable for conditions of the present and foreseeable future in sufficient time for adequate scrutiny prior to the 1981 Session of the General Assembly.

Respectfully submitted,

J. Lewis Rawls, Jr., Chairman

II. INTRODUCTION

In 1977 the General Assembly adopted House Joint Resolution No. 236 which called for a study of the water supply and allocation problems of Northern Virginia and of Southeastern Virginia to include identification of the extent and nature of such problems together with recommended solutions for their alleviation.

Starting in July 1977, the Commission held public hearings or public meetings in Suffolk, Front Royal, Manassas, Falls Church, Leesburg, and Fairfax. These public hearings and public meetings were held in order to obtain the broadest public input possible from people concerned about water supply and allocation problems. In addition, the three subcommittees of the Commission met on different occasions to deliberate and decide upon specific charges of responsibility as found in the resolution.

Consideration was given by the Commission to legal questions pertinent to successful implementation of alternative programs to satisfy water supply and allocation problems in both Northern Virginia and Southeastern Virginia. The Commission concluded that several attractive and viable alternatives for solving the water supply and allocation problems in both geographical areas would require export of water for use outside the river basin from which withdrawn, thereby contravening the common law doctrine of riparian rights embodied in statutory law and in decisions of the courts.

The Commission recommended that in order to properly assert and protect the riparian rights of the Commonwealth, a water withdrawal permit system to equitably allocate water for use in the Potomac River and its tributaries was needed.

The concept of requiring water-saving devices and mandatory conservation measures was also endorsed by the Commission.

Accordingly, the Commission suggested legislation to implement these concepts.

The Commission recommended that the State Water Study Commission created pursuant to House Joint Resolution No. 236 be expanded to reflect a Statewide constituency and extended for at least one year with an additional report and recommendations due on or before December 1, 1978.

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 economicaaly, 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 thoroghly 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 Senate Joint Resolution No. 1 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., John W. Daniel, II, and Sieglinde F. Nix of the Division of Legislative Services along with staff 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 ensure 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 following 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 Allocations 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 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 Annandale.

The subjects that seemed most prominent in the minds of those attending the 1978 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.

During 1979 the Commission continued its deliberations of water supply and allocation problems throughout the Commonwealth, and it continues to work with researchers from VPI&SU School of Agriculture, Department of Agricultural Economics. These research personnel, together with the Commission are preparing a report, the objectives of which are to provide an analysis of the extent to which private interests in ground water and surface water in Virginia are subject to regulation by the State, to include an analysis of economic issues associated with alternative water allocation institutions.

In addition, the Commission initiated studies being conducted by research personnel at the Water Resources Research Institute at VPI&SU. The objective of these studies is to develop a comprehensive water code with alternative provisions which will take into account the inter-relationship of all types of water, to provide a mechanism for dealing with water quantity and water quality in a comprehensive manner, and to develop an allocation system which promotes efficient use and equity among all users.

The Commission is considering the advisability of recommending that the Commonwealth negotiate with North Carolina an interstate water resources management compact and has recommended that the two states commence informal negotiations with respect to this subject.

The Commission has accepted the Geraghty & Miller report on ground water in Southeastern Virginia, and recommendations for implementation of the consultants' findings will be presented as a part of the comprehensive legislative proposals to be made by the Commission.

The Commission believes that an appropriate water supply management plan needs to be adopted now to prevent the advent of critical conditions. The fundamental question before the Commission for decision is whether water supply management should rest with an administrative agency of State, regional, or local government now or should water continue to be managed with the rule of decision lying primarily in common law, as modified by the judiciary, until altered by the General Assembly on some future day. The Commission believes that a yet to be defined water supply management plan at the State level is needed. The Commission is unprepared at this time to recommend a course of action to provide the needed alteration of water law due to incomplete and ongoing studies upon which the Commission's future proposals will be postulated.

IV. WATER SUPPLY ASSESSMENT IN SELECTED AREAS OF THE STATE

A. Northern Virginia

The Northern Virginia Subcommittee met numerous times and brought together those entities involved 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.

There are three major supply systems serving the Northern Virginia jurisdictions. Those systems are the Goose Creek Reservior 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 a reoccurrence 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 Virginia jurisdictions and agencies and is served by the Northern Virginia Planning District Commission as secretariat. A regional water system map has been agreed to and a water sharing agreement has been executed among these eight political subdivisions. The eight jurisdictions will provide mutual assistance in accordance with mutually agreeable procedures. The regional water sharing agreement endorses the concept of interconnections between existing water systems.

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. Feasibility studies made by the Corps of Engineers now show that these three proposals would be prohibitively expensive. The fourth alternative for increasing the regional raw water supply is raising the Occoquan Dam by two 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:

1. 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 on-site construction has begun. 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 concultants to determine the feasibility of raising the Occoquan Reservoir Dam two feet to provide additional storage. 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 at elevation one-hundred eighty feet mean sea level, 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.

2. 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 its county.

3. The Interstate Commission on the Potomac River Basin (ICPRB) 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. In addition the ICPRB has developed a proposal to investigate an operating mechanism for regulating Potomac River low flow through utilization of the reservoirs within the watershed. This strategy will utilize the Potomac flow simulation model recently completed by John Hopkins University.

4. The Baltimore District Corps of Engineers completed a water supply study in August 1979 for Washington Aqueduct, Washington Suburban Sanitary Commission, and Fairfax County Water Authority. This effort was based on the 7-day, one-hundred year drought, 100 mgd downstream flow-by for environmental purposes and a 135 mgd available from Bloomington during the critical month (August). During October 1979 the Corps initiated a study to examine the feasibility of reallocating storage in Bloomington Reservoir to allow for greater water supply storage. Five "Plans for Choice" were developed ranging from no regional cooperation to total regional cooperation. Following is a brief description of each plan and the average annual cost as presented in the Corps' report:

PLAN 1 - THE WITHOUT CONDITION

This plan forms the basis for comparison with the other plans. It consists of water supply conditions that would exist through the year 2030 in the absence of any plan implementation to alter the management of water resources. It requires no additional cooperation, as some will occur because of the Potomac Low Flow Allocation Agreement and areawide emergency conservation programs. A one in 100 year, 7-day deficit has the potential of occurring as early as 1990, because the plan only includes the following elements:

- construction of a 400 mgd water supply intake on the Potomac River by WSSC;
- construction of a 200 mgd Potomac River water supply intake by FCWA concurrent with a 50 mgd Potomac River treatment plant staged to full operational capacity of 200 mgd by 2011;
- completion of Bloomington Lake in 1981, which would provide flow releases of an expected 135 mgd (based on a 30-day analysis) for certain critical months with varying releases during other months;
- state plumbing regulations in both Maryland and Virginia to reduce water use;
- a 100 mgd flow-by to the Potmac Estuary and flows allocated during emergencies by the Potomac Low Flow Allocation Agreement;
- raising the Occoquan dam by 2 feet;

As such, the Without Condition Plan projects a gradual diminishing of available water from the Potomac River.

PLAN 2 - LOCAL PLAN

This plan addresses the water supply problems by providing separate and distinct sources of water for each of the water service areas. This plan assumes that minimal regional cooperation is required. Local components are sized and operated to meet the individual service needs with a unique component for each service area. There are no deficits experienced with this plan based upon the assumptions as detailed. All areas (FCWA, the Aqueduct, WSSC, and Rockville) are to apply conservation which attains a 10 percent reduction for each area by the year 2030. Reregulation is to be applied by FCWA and WSCC; Bloomington Lake and its benefits become applicable to the Aqueduct and Rockville; Little Seneca Lake benefits WSSC, and the Potomac River to Occoquan Creek raw water interconnection benefits FCWA. This plan provides the Aqueduct with water by allowing the District of Columbia to purchase most of the uncontracted for water supply storage in Bloomington Lake. This is also the distinctive characteristic of this plan because in this case, the District of Columbia becomes the beneficiary of Bloomington Lake rather than the service areas together, which is a characteristic of the other plans.

PLAN 3 - THE SUBREGIONAL PLAN

This plan requires a greater degree of regional cooperation than the local plan. The components being operated in one service area also provide water to meet the partial needs of another service area. The approach to the water supply problem in this plan is to construct separate projects (one on the Maryland side and one on the Virginia side of the Potomac River) to satisfy shortages on either side of the river. By sizing the projects larger than required for the individual service area needs, FCWA and WSSC could reduce withdrawals from the Potomac River, thereby allowing more flow in the river for Rockville and the Aqueduct, while at the same time taking care of their individual needs.

In essence, during times of shortages in the Aqueduct and Rockville services, 50 percent of their shortage would be provided from the flows released from Little Seneca Lake while the other 50 percent would be met by the Potomac to Occoquan reversible raw water interconnection.

PLAN 4 - REGIONAL PLAN

This plan requires a higher degree of regional cooperation as the projects are designed and operated to meet the entire Potomac River water needs regardless of location. The plan is considered regional in scope because each project is shared among the major service areas both in terms of costs and benefits. It consists of Little Seneca Lake and a Potomac River to Patuxent River raw water interconnection as well as conservation which attains a 10% reduction for each area by year 2030 and reregulation.

PLAN 5 - REGIONAL PLAN 3

This plan is the same as Plan 4, but without the construction of Little Seneca reservoir.

The final volume of the Corps' report, addressing institutional and economic considerations and including Table 1 shown herein, was not made available until early October, immediately before the Corps' October 25 public hearing, allowing inadequate time for public consideration and comment. The distribution of benefits and costs in these plans, first exposed in the last volume, is unacceptable to Virginia because of its discrimination against Fairfax County Water Authority users. Table II shows this discrimination in terms of unit costs to Fairfax County water users. It is unfortunate that the Corps chose to develop and publish the alternate plans in this form, with so little advance notice or discussion. Essentially the issue of equitable cost sharing depends on the distribution of (low cost) reservoir benefits versus (high cost) reversible pipeline benefits. A better and more equitable approach than that developed by the Corps is critically important to the citizens of Northern Virginia. It also has become obvious that the possible 1988 freeze on the Potomac Low Flow Allocation Agreement formula would be devastating to the interest of Northern Virginia.

The Corps' projection of water demand through 2030, including the effect of water conservation, is a valuable contribution, as is the identification and analysis of projects to meet the demand. The local governments of Metropolitan Washington should take this valuable data and cooperatively develop their own plan and schedule for implementation, including cost sharing. Water supply remains primarily a local responsibility. Recent progress in regional cooperation on sewage problems in the area provides a working model of what can be accomplished.

TABLE I

AVERAGE ANNUAL COST* APPORTIONMENT - 2030 ALLOCATION RATIOS ($1000)

PLAN	WASHINGTON AQUEDUCT & ROCKVILLE**			WSSC			FCWA			TOTAL		
	Flow (mgd)	Cost 5¼%	6⅛%	Flow (mgd)	Cost 5¼%	6⅛%	Flow (mgd)	Cost 5¼%	6⅛%	Flow (mgd)	Cost 5¼%	6⅛%
1. WITHOUT PLAN												
Bloomington Lake***	49	640	640	56	730	730	30	390	390	135	1,760	1,760
Total	49	640	640	56	730	730	30	390	390	135	1,760	1,760
2. LOCAL PLAN												
Conservation	35	110	110	42	100	100	23	60	60	100	270	270
Reregulation	—	—	—	—	—	—	—	—	—	—	—	—
Little Seneca Lake	—	—	—	114	1,310	1,680	—	—	—	114	1,310	1,680
Potomac River to Occoquan Raw Water Interconnection	—	—	—	—	—	—	66	3,650	4,650	66	3,650	4,650
Subtotal	35	110	110	156	1,410	1,780	89	3,710	4,710	280	5,230	6,600
Bloomington Lake	106	1,380	1,380	19	250	250	10	130	130	135	1,760	1,760
Total	141	1,490	1,490	175	1,660	2,030	99	3,840	4,840	414	6,990	8,360
3. SUBREGIONAL PLAN												
Conservation	35	110	110	42	100	100	23	60	60	100	270	270
Reregulation	—	—	—	—	—	—	—	—	—	—	—	—
Little Seneca Lake	28.5	350	450	77	960	1,230	—	—	—	105.5	1,310	1,680
Potomac River to Occoquan Raw Water Interconnection	28.5	1,400	1,790	—	—	—	46.0	2,260	2,890	74.5	3,660	4,680
Subtotal	92	1,860	2,360	119	1,060	1,330	69	2,320	2,950	280	5,240	6,640
Bloomington Lake	49	640	640	56	730	730	30	390	390	135	1,760	1,760
Total	141	2,500	3,000	175	1,790	2,060	99	2,710	3,340	415	7,000	8,400
4. REGIONAL PLAN												
Conservation	35	110	110	42	100	100	23	60	60	100	270	270
Reregulation	—	—	—	—	—	—	—	—	—	—	—	—
Little Seneca Lake	38	420	530	51	550	720	31	340	430	120	1,310	1,680
Potomac River to Patuxent Raw Water Interconnection	19	840	1,060	26	1,150	1,450	15	600	840	60	2,650	3,350
Subtotal	92	1,370	1,700	119	1,800	2,270	69	1,060	1,330	280	4,230	5,300
Bloomington Lake	49	640	640	56	730	730	30	390	390	135	1,760	1,760
Total	141	2,000	2,340	175	2,530	3,000	99	1,450	1,720	415	5,990	7,060
5. REGIONAL PLAN												
Conservation	35	110	110	41	100	100	23	60	60	100	270	270
Reregulation	—	—	—	—	—	—	—	—	—	—	—	—
Potomac River to Patuxent Raw Water Interconnection	57	1,870	2,380	77	2,520	3,220	46	1,500	1,920	180	5,890	7,520
Subtotal	92	1,980	2,490	119	2,620	3,320	69	1,560	1,980	280	6,160	7,790
Bloomington Lake	49	640	640	56	730	730	30	390	390	135	1,760	1,760
Total	141	2,620	3,130	175	3,350	4,050	99	1,950	2,370	415	7,920	9,550

*December 1978 dollars. 1980 Base year.

**Rockville comprises approximately 2% of the combined costs and flow of the Washington Aqueduct & Rockville section.

***Represents cost of remaining water supply storage not yet contracted for and does not represent total cost of the project.

†All Bloomington Lake Project costs are based on 3¼% interest rate as authorized.

‡Includes operation cost of pumping only to test once a week — additional costs will be required during recurrence of drought.

TABLE II

AVERAGE ANNUAL COST APPORTIONMENT
2030 ALLOCATION RATIOS

2. LOCAL PLAN

	COST (MILLION $)	% OF COST	POTOMAC USE (MGD)	COST (CENTS/1000 GAL)
WAD	$1.5	17.8	310	1.33
WSSC	2.0	24.3	305	1.88
FCWA	4.8	57.9	100	13.22
	$8.3	100.0	715	

3. SUBREGIONAL PLAN

	COST (MILLION $)	% OF COST	POTOMAC USE (MGD)	COST (CENTS/1000 GAL)
WAD	$3.0	35.7	310	2.7
WSSC	2.1	24.5	305	1.9
FCWA	3.3	39.8	100	9.0
		100.0	715	

4. REGIONAL PLAN

	COST (MILLION $)	% OF COST	POTOMAC USE (MGD)	COST (CENTS/1000 GAL)
WAD	$2.3	33.1	310	2.0
WSSC	3.0	42.5	305	2.7
FCWA	1.7	24.4	100	4.7
		100.0	715	

5. REGIONAL PLAN

	COST (MILLION $)	% OF COST	POTOMAC USE (MGD)	COST (CENTS/1000 GAL)
WAD	$3.1	32.3	310	2.7
WSSC	4.1	42.7	305	3.7
FCWA	2.4	25.0	100	6.6
	9.6	100.0	715	

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 actiou 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 Commission 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 groudnwater from interbasin, intrabasin, interstate and intrastate sources.

Characteristically, the water supply demand varies among political subdvisions, 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 Commission 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 Janaury 1973, the Authority expended considerable effort in attemtping 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 additonal but unspecified information was required on the enviromental effects of the project. Due to the need for a complete environmental assessment, the Corps of Engineers was required 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. The study of water supply in Southeastern Virginia being conducted by the Corps of Engineers is undergoing review which may result in revisions of the projected future water supply demand. The review is expected to be completed by the Norfolk District Engineer during calendar year 1980.

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 has developed a system of wells and plans to develop abandoned 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 of Virginia Beach owns no pulic water supply facility and through contractural arrangements with the City of Norfolk obtains its water supply from water which is surplus to the needs of Norfolk. During the year 1977 the average daily water use in Virginia Beach was 18.6 million gallons and the year 1990 daily use was projected in 1978 by the Corps of Engineers to be in the order of 34 million gallons. The present contract between the City of norfolk and the City of Virginia Beach expires in the year 1993. In an effort to utilize efficiently the water made available to Virginia Beach, the City has adopted a water conservation ordinance which requires the use of water conserving plumbing fixtures in new construction.

Virginia Beach is pursuing the establishment of a brackish water desalting facility which is expected to produce initially 2 million gallons of water per day at costs estimated to be considerably higher than conventional water supply systems produce.

Additionally the City of Virginia Beach has investigated the feasibility of developing shallow water wells and has found that from 10 to 15 million gallons per day may be obtained from widely spaced wells; however, such wells would not be conducive to the development of a central water supply system due to the necessity for their wide spread location.

Since there are no significantly large fresh water streams within the boundaires of the City of Virginia Beach, there are extremely limited surface water resources available for development. The numerous deep underground aquifers in the area yield water in large volumes but with chloride concentrations in excess of acceptable limits for most uses. This makes the development of freshwater supplies within the boundaries of the City of Virginia Beach most improbable; therefore, it is evident that large supplies of non-saline water must come from areas to the west of the City and to the west of the Cities of Chesapeake and Norfolk. The City of Virginia Beach, in seeking to utilize waters outside its boundaries faces the question of riparian rights and interbasin transfer. In addition, in an effort to utilize waters outside its boundaries, the City of Virginia Beach would be faced with the statutory provsion that no political subdivision may impound waters within the boundaries of another political subdivision without first obtaining the prior approval of that political subdivision.

The unique geographical location of Virginia Beach as the eastern most jurisdiction in Sotheastern Virginia together with its limited fresh water resources and the serious riparian issues involved in most potential solutions makes the development of a separate system most difficult to improbable.

Interconnection of water supply systems in Southeastern Virginia jurisdictions together with intergovernmental arrangements to share surplus water among those jurisdictions would ameliorate to a significant degree water shortages which have been experienced in the area.

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 folloiwng reasons: low hydrologic capability; public health reasons; transitory problem solution; and technical feasibility.

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 impundments supplemented by pumbping from the Nottoway River.

3. Combination of purchasing treated water from the Appomattox River Water Authority and contruction 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 Balckwater and Nottoway Rivers to meet the future needs of the Hampton Roads area because of previous water resource allocations. The two alternatives on the Balckwater 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 by the Corps of Engineers 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 anticiapated 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 Norfolk District Engineer in his August 21, 1978 announcement, stated that it was his plan to recommend lake Gaston as the future source of water supply for the Hampton Roads area. The North Atlantic Division Engineer has since requested that the projected demand be redone using different criteria. If this results in a substantial change in the projections, revisions in other sections of the study may be necessary.

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 constitutes 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. Note is made that the conservation effort, if made permanently, would result in more severe conservation measures being required during time of drought. Reuse of industrial water as is practiced in several industrial concerns is adding significantly to easing of demands on water systems in the area as would the use of dual water systems - one for potable water and the second for uses other than for potable water. Approximately 100 million gallons per day of water potentially is available from domestic waste water treated in the region.

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. Portsmouth'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 summarized the existing and projected yield of water supply systems in Southeastern Virginia:

POLITICAL SUBDIVISION	WATER SUPPLY SOURCE(S)	YIELD IN MILLION GALLONS PER DAY	1990 DEMAND* IN MILLION GALLONS PER DAY
City of Norfolk	5 Reservoirs 4 Wells Blackwater River and Nottoway River Diversions	80	49.8
City of Portsmouth	4 Reservoirs 2 Wells	27	17.3
City of Chesapeake	Northwest River (To be operational in 1979-1980)	10	15.4
City of Suffolk	2 Wells Development of Quarries and other surface sources in planning stage	11	5.8
City of Virginia Beach	Planning stages for desalting of suitable brackish water and an additional increment of from 10-15 MGD from shallow ground water aquifers.	2	33.7

* - 1990 demands from projections of Corps of Engineers (1978)

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.

Principal conclusions resulting from the investigation made are as follows:

"1. The gound water system of the study area contains more than 120,000 billion gallons of fresh water in storage and is replensihed at an average rate of more than 500 billion gallons a year. The present rate of pumping from the system is approximately 36 billion gallons a year, or 100 mgd.

2. Pumping of the gound water has caused some lowering of the ground water level of the Lower Artesian Aquifer, which in turn has caused damage to perhaps hundreds of small-capacity wells and has induced salty water to move very slowly into the fresh ground water in the eastern half of the study area.

3. The harm caused thus far by the declining ground water levels is substantially less than the benefits derived from using the ground water.

4. A conservative estimate is that total withdrawals from the Lower Artesian Aquifer can be increased to 150 to 200 mgd without exceeding the recharge capacity of the aquifer and without causing intolerable adverse impact.

5. Shallow aquifers in the region, not presently used to any great extent, may have a good potential for supplying additional amounts of water.

6. The State Water Control Board presently does not have adequate funds to properly investigate the ground-water potential of the region and to determine how the ground water can best be developed with minimal adverse impacts."

Principal Recommendations made by the ground water investigators are as follows:

"1. Permit an increase in the withdrawal of ground water from the Lower Artesian Aquifer to a rate of 150 to 200 mgd, accompanied by additional investigations of the yield of the ground-water system and methods of minimizing adverse impacts.

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

3. Require permitting of all withdrawals of ground water, except for individual domestic use, and require filing of completion reports for all new wells and registration of all wells now in use.

4. Provide an increase in funding to the State Water Control Board so that it can carry on the necessary studies to properly manage increased withdrawals from the ground water system."

Recommendations for implementation of the consultants findings will be presented as a part of the comprehensive legislative proposals to be made by the Commission. When legislative proposals have been completed, the Commission will recommend a plan for implementation of the consultants' recommendations.

C. Fredericksburg Area

The Rappahannock Service Authority authorized a three-phase study to develop a regional water supply plan to meet the long-range needs of the area. Phase I, which includes a review of existing water supply facilities, projection of water supply demand and development of alternatives to meet these demands, was completed in November 1978. Phases II and III are to include a detailed engineering study on the selected alternatives and development of management and financial arrangements.

A representative of the Authority requested $75,000 from the Commission at the July 10, 1979, August 15, 1979, and November 19, 1979 meetings for funding this study. The Commission determined that the information contained in the Authority's Phase I Study Report was that which the Commission needed and that which the Commission intended to have gathered. The Commismsion at its meeting on november 19, 1979 voted to purchase from the Rappahannock Service Authority the Phase I Study Report relative to the sources and availability of water within the Service Area. The sum of $45,000 was appropriated by the Commission for that purpose.

The Corps of Engineers ccmpleted their water supply survey in August 1978 which was conducted under the provisions of the Water Resources Development Act of 1974. This effort complemented the Phase I Study authorized by the Authority.

V. OTHER WATER RESOURCE ISSUES OF SIGNIFICANCE

Conservation of Water

Although other areas in our country have had almost continual problems with the adequacy of wanted water. Virginia has generally had abundant, well distributed water to meet most wants except when an occasional drought affects parts or all of our State. This seldom happens but in the middle 1970's droughts hit Virginia.

During 1976, most of the State suffered some periods of meteorological drought with the Tidewater and Eastern Piedmont areas being hit by the most severe conditions. Early fall 1976 saw some alleviation of the situation, but the moisture deficiency recurred in November 1976 and continued until October 1977 causing a severe drought in a large portion of the State that was considered to be the most severe period of drought to hit the State since 1930-32, some 45 years before. Rains in october 1977 eased the drought and, even though the month of November 1977 was wetter than normal, the effects of the prolonged drought were still in evidence most of the rest of the year with a majority of the areas in the State reporting yearly precipitation deficits.

Because of alarm about the 1976-77 droughts in Virginia as well as the severe droughts in other parts of our country, particularly in California, conservation of water became of great interest. In the past water conservation had usually meant a broad consideration of wise development, protection, and use of water resources, but a much narrower meaning became popular that involved basically using less water. Decreasing daily per capita demands and decreasing water use in industry and commerce along with some increase in reuse became popular goals. The value of water conservation in times of water curtailments resulting in calamities of water systems and in times of high energy costs associated with water uses is also being given greater recognition.

The 1978 General Assembly considered several pieces of legislation concerning water conservation. The following were passed:

H. B. 471 (McClanan and others) - Relating to the duties of the State Water Control Board regarding water conservation

The legislation amended the State Water Control Board Law by stating that the policy of the Commonwealth (in addition to policy statements contained in the existing law) is to promote water resource conservation from statute and encourage water consumption reduction in order to provide for the health, safety, and welfare of present and future citizens of the Commonwealth. The bill specifically requires the Board to study and investigate methods, procedures, devices, appliances, and technologies which could assist in water conservation or water consumption reduction; to coordinate its efforts toward water conservation with other persons or groups, within or without the Commonwealth; and to make reports concerning, and formulate recommendations based upon, any such water conservation studies to assure that present and future needs of the citizens of the

Commonwealth are met.

S. B. 327 (Rawls, Colgan, Mitchell, McClanan) - Relating to water shortage emergencies in localities; interjurisdictional assistance.

The bill was the result of recommendations of the State Water Study Commission and provides that after a water supply emergency has been declared by the Governor, the owner of a water supply system serving that locality may apply to the State Water Control Board for assistance. If the SWCB determines that the locality is applying all feasible water conservaiton means and that water is available in neighboring jurisidctions where interconnections for the transmission of water exist, the Board shall inform the Governor, who may appoint a committee of representatives from the affected jurisdictions to negotiate the allocation of sale/purchase of water between the jurisdictions.

S. B. 176 (Buchanan) - Relating to emergency services and disasters.

The bill provides that local governing bodies can manage water supplies in the absence of a declared state of emergency to prevent a water shortage provided that such management is uniform in application among like classes of users.

H. B. 468 (McClanan and others) - Relating to use of water efficient fixtures, devices and appliances in State buildings.

The bill provides that maintenance of State buildings shall include the installation and utilization of approved water conservation devices to avoid the wasting of water throughout the facilities owned by the Commonwealth.

H. B. 469 (McClanan and others) - Relating to installation of water saving devices in new buildings.

The legislation provides that localities may by ordinance, require water conservation devices in new buildings and in the case of the retrofitting of buildings constructed prior to July 1, 1978.

H. B. 470 (McClanan and others) - Amending the Uniform Statewide Building Code to address water conservation.

This measure amends the Building Code to provide that buildings and structures should be permitted to be constructed at the least possible costs consistent with recognized standards of health, safety, energy, and water conservation and barrier-free provisions for the physically handicapped and aged.

Conservation Efforts in Virginia

Interest in Virginia as well as nationwide in the new water conservation concepts is starting to show results. There is a widespread feeling that using less (whether it is water or other goods or services) is a moral and patriotic virtue. Virginia Beach and other important communities have passed ordinances that require water conservation devices under certain conditions and many plumbing suppliers promote water saving equipment. Higher costs of water and wastewater services have caused many people to save water in hopes funds will be available for other needs. New federal requirements condition some grants and loans to communities who demonstrate that they are promoting water conservation. Increased resistance to new water projects by environmentalists is encouraging municipalities and industries to use less water. Increased energy costs that may be associated with greater distances of water supply encourage the use of less water.

All reasons combined seem to indicate the once used assumption that water use was bound to keep increasing may not be true. The Second National Water Assessment published by the Water Resources Council in 1978 reported substantially lower use projections than was reported in the First National Water Assessment in 1968, probably resulting from combined conservation efforts.

Fluoride Regulations' Impact on Small Water Supply Systems

Many customers on water supply systems in Southeast Virginia are becoming alarmed and outraged at regulations that may cause great increases in water costs to them because their water supply has too much fluoride. The State Health Department, which agreed to enforce the National

Interim Primary Drinking Water Regulations for EPA in Virginia, has recognized the Virginia dilemma and has made great efforts in trying to resolve the problem.

EPA regulations that were promulgated in accordance with provisions of the Safe Drinking Water Act of 1977 contain a number of Maximum Containment Levels (MCLs), among them MCLs for fluoride. In Virginia, a limit of 1.8 milligrams per liter has been chosen based on the EPA belief that when 1.8 milligrams per liter is exceeded moderate to severe fluorosis will affect some portion of the population using this high fluoride water. EPA's regulations were based on the laterst scientific data available to them, but most Virginians seem to feel that although in some instances water supplies have several times the EPA acceptable concentration of fluorides there is no reason for alarm, that there are no known recognized health problems other than discoloration of teeth during childhood in some individuals.

The Health Department for EPA has issued variances and exemptions for a few supply systems with high fluoride content, but these exemptions expire on January 1, 1981. In order to comply with EPA regualtions, it will be necessary for affected systems to add costly treatment equipment that will result in very great costs for water. Some estimates have been discussed which for small systems might mean increased water bills of as much as $100 per customer per month.

At the Water Study Commission meeting of August 8, 1979, it was agreed that Chairman Rawls would communicate with the Virginia Congressional Delegation to ask for aid in resolving this problem. The response to his request for help has been very good with indications that numerous appeals to EPA have been made to consider extending exemptions for affected water systems and/or reevaluating the medical evidence that serves as the basis for the MCLs. It has been indicated that presently there are human epidemiological studies of the relation of fluorides in drinking water underway in Texas and other coastal areas of our country that share this problem. Virginia has been requested to provide data relating to the health problems from fluorides.

Protection of Potential Reservoir Sites

The Director of the Virginia Soil and Water Conservation Commission has brought up problems associated with Virginia water supply impoundments. His interests may be primarily with rural uses of water, but the problems of providing water all over Virginia depend to a large degree on proper management of stored water.

Major concerns recognized to exist are:

- Impoundments have limited useful lives because they become progressively filled with sediment and are prone to excessive levels of plant growth if nutrients are allowed to accumulate.

- Once an impoundment has been constructed, it generally becomes impractical to increase its capacity because of development around it, unless definite plans have been made for such expansion. This seldom occurs.

- All development on a watershed above a water supply impoundment is likely to cause increased problems due to sediment and nutrient runoff,

- Once an impoundment deteriorates, it is almost impossible to restore its original usefulness.

- Old impoundments, in addition to decreasing in volume due to accumulation of sediments, may be found to be unable to supply water of proper quality to meet our ever increasing standards.

- As a region becomes more developed (and they need more and better water supplies), it becomes increasingly difficult to find sites for new reservoirs that have not already been developed for uses other than water supply to the extent that their cost is prohibitive.

- If communities are unable to develop needed water supply in reservoirs close to them, they may find it necessary to go great distances at great expense (both financial and environmental) to get needed water.

- New needs for irrigation water may compound water problems as the demand for greater

production efficiencies in agriculture becomes widespread.

- Although in the past most communities took responsibility for financing the development of their own water supply systems, there may be growing demands from communities for help from Federal or State sources to finance systems that will meet more stringent requirements that may have been forced upon them.

Although a great amount of thought has been given in the past to these many concerns about water supply impoundments, there is a great need to develop plans as to how to cope with these problems. There have been proposals for increased funding from State or Federal sources, suggestions that conservation may be the answer, and recommendations that control of land development and growth be made. Control of watersheds above impoundments has been attempted, but often found inadequate.

Consideration is being given to the need and wisdom of asking for legislation similar to that North Carolina recently adopted. In that state the water resource agency judges the state's needs from projected federally constructed reservoirs and makes necessary arrangements to assure future needed supplies are available. The state may contribute a large share of non-federal costs of some approved projects under PL 566 and may acquire real property for some needed water resource developments.

In the Potomac Basin, the apparent absence of authority within Virginia, to accept responsibility for the non-federal share of a federal project, has raised a number of questions. Virginians depend on the Potomac, and will depend on the supplemental flow to be provided by Bloomington Reservoir, a Corps of Engineers project. Maryland's Potomac Water Authority was created to hold responsibility for the nonfederal share. With direct competition for the same water between the Corps' Washington Aqueduct Division, Maryland's Washington Suburban Sanitary Commission, and Virginia's Fairfax County Water Authority, the missing Virginia authority may be very damaging. Legislation may be needed to afford Virginia a role in such projects, particularly Bloomington.

House Joint Resolution No. 88

As mandated in the 1978 General Assembly's House Joint Resoltuion 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-92-600) 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. However, federal regulations are causing undue hardships beyond the financial capabilities of some localities and a Statewide mechanism to make funds available to the localities either on a loan or grant basis may be necessary. As an initial step, based on obvious current needs, a State hardship grant program should be developed. Such a program should be patterned after the existing (but unfunded) State hardship sewerage grant program. Its goal would be to assist publicly owned water systems with necessary improvements where available federal assistance (probably FmHA) is inadequate. The program could be administered as "piggyback" grants, like those from the Appalachian Regional Commission, and could be handled by the same State agency.

Roanoke Area Governments Conflict Over Water

(a) Upper Roanoke Basin Water Resources Study - Corps of Engineers, Wilmington, N.C.

Study completion in late 1981 is anticipated. Preliminary studies to date indicate that several reservoir projects, located in the basin, are economically feasible, considered separately or in combination. In addition, a local protection plan involving channel improvements through the Cities of Salem and Roanoke has been developed that will provide a degree of flood state reduction. The channel improvements are also economicaly justified separately and possibly, in combination with the reservoir projects. If the channel improvements, in combination with the reservoirs, are economically justified, a higher degree of flood protection will be possible. Montgomery County officials and citizens, attending a public meeting recently in Shawsville, Virginia, have all been opposed to Corps of Engineers proposed dams in Montgomery County. Detailed analyses of the best alternative plans, including the Roanoke-Salem channel improvement plan, the most favorable upstream reservoir plan and a non-structural plan, are being conducted.

After these analyses are complete, the Corps of Engineers' recommendations as to which plans should be further studied in State III will be made available.

(b) Water Supply Conflicts - Roanoke Valley

During 1979, Roanoke Valley governments have entered into a period of cooperation, especially in matters of water supply.

(1) Roanoke County and the Town of Vinton have an agreement to jointly develop 2 MGD in the Vinton-East County Service Area. The County has, or will, develop three wells in this area as fulfillment of its obligation. The wells and water lines, while owned by the County, will be operated and maintained by the Town of Vinton for a period of 20 years.

(2) Roanoke County and Roanoke City have reached agreement on exchange of sewer and water lines within their respective jurisidctions. Additionally, the City is obligated to sell bulk water to the County (minimum of 1.5 MGD), based on Roanoke City's cost of production. Annually, this amount of bulk water is to be revised upwards depending on Roanoke County's needs.

(3) Salem Area - Water Supply

In the talking stages, is a joint Salem-Roanoke County agreement to serve the West County Area.

(4) Back Creek Withdrawal and Reservoir

The Corps of Engineers have advised Roanoke County that pending completion of their Upper Roanoke Basin Water Resource Study, their permit request for withdrawal of water from Back Creek is hereby denied.

In the matter of the Back Creek Reservoir, the Virginia State Supreme Court has ruled that the City of Roanoke must obtain from Roanoke County permission to construct a reservoir on Back Creek in Roanoke County, thus overturning the Lower Circuit Court decision.

(c) Roanoke Valley Water Supply Study

Governor Dalton requested the Corps of Engineers to undertake a special water supply study of the Upper Roanoke River Valley to develop regional alternatives. The regional concepts would specifically address water needs of the Cities of Roanoke and Salem, Town of Vinton and Roanoke County from 1980 through the year 2000.

In June 1979, a contract was awarded by the Corps of Engineers to Moore, Gardner and Associates, Inc. to conduct the study. A final report is to be completed in late December 1979.

Considering the array of study alternatives selected, an interim output from the study has identified that any deficit in the average daily water demand for Roanoke Valley by the year 2000 is negligible. The scope of the study does include maximum utilization of existing systems by interconnecting systems and expansion and/or upgrading of sources, treatment facilities and main transmission lines, and the development of new sources and transmission facilities to deliver the required water to each of the four water systems.

Prince William-Fairfax County Water Authority Conflicts

In 1977, a dispute arose between Prince William County and the Fairfax County Water Authority (FCWA) over the water rates being charged by the FCWA to Prince William County users. The case was given a court hearing, in which the court decided in favor of FCWA. Prince William County appealed the case to the State Supreme Court, which elected not to hear the matter. The County is now examining several alternatives to address the need for future water supply, one of which consists of negotiating a new rate structure with the FCWA (a consutling firm has been retained to do this). Another alternative would involve the construction of an impoundment on Cedar Run, a tributary to the Occoquan; however, this has been met with significant opposition.

Another point of friction between Prince William County and the FCWA is the proposal by the FCWA to increase the height of the Occoquan dam by two feet. Prince William County has expressed its concerns about potential flooding impacts both upstream and downstream from the dam. The FCWA produced a consultant study to show that significant flooding would not result from the project, and Prince William County has retained a consultant to review this study. A local advisory committee consisting of representatives from Prince William and Fairfax Counties has been established under the Impounding Structure Regulations to address these concerns.

VI. LEGAL ISSUES

In October 1978 the Water Study Commission joined with the Virginia Environmental Endowment in funding a study by Drs. Sandra S. Batie, William E. Cox, J. W. Looney, and Leonard A. Shabman to be called "Legal and Ecomomic Implications of Changing Virginia's Water Allocation Institutions". The legal part of the study and the final in-depth report that will cover also economic, financial, and enviromental considerations will be delivered in march 1980.

In July 1979 the Water Study Commission started negotiations leading to a contract to study and report on certain aspects of Virginia water law. Dr. William R. Walker, Director of the Water Resources Research Center, is developing a comprehensive water code for Virginia with alternative provisions and commentary which will take into account the interrelationship of all types of water, provide a mechanism for dealing with water quantity and quality, and develop an allocation system which promotes efficient use and equity among users. For purposes of review by the Commision, the alternate code provisions will probably be developed in sections dealing with regulation of consumptive uses, administrative structure and operation, and water quality protection. It is planned that after each section there will be a commentary setting forth policy, philosophy, advantages, and contraints as appropriate for each of the alternatives, be they in the form of a new section for the code or a modification of existing statutes. The study will contain language for new sections in the code and modification of language in existing statutes. It will also contain an appendix with supporting background studies.

Dr. Walker's findings and those of Dr. Batie, et al, are to be presented to the Commission in final reports scheduled to be completed on or before June 1980.

A first report to the Commission made by the Virginia Water Resources Research Center in December 1979 appears in this report as Appendix I. A special report to the Commission made

December 12, 1979 by Drs. Sandra S. Batie, William E. Cox, J. H. Looney, and Leonard A. Shabman, Department of Agricultural Economics, Virginia Polytechnic Institute and State University, is appended hereto as Appendix II to this report. The Commission has accepted these reports but the Commission does not endorse any of the findings reported therein by the investigators.

VII - SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

General concern has been expressed throughout the State for the need to define policy with respect to the transfer of water from one geographical area to another. Notably, it has been learned the communities in Southeastern Virginia and in Northern Virginia have outgrown water supply sources readily available in their immediate area, and there is a need to consider transport of water from outside these communities which would involve transfer of water from one basin to another. Such transfers of water from basin to basin are not recognized in common law as a water use right which may be exercised. Almost without exception throughout the Commonwealth significant concerns are expressed regarding problems associated with financing water treatment, storage and distribution systems.

The Commission has engaged research personnel from VPI&SU to provide an analysis of the extent to which private intersts in surface water and ground water are subject to regulation by the State together with economic issues associated with alternative water allocation institutions. These studies also include the objective to develop a comprehensive water code with alternative provisions which take into account the interrelationship of all types of water, to provide a mechanism for dealing with water quantity and water in a comprehensive manner, and to develop an allocation system which promotes efficient use and equity among all users. The results of these studies which are not expected until mid-calendar year 1980 are crucial to the sound development of draft water legislation to be recommended by the Commission.

The Commission has found that conditions have changed since the evolution of our present water policies and water laws to the extent that the Commission is constrained to recognize that such changes make mandatory the amendment of State law to assure that water is available to all to satisfy their needs with equity.

The Commission finds that while sources of water supply are not universally scarce throughout the entire Commonwealth, there is almost without exception in every quarter of the State a dearth of financial resources for application to water supply storage, treatment, and transmission facilities. With this recognition, the Commission concludes that a grants-in-aid program should be established whereby local political subdivisions may supplement local financial resources with funds appropriated by the General Assembly for the specific purpose of providing adequate water supply storage, treatment, and transmission systems.

In the Potomac Basin, the apparent absence of authority within Virginia to accept responsibility for the non-federal share of a federal project, has raised a number of questions. Virginians depend on the Potomac, and will depend on the supplemental flow to be provided by Bloomington Reservoir, a Corps of Engineers project. Maryland's Potomac Water Authority was created to hold responsibility for the non-federal share. With direct competition for the same water between the Corps' Washington Aqueduct Division, Maryland's Washington Suburban Sanitary Commission, and Virginia's Fairfax County Water Authority, the missing Virginia authority may be very damaging Legislation may be needed to afford Virginia a role in such projects, particularly Bloomington.

Northern Virginia

In the Northern Virginia area finished water interconnections have been expanded whereby water users within the service areas of Fairfax County Water Authority will have available a maximum additional water supply increment of eighteen million gallons per day through arrangements with Falls Church City and Arlington County. In addition, eight Northern Virginia political subdivisions have developed and agreed to a water sharing agreement the purpose of which is to assist the member jurisdictions in providing adequate water during drought or emergency situtations. Fairfax County Water Authority has initiated construction of a raw water intake on the Potomac River, is moving toward increasing storage in Occoquan Reservoir by raising Occoquan Dam by two feet and is evaluating additional water storage sites for potential use in augmenting existing water supply systems.

Fredericksburg Area

The Rappahannock Service Authority is proceeding to complete a three-phase study which would lead to the formation of a regional water supply plan to serve the long range water needs of the area. Phase I of the effort has been completed and phases II and III are scheduled to include a detailed engineering study of selected alternatives with consideration of management and funding arrangements.

Southeastern Virginia

The Commission engaged ground water consultants to make a study of ground water availability in the Atlantic Coastal Plain in Southeastern Virginia and specifically to determine the quantity of ground water available for withdrawal without causing adverse environmental impacts. A principal conclusion reached by the consultants was that from 150 MGD to 200 MGD of fresh ground water (approximately 170 percent to 230 percent the current rate of withdrawal) can be withdrawn from the Lower Artesian Aquifer in the western portion of the study area without causing an intolerable level of adverse impacts. The City of Virginia Beach owns no public water supply facility and obtains water surplus to the needs of Norfolk through a contractual arrangement with the City of Norfolk which expires in 1993. Virginia Beach in 1977 used an average of 18.6 million gallons per day and in 1978 the Corps of Engineers projected daily demands in 1990 to be in the order of 34 million gallons. In order to make the most efficient use of available water, the City of Virginia Beach adopted a water conservation ordiance requiring water conserving plumbing devices to be used in new construction. A brackish water desalting facility is being pursued by the City which initially is expected to produce 2 million gallons of water per day at a cost estimated to be far in excess of that produced by conventional systems. The City has investigated shallow water wells as a source of supply and found that from 10 to 15 million gallons per day may be obtained from that source; however, the widely spaced well system would not be conducive to serving a central water supply system to serve the area due to the required widespread well field. Both surface and ground water supplies of fresh water are extremely limited within the boundaries of the City of Virginia Beach, making the development of a source of water supply within the City most improbable. It is evident that large supplies of non-saline water must come from the west of the City and to the west of the Cities of Chesapeake and Norfolk. In attemtping to use water from outside its boundaries, the City of Virginia Beach would be faced with the issue of interbasin transfer and riparian rights, and with the statutory provision that no political subdivision may impound waters within the boundaries of another political subdivision without first obtaining approval of that political subdivision. The unique geographical location of Virginia Beach, together with the limited supply of freash water within its boundaries and the serious riparian issues involved in potential solutions, makes the development of a separate system in Virginia Beach most difficult to improbable. An intergovernmental arrangement to share surplus water among Southeastern Virginia jurisidcitons through interconnected systems would ameliorate significantly the water shortages which have been experienced in the area during recent years. The study of water supply in Southeastern Virginia being conducted by the Corps of Engineers is undergoing internal review in the office of the Norfolk District Engineer with the final results of that review not expected until calendar year 1980.

Legal Issues

The Commission has found that several Virginia communities have outgrown the readily available water supply in their immediate areas, 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. Thus, questions arise as to 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. 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 completly unused? These and other related questions raise basic and profound issues of policy which this Commission believes would best be resolved subsequent to completion in mid-1980 of the studies and analyses of Virginia

water laws and water problems being conducted at VPI&SU, one funded in conjunction with the Virginia Environmental Endowment and another funded solely by the Commission. This Commission is of the opinion that it will be in a position to contribute better to the satisfactory resolution of these important issues if the Commission continued for an additional year.

RECOMMENDATIONS

The specific recommendations of the Commission are as follows:

A. The Commission recommends that the State Water Study Commission be continued for an additional year to receive outstanding study reports, to develop draft legislation for presentation to the Governor and the General Assembly.

B. The Commission recommends that the studies of legal aspects of water initiated by the State Water Study Commission be carried to completion with researchers at VPI&SU.

C. The Commission recommends that the State Water Study Commission hold public hearings as soon as possible after June 30, 1980 for the purpose of fully informing the public of suggested legislative proposals, receiving public comments on such proposals and for the purpose of formulating appropriate legislative proposals to be recommended for consideration by the 1981 Assembly.

D. The State Water Study Commission recommends that the State Water Control Board (for the Commonwealth), the Fairfax County Water Authority, and appropriate local governments in Northern Virginia, work with the District of Columbia and Maryland officials to develop and implement an equitable regional plan, based on data in the recent Corps study, to solve the potential water shortage in the Metropolitan Washington region. The Commonwealth should be prepared, if the regional approach is not productive, to take legal action to protect the rights of Virginians to the use of Potomac water.

APPENDIX I

FIRST REPORT TO WATER STUDY COMMISSION

BY

VIRGINIA WATER RESOURCES RESEARCH CENTER

The Problem

During the first 350 years of Virginia's history, the problems associated with water have been minimal. In essence, there was sufficient water to meet most needs on a regular basis, and it was appropriate that the problems which did arise were resolved on a case-by-case basis. In general (there were isolated exceptions) the supply of water exceeded demand, and the system could withstand a certain amount of inefficiency and still accommodate most needs. This situation permitted a great deal of independent action because the activities of one user seldom impinged on another, and direct confrontations were rare.

The amount of water available at the time Jamestown was settled is approximately the same amount that is available today. In the intervening years, the population has increased substantially, and the problem of supply and demand has become more acute since society has changed from a strictly agrarian one to one which is more industrial. This change, coupled with a higher standard of living and consequent increase in individual demands for water, has moved the demand parameter closer to the maximum amount available.

Since the supply function of the equation is static, the only altenative to meeting increased demand is better resource management. The problem is to balance competing demands on some basis of equity while seeking to maximize the use of the resources. In addition, the management strategy must provide a mechanism to accommodate short-term stresses on the system—droughts—and enough flexibility to facilitate changing needs and values. Thus, a comprehensive water code must provide a vehicle for organizing otherwise independent and potentially conflicting actions into a scheme which promotes efficiency, avoids waste, and assures equity among the participants.

A Water Policy for Virginia

The management of the state's water resources must be predicated on a philosophy or policy which provides a framework for decision making. The management of water is very diverse, yet seemingly independent decisions have a ripple effect on other aspects of the resource. Inconsistencies in this very diverse decision-making structure (private and various levels of government) can be minimized and preferably avoided only if all decisions are made in the context of a unified set of goals enumerated by policy. The policy should be broad enough to stand over time, but elements should be flexible enough to accommodate changing needs and values.

Present Status of Water Policy in the Commonwealth

Water policy statements are found in Virginia's Constitution, legislative enactments, agency regulations, and court decisions. Often, these statements are imprecise or contradictory. Each may contain elements of a comprehensive policy, but none are adequate in their present form.

The constitutional declaration is too general to offer much assistance to decision-makers.

Legislative enactments define desirable goals in water use, but they do not provide a complete basis for resolving claims of conflicting use. For the most part, they relate to specific areas of activities, e.g., wetlands, scenic rivers, water quality, and/or drainage.

Policy-making authority delegated to state agencies generally has not worked too effectively. Policy is so fundamental to the decision-making process that it should not be insulated from the

citizens in a bureaucracy. Policy should be enunciated by those directly responsible to the people—their elected representatives.

The common law riparian doctrine, which is applied by the courts, gives general guidelines of defining the water rights of individuals, but it does not provide guidance for either short- or long-term planning. Even if the courts' opinions were more detailed in outlining long-range implications of the immediate decision, the judicial system is not designed to implement decision-making on a sustained basis. Court action, for the most part, is after the fact and is predicated on the assumption that the system has enough resilience to recover. This capability to respond after the fact may be a luxury which the present environment cannot afford.

In addition, the policy must be consistent and comprehensive in its application to water in all its forms. The policy as reflected in the riparian doctrine is not well suited for management of groundwater since it cannot be considered in most cases to be renewable in terms of time and space as in the case of surface water.

Options for the Commonwealth

In the following sections of this report, water policy based on the doctrines of prior appropriation, riparian rights, and public trust are examined in terms of their advantages and disadvantages. Other alternatives might be some combination of these legal principles, but they are not considered in this report.

Water Policy as Enunciated by the Doctrine of Prior Appropriation

The prior appropriation doctrine evolved out of usage and custom in the mid-1800's and has been the predominant water policy for 17 states located west of the 98th meridian. Any proposed changed in policy would not be complete without an evaluation of this doctrine in terms of its application in the East.

A detailed analysis must begin by reviewing this policy in its historical setting. First, it developed in a frontier society out of necessity that existed at the time. It was never conceived in terms of a broad public policy objective to guide water resource development over time. Second, because of the arid climate of the West, the water right developed as a property right, and the basic principles governing prior appropriation were to provide security for this property right. The priority system that was adopted dictated that the first user in time had the superiro right. Thus, factors such as public interest or maximum use of the resource were always subservient to the fundamental concept that a water right as property must be allocated on a time basis.

Much can be learned from an analysis and evaluation of this system. Any changes in water policy for the humid East should consider aspects of the appropriation system which are good and reject those which are unworkable.

Description

Water rights under the appropriation doctrine are obtained either by making application to a State to divert unappropriated waters or by the physical diversion of unappropriated water and applying them to beneficial use. The water right, once obtained, is in perpetuity but can be lost through non-use or forfeiture. Allocation among various users is based on time—the person who received the first appropriation has the superior right to use all the water until his appropriation has been satisfied.

Water which has been appropriated can be used on any land without regard to its physical location to the water. Both the point of diversion and purpose for which the water is to be used are fixed with the granting of the appropriation and can be changed only with the approval of the state after a showing that no other water rights will be affected.

Origins

Early evidence of the appropriation doctrine in the united States can be found in three

unrelated general movements in the mid nineteenth century–Spanish settlement in parts of the Southwest, Mormon colonization of Utah, and the California Gold Rush. In the Spanish settlements, the rights of prior appropriation existed under Mexican law before the teritory was ceded to the United States. The Mormon Church improvised a temporary system of land titles soon after occupying the region which later becan Utah. A system of water titles were established as part of the orderly development of the Mormon settlement. In the case of the California Gold Rush, the law that evolved is attributable to the miners. the rules governing the acquisition, holding, and forfeiture of individual mining claims were based on the priority of discovery and the diligence of working them. the same principles thus controlled the acquisition and exercise of the right to the needed water to work the placer mining claims. The actual diversion of water to beneficial activities give notice to all the world of the water claim, and those using the water first were deemed to have the superior right.

This method of establishing water rights and the general rules which evolved for settling disputes became known as the appropriation doctrine. Its application was primarily on the public domain where the miners were trespassers. Although there was no state or federal law respecting water, the courts nevertheless began to recognize miners' claims as possessory rights that were good among themselves and against all others except the federal government. During the period 1850-1875, the appropriation doctrine was adopted by state and territorial statutes in the west (area west of the 98th meridian). Congress gave tacit approval by taking no direct action with respect to the mining claim and the use of water on the public domain. At the close of the Civil War, in 1865, efforts were made to reclaim the mines and to sell them to satisfy the war debt. Western senators and representatives successfully defeated this effort and succeeded in obtaining the passage of the Act of 1866, which confirmed the rights of the miners to both minerals and water and accepted the elements that define the prior appropriation doctrine.

Advantages

Greater Flexibility as to Place of Use . Appropriated water can be used at any location. Thus, the benefits to be derived from the use of water on land are not limited to land adjoining a stream or within the same drainage basin.

Greater Certainty of Water Rights . The quantity and priority of water rights are fixed and do not vary over time. Unused water rights are not allowed to persist and thus threaten stability of existing rights. The concept of greater certainty can be exaggerated since everyone except the most senior appropriator is subject to the amount that is naturally available at any point in time.

Disadvantages

The disadvantages associated with the doctrine of prior appropriation are drawn from experience in the West, where the doctrine has been in effect for more than a hundred years. These same problems would appear if the doctrine were adopted in Virginia.

Water is Wasted . The advantage of being able to use water on nonriparian land gives rise to conveyance losses which can be substantial. A report to the Oregon legislature indicated that if conveyance losses were reduced, the state could double its irrigable acreage. Although the conveyance losses due to evaporation would likely be less in the East than in the West, the losses resulting from permeable conveyance facilities would be equally large in the East because the cost of lining canals or using large pipe is likely to preclude their use.

In the West, wasteful diversion practices have developed which have been incorporated into water rights. Dams instead of pumps are often used to raise water to the level of a diversion ditch. Although this practice is beneficial to users drawing water from the ditch because it saves pumping costs, it is extremely wasteful from a public policy perspective. Water is withheld from use by others when it is used solely to raise water from the stream to the diversion ditch. In an era of rapidly rising energy costs there could be considerable sentiment for retaining this wasteful diversion practice in an appropriation policy which might be adopted.

Waste occurs in the West because many senior appropriators are located near the mouth of a stream. Thus, excessive channel losses are incurred in satisfying senior priorities. The same situation could occur in the East because existing users would probalby be given a water right which would be superior to water rights for new uses. Intensive reuse of water is dependent on having each

successive user located in order from headwaters of the stream to its mouth. To the extent that senior appropriations are located at down-stream points, the opportunity to reuse the water is substantially reduced.

Waste occurs in the West because appropriators will always use their full appropriation rather than that which is actually needed for fear of losing part of their water right by forfeiture.

Under the appropriation doctrine, water is likely to be applied to the same purpose forever. The interdependence among users already established is likely to foreclose changes to other purposes regardless of the benefits to individuals or society. The West is experiencing considerable difficulty in providing water for energy production—a need not fully contemplated twenty years ago. The granting of water to existing users would place Virginia in substantially the same position as the West. New water rights granted after the adoption of the prior appropriation doctrine would be granted with the assumption that existing needs would continue. Attempts to change the purpose of use would draw objections because the new use might affect factors such as velocity, quantity, level, and purity of flow. In addition, the new use might be more consumptive than the former use and might have a substantial impact on subsequent users. The change from a non-consumptive to a consumptive use is a very strong possibility when the new uses are related to new forms of energy production, e.g., coal gasification.

Failure to Distinguish Important Uses . In a time of shortages, the prior appropriation doctrine terminates in reverse order of priority, with senior appropriators getting their full amount without any assessment of the relative value of the various uses. In the case of agriculture, a high-value crop might be sacrificed because the water priority was low, or an orchard might be destroyed for lack of water in lieu of annual crop because the orchard owned has a low priority for water.

Economic Growth Can Be Stymied . One factor in continuning economic growth may be the ability to shift water to a more profitable enterprise. Prior appropriation tends to "freeze" water into existing use patterns. This could occur in Virginia by the granting of water rights to existing uses at the time the new doctrine is adopted.

Priority Appropriation Incompatible With Maximum Utilization . In 1893, the Case of Nichols v. McIntosh in the Colorado court held:

> "Property rights in water consist not alone in the amount of the appropriation, but also in the priority of the appropriation."

Thus, prior appropriation grants to the water user a private right on a first-come, first-served, basis while maximum utilization would likely involve a sharing of water among all users to improve the efficient use of water for the overall benefit of the state. Maximization of use would suggest use based on some qualitative determination such as the best means and patterns of allocation for the state as a whole. This concept is incompatible with prior appropriation doctrine which is designed to protect private property in water.

Appropriation Makes Difficult Integrated Management of Surface and Groundwater . Management of surface waters permit a senior appropriator to shut down a junior approrpriator and the benefit to the senior appropriator usually is fairly immediate. Groundwater flows, on the other hand, are very slow and the pattern complex. The adverse effect of a junior appropriator's pumping may not be noticeable for months or years. Likewise, the shutting down of a junior appropriator's well may not have an immediate impact on the flow for the senior appropriator.

Appropriation Not Suited to Manage Non-Tributary Groundwater . Deep well extraction from confined aquifers produce water that would not contribute to surface flow except for the pumping of a well. Colorado, which has been a strict appropriation state since its creation, has recently considered legisiation which allows pumping permits only for the quantity of water underlying land owned by the applicant. This is a sharp departure from the doctrine of prior appropriation and suggests that the doctrine does not work well for all water resources.

Experience of Eastern States Which Have Considered Prior Appropriation.

In a 1955 report to the Governor of Virginia, the Virginia Advisory Legislative Council recommended against the adoption of the prior appropriation doctrine. The Florida Water Resources

Study Comission also rejected the adoption of the prior appropriation doctrine in a 1957 report to the Florida Governor.

Mississippi adopted the doctrine in 1956, but a law professor from Mississippi commented "it appears that it is nothing more than a predetermination of relative rights to be employed in the rare instance of water shortage...it does little to prevent water shortages or to stimulate greater utilization of a normal abundant water supply."

Water Policy as Enunciated by the Riparian Doctrine

Historically, the riparian doctrine in application has been the dominant policy governing water allocation in the Commonwealth. It therefore must be examined in terms of its fundamental characteristics. Its advantages and disadvantages need to be carefully analyzed and evaluated before considering any change in water policy.

Description

Under the riparian doctrine the right to use surface water is restricted to the owners of land contiguous to a watercourse. The water can only be used on lands bordering a stream and within the same drainage basin. The amount of water available to each riparian land owner must be reasonable in relation to others having a similar right.

Advantages

Flexible Standard . It allows each riparian owner a certain amount of flexibility in starting a new use or in expanding or altering an existing one, in the light of chaning conditions of water use and supply.

Minimum Administration . Adjustment of conflicts between users is on a case-by-case basis utilizing the court system. An elaborate bureaucracy is not necessary for administering the system.

Provides for Instream Uses . The general allocation of water under the riparian doctrine provides for instream uses of water under most circumstances since all riparian users throughout the length of a watercourse share in the water on the basis of reasonable use.

Disadvantages

Restricts Place of Use . The use of stream water is limited to riparian owners and the use must be on riparian land. Although the water right associated with one parcel of land may be separated from the land, it can only be used on other riparian lands. It is argued that a better or "higher" use of water may freqently be made on lands not riparian to the stream.

Uncertainty Exists as to "Quality" of Riparian Water Rights . The reasonableness of a particular water use by one riparian varies with the needs of other riparians. This can discourage investments because the amount of water available to any riparian cannot be assured for a given length of time, with the result that the water resource is under used.

Water Rights Administration is Cumbersome . The problem of uncertainty related to a water right is further aggravted by the fact that the amount or extent of the reasonable use can only be determined by litigation. The results of litigation can be temporary since the court's decision is based on the circumstances existing at the time of the decision. Increased water use by one riparian or the adding of another riparian user on a stream could require further adjudication of the water rights of all the users.

Administration of water rights under the riparian doctrine are also hindered because courts (1) can make decisions only after the fact; (2) are ill-equipped to incorporate sufficient flexibility in decrees to meet chaning conditions; (3) cannot facilitate planning, and can only decide conflicts; (4) have no means of incorporating the "public interest" into the decree-making process; and (5) require a large expenditure of both time and money when measured against the limited scope of the decree.

Interbasin Transfers Are Precluded . Water cannot be moved from areas of surplus to areas of scarcity. This menas that there can be an under-use of a finite resource in one region while another region may have to control economic growth because of the limited supply of water available.

Cannot Accommodate Conjunctive use of Surface and Ground Water . Although the riparian doctrine could apply to underground streams in most jurisdictions following the riparian doctrine, it is only in rare cases that the courts have found groundwater to be flowing in well defined channels. The law relating to percolating water (non-flowing groundwater) is substantially different from the water law under the riparian doctrine. The physical facts would support a conclusion different from that found in law. Much of our groundwater is in fact moving, suggesting that the amount of percolating water beneath the surface might be smaller than now contemplated by the law. Virginia has adopted the criteria requiring surface evidence of an underground stream before the courts will apply the riparian doctrine. Only in very few instances have these physical circumstances been present. The result has been that the riparian doctrine has not been applied in most cases involving groundwater in the Commonwealth.

Water Policy as Enunciated by the Public Trust Doctrine

The origin of the public trust doctrine has its roots deep in the history of human behavior. Through the years it has evolved and expanded so that its application includes most natural resources, including water. In addition to its common law origin it is recognized in many state consitutions, although not explicitly in Virginia's.

The doctrine not only provides guidance for allocating the water resource among competing uses, it also provides a guiding philosophy for managing the resource in areas other than allocation. It makes the decision-maker, with respect to all problem areas, accountable for considering both the immediate and ripple effects of any decision. The structure of doctrine, however, still allows flexibility to accommodate changing needs and values within policy guidelines.

The emergence of this doctrine as a policy for the management of all water resources is relatively recent. There is not available at this time an accurate assessment of the impact or the problems associated with implementation based on extensive experience. It is more comprehensive than the policies reflected in either the riparian or appropriation doctrine. Some experience would have to be gained from actual use of the policy because the criteria needed for implementation could be so restrictive as to defeat it or so broad as to bring decision-making to a halt. The potential for good should be enormous.

Historical Evolution

The public trust doctrine is the concept that certain property is held by the sovereign (government) in trust for the people. It is rooted in Roman and English law.

With the discovery and settlement of North America, the English view of public rights in navigable waters passed to the colonies. Since that time, the scope of the doctrine has expanded to include not only tidelands and navigable waters, but also wetlands, wildlife, and parklands. Public uses of these areas also have broadened, as courts have added rights of hunting, fishing, aesthetics, recreational enjoyment, bathing, swimming, and shore activities. In recent years, the public trust doctrine has made significant gains in the area of water and other natural resources. The necessity of planning for the protection of these resources also has been recognized under the doctrine.

Although its development throughout most of the nation's history has been in common law, the public trust doctrine is now being recognized in some states as a constitutional right. In addition, in at least one state the courts bave interpreted a constitutional provision as recongnizing a public trust in natural resources although the term "public trust" is not explicitly used. Virginia's Constitution recognizes the need to protect and conserve natural resources but is not explicit in its recognition of the public trust. However, drafters of this section have stated that a public trust is established by implication. As yet, the courts have not made an intrpretation.

Both common and statutory law are beginning to recognize the use of the public trust doctrine in general environmental legislation; however, full recognition will come only when government

accepts the obligation imposed on it by the public trust to protect natural resources and the environment.

Broad Format for Water Management Code

The comprehensive planning, development, and management of water resources must be based on a system of water laws which contains the administrative structure for implementation. Broad governmental policies which reflect the public interest must be made compatible with existing and future private water rights. Laws which allocate and control various types of water users must be placed within continuing and unified administration. The state must have authority to control both existing and new uses, the division of water among users, and the reallocation of water rights of new uses as needs change. The system must not only promote the welfare of individual water users, but it must provide the means for implementing economic objectives, coordinate private activities with state projects, protect interests of the public in common uses and environmental values, and integrate the activities of private users into a comprehensive state plan for water development and management.

The focus of the code will be on people and not the resource--water. It is people who will develop and maximize the output from the uses of water, and thus the regulatory function must be directed toward them. The legislation will encourage and deter, require and prohibit, the activities of people, but it must also reflect a basic understanding of human nature and take economic factors into account or it will likely fail.

A water management act must be comprehensive in scope. All water available to man in usable form will be subjected to the same fundamental rules. The water law will be consistent with hydrologic science and no "private waters" shall be placed beyond the laws reach, and no artifical classification shall require different rules to be applied to the same water as it moves from one phase to another of the hydrologic cycle.

The old concept of private property in some forms of water once had a rational basis, but its function may be better performed by more flexible controls. Water is a distinctly different type of property than land. Real property has been viewed as an object of private ownership subject to public restraints. Water , on the other hand, should be viewed as public property subject to private use .

The widespread notion that the landowner owns the groundwater discovered within his boundaries was originally adopted because of ignorance of the hydro-geological principles which made a rational system of control impossible, and because harm done to neighbors was generally small. The landowner's "property" in the groundwater is really a system of anarchy, under which each landowner can seize what he might without regard to his neighbor who may be powerless to protect his property. Science has so magnified the possibilities of harm that the rule is made intolerable. While groundwater uses may not pose as acute statewide problem at present, history has demonstrated that sooner or later groundwater problems will surface and their arrival may be accelerated by a law that strictly controls streams but leaves the landowner a free hand with groundwater.

In a dynamic society, efficiency will require change if maximum benefits are to be continually obtained. New and better uses will arise to promise more than being produced by existing, perhaps even outmoded uses. The resulting shift from present uses to new ones must meet the same test applied to an original use. Each step must be toward a maximization of the benefits from the resource. The people of Virginia give far greater weight to the environment and aesthetic values than they did twenty years ago. Those values include recognition of non-economic uses of water such as maintenace of minimum flows for fishing, recreation, boating, and aesthetic enjoyment. The new law will need to graft environmental concepts onto tradtional state water rights if it is to reflect the concerns of the citizens. The goal is to propose a water code for Virginia that will promote the goal of efficienty by providing both security and flexibility of water rights.

A P P E N D I X II

Property Interests in Water Under

Current Virginia Law

Water historicaly has been subjected to a substantial level of governmental control, but private property interests in the resource have been recognized. Provisions of both the state constitution and aplicable legislation indicate the existence of a public interest in water; however, the fact that this public interest co-exists with private rights is made clear in legislative statements of water policy and statutory controls over various aspects of water use.

In order to assess the nature of the private interest in water, it is necessary to consider decisions of the Virginia Supreme Court in which private water rights have been defined. The court has developed separate allocation principles for water in streams and ground water, with the result that the private interest varies between the two sources of water.

Private rights in streams have been defined through application of the riparian doctrine under which water rights arise as a consequence of the ownership of land bordering or crossed by a natural stream. The riparian right constitutes a property intested vested in the owners of riparian property, taking of which requires due process of law. The right is of a usufructuary nature and is not lost by simple nonuse. Although the riparian right originally exists as an incidence of the ownership of riparian land, it can be severed and can exist as a separate property interest.

The scope and extent of the riparian right is determined by the flexible criterion of reasonableness. To be reasonable, a particular water use must be compatible with others sharing the same source of supply. Not all adverse effect is prohibited, but only that which produces "unreasonable" harm to other riparian owners. In the absence of injury to others, essentially any water use is reasonable and therefore lawful. The concept of reasonableness does not create a water right of fixed magnitude but may result in changes in the recognized magnitude of the right over time, thereby introducing an element of uncertainty. Municipal water use generally has not been considered to be a reasonable use of water. If surplus water is not available, public suppliers generally have to purchase or to exercise eminent domain powers to acquire affected water rights of other parties.

The riparian doctrine restricts use of water to riparian land. To be considered riparian to a particular stream, land must be part of a contiguous tract in contract with the stream, and any portion extending beyond the watershed of the stream is exlcuded from riparian status. Land is riparian to a stream only at its location on the stream, and water for a particular tract cannot be diverted at an upper point and transported such that intervening landowners on the stream are bypassed. The prohibition against non-riparian use generally is not enforceable in the absence of injury to other parties.

Riparian rights are restricted by certain judicially recognized public rights. Such rights may be restricted on navigable streams, traditionally defined to include those susceptible to commercial use. Riparian rights on navigable streams are subservient to the public right of navigation and may be destroyed without compensation by governmental projects for improvement of navigation. Virginia has not given general acceptance to the position adopted by a minority of the states that public water supply rights are part of the superior public right in navigable waters. However, special water rights now held by the City of Richmond were created by legislative action and constitute a major exception to the riparian doctrine. The public doctrine serves as a potential limitation on the power of the state to allow private use of waters that interferes with protected public uses, but this doctrine has not been applied to the water allocation issue in Virginia.

Common law rights relating to percolating ground water are not as well defined in Virginia as are rights in streams. The state supreme court has not explicitly stated its choice of ground water allocation doctrine but appears to lean toward acceptance of the reasonable use doctrine. This doctrine is somewhat similar to the riparian doctrine in that it imposes restrictions on place of water use; export of water from the overlying land is generally prohibited. However, the doctrine

bears little resemlance to the riparian doctrine with regard to onsite use or the use of property interfering with the ground water supply on adjacent property. The ground water doctrine establishes a more absolute right with regard to onsite activities and does not impose a requirement of sharing the available supply as is done under the riparian doctrine. Most of the Virginia court decisions have involved coal-mining interference with water supply on adjacent or overlying land, and the state court has held that such intereference generally produces no liability in the absence of negligence or in cases where improper support is left for the land's surface.

Existing State Water Management Activity

State involvement in control over water use has been increasing for a substantial period of time. The only direct allocation measure to be established is the Ground Water Act of 1973 (GWA), but several other management activities have a significant effect on water use.

GWA provides for creation of special management districts within which a permitting program is operated. However, the potential effectiveness of this program is hindered by several factors. Excessive exemptions reduce the scope of the act. Provisions defining the scope of existing uses are based on maximum daily use only and thereby create a loophole for uncontrolled expansions in total pumpage. Requirements restricting existing users to a beneficial use have a questionable impact in their present form. GWA is silent with regard to permit duration, public interest review of permitted uses, and transfer of permits between users, thereby making no direct provision to insure continued use of water in ways that maximize the public interest.

Several other state management activities have an indirect impact on the allocation process. Constraints on dam construction and operation control water resource development. State controls regarding public water supply affect the development of waterways for supply purposes. State water policies and plans, while having no direct implementation mechanisms, influence water development and use. Finally, delegations of authority to political subdivisions provide controls over water development. Especially significant in this regard are requirements for local approval of interjurisdictional water supply projects.

Federal Water Management Activities

Affecting State Allocation

The federal government influences water allocation at the state level through a variety of mechanisms. One of the most direct impacts on allication is achieved through exercise of jurisdiction of the federal courts to resolve water-use conflicts on interstate streams. Congressional authorization of federal water projects has been interpreted as a legislative allocation on at least one stream, the Colorado River.

A more continuous involvement in the allocation process is achieved through exercise of controls over navigable waters, a classification that encompasses essentially all the nation's waters for certain regulatory purposes. Of significant impact in this regard are the permit programs operated by the U. S. Army Corps of Engineers (COE) under the Rivers and Harbors Act of 1899 and pursuant to the dredge and fill provisions of the Clean Water Act. COE policies indicate an attempt to administer its permit programs to reflect consideration of state views to the extent possible. A second federal regulatory activity related to water allocation is the licensing program of the Federal Energy Regulatory Commission under the Federal Power Act. The Environmental Protection Agency also exercises certain regulatory authority under the Clean Water Act and the Safe Drinking Water Act which could have impact on allocation decisions. While these regulatory programs generally do not function as direct allocation measures, they impose conditions that must be met prior to exercise of water rights and therefore have the potential to frustrate such rights.

The federal government also influences water allocation through its involvement in water resources development and related activities. Of primary interest in this area are COE project construction and water resource planning. Federal activities also encompass various forms of assistance to non-federal entities such as federal planning studies and financial contributions to non-federal water development projects. A primary example of this latter activity consists of assistance to local small watershed projects under the Watershed Protection and Flood Prevention Act. While mechanisms for state input into the various federal programs are provided, federal involvement of this type has the potential to reduce state control and channel development in

directions not fully consistent with state deisres.

Constitutional Issues Associated with

State Regulation of Water Use

Water rights are generally recognized as a property interest; therefore they are protected by safeguards contained in federal and state constitutions. Subject to these constitutional constraints, however, water rights can be regulated through exercise of the state's police power. This power serves as a control over private actions affecting the public health, safety, morals, and general welfare. Regulation of the utilization of water and other natural resources generally has been considered a valid application of the police power. However, the line which separates valid applications of the police power from unconstitutional infringements of private rights is difficult to define and has been the subject of numerous lawsuits.

A primary application of the police power in Virginia has been in the area of land-use controls. Analysis of decisions of the Virginia Suprement Court in cases involving challenges to such controls and other police power applications provides the basis for identifying the following characteristics of valid police power regulation in Virginia:

1. Regulations must have a reasonable relation to the subject matter of the police power - - i.e., the public health, safety, morals or general welfare.

2. The existence of unearned benefit or uncompensated loss to private property interests does not necessarily invalidate regulation having the requisite relation to the subject matter of the police power.

3. Regulations must not destroy the beneficial use and enjoyment of property.

4. Regulations must apply uniformly to those similarly situated.

5. Regulations must not be based on socio-economic factors.

6. Regulations must not be based solely on aesthetics.

7. Regulations must recognize pre-existing uses of property.

8. Regulatory authority involving discretionary decision-making can be delegated to administrative agencies under proper conditions.

9. Regulations being subjected to judicial review are presumed valid until proven otherwise.

Review of the case histories of states where modifications of water allocation systems have been challenged in the courts indicates the following to be the primary constitutional issues regarding such modifications:

1. Can common law allocation doctrines be abolished and replaced by legislative allocation programs?

2. What restrictions can be imposed on vested rights, and how are such rights defined?

3. Can state government authorize previously unlawful water uses such as interbasin transfers?

4. What delegations of regulatory authority to administrative agencies are proper?

5. Can water-user controls be applied on a special district basis in place of statewide application?

Consideration of these issues in relation to existing Virginia water law and the characteristics of the police power as it has evolved in the Commonwealth allows the following tentative conclusions to be drawn regarding the constitutionally of modifying the state's water allocation institutions:

1. There appears to be no constitutional obstacle to adoption of police power control measures to

replace existing common law water alloction doctrines, provided that proper consideration is given to vested rights existing under the common law. The federal courts and courts of other states have been essentially unanimous in their approval of such action. The Virginia Constituion gives clear recognition to a public interest in protection of the water resource from destruction. Thus General Assembly action adopting legislative water-use controls would appear to be justified if based on a finding of a need to prevent overuse or to manage injurious conflict over available supplies.

2. Vested rights are not imune from all police power regulation but are subject to reasonable controls such as, e. g., required registration and elimination of waste. Because of inherent uncertainties and the unquantified nature of the water right as recognized in the common law, there appears to be no constitutional basis for a claim that each established water use must be given continuing protection at the level of use existing at the imitiation of state controls. However, the limits of police power regulation of existing water use have not been well defined.

3. On the bais of precedent from other states, vested rights can be defined to exclude common law rights not being exercised by a prescribed date.

4. Subject to reasonable protection of vested rights, state authorization of water use activities not recognized under the common law appears to be a valid exercise of regulatory authority. With regard to the question of whether the state can authorize interbasin transfers, it is significant to note that such transfers are not prohibited under present law where no injury results to valid riparian interests. Therefore state approval of transfers of surplus water appears to pose no legal difficulty. Where adverse effects are possible, the police power would appear to provide a basis for the state to define acceptable limits for such impacts and establish mechanisms for resolution of related conflicts.

5. Delegation of regulatory authority to administrative agencies does not appear to pose a problem in view of a provision in the Virginia Constitution authorizing the General Assembly to create agencies and assign their authority and duties. The Virginia Supreme Court in general has not taken a restrictive position regarding delegation.

6. Application of water-use controls only in areas with special water management problems appears to be consistent with constitutional requirements for equal protection of the laws. The special district approach to application of police power controls has been widely utilized since the approach was upheld by the U. S. Supreme Court in 1926.

Since state control over water use is likely to involve some degree of disruption in private water rights, the issue of compensation for injury must be considered. Questions of compensation in connection with unconstitutional takings of property are frequently resolved by the courts, but other applications of compensation mechanisms are also possible. For example, considerations of equity may lead to policies for granting of compensation in certain situations where no constitutional obligation exists. Increased reliance on economic incentives has potential for facilitating negotiated settlements to water use conflicts. Development of water allocation programs provides an opportunity for establishment of a compensation mechanism to function in a non-judicial setting as a continuing water management institution.