VIRGINIA DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT

DIVISION OF WATER RESOURCES

COMPREHENSIVE WATER RESOURCES PLAN

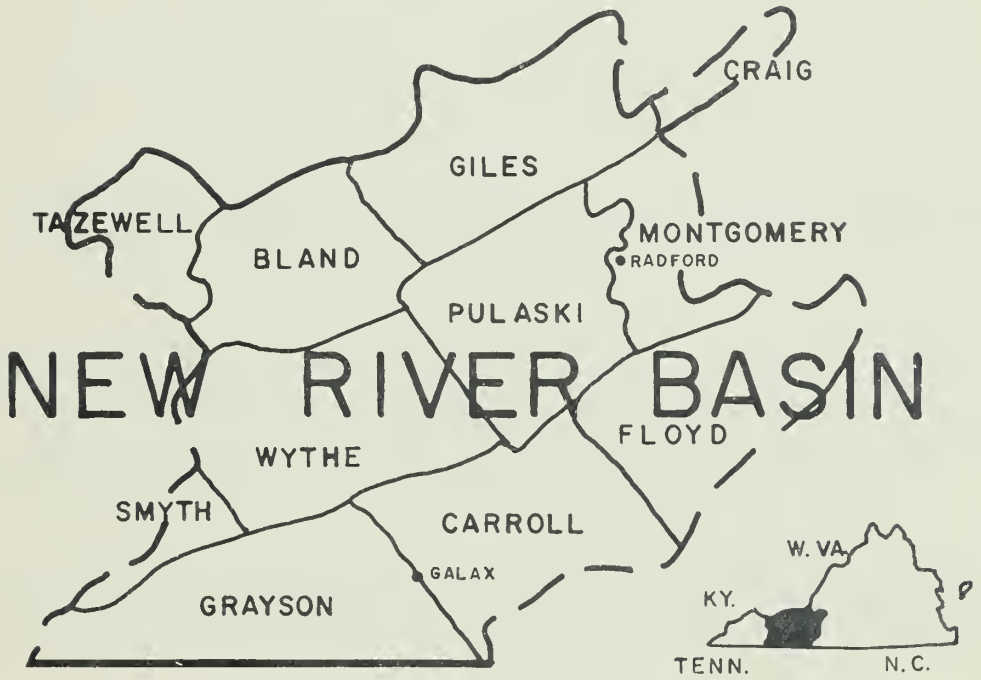
VOLUME VI - IMPLEMENTATION OF DEVELOPMENT ALTERNATIVES

PLANNING BULLETIN 206

1967

VIRGINIA DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT

DIVISION OF WATER RESOURCES



COMPREHENSIVE WATER RESOURCES PLAN

VOLUME VI - IMPLEMENTATION OF DEVELOPMENT ALTERNATIVES
PLANNING BULLETIN 206
DECEMBER, 1967

RVIN M. SUTHERLAND
Director

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Executive Assistant

DIVISIONS
RESTRY
NERAL RESOURCES
RKS
BLIC RELATIONS AND ADVERTISING
ATER RESOURCES

COMMONWEALTH OF VIRGINIA

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT

911 EAST BROAD STREET
RICHMOND, VIRGINIA 23219

April 23, 1968

His Excellency, Mills E. Godwin, Jr., Governor of Virginia, and Members of the Virginia General Assembly

The General Assembly of Virginia in Chapter 561, 1966 Acts of Assembly, directed the Board of Conservation and Economic Development to proceed as rapidly as possible to study the existing water resources of the State, means and methods of conserving such water resources, and existing and contemplated uses and needs of water for all purposes.

The legislation directing the Board to carry out the aforementioned activities requires that the Board formulate a coordinated policy for the use and control of all the water resources of the State and issue a statement thereof.

Volume VI, Planning Bulletin 206, contains an interim statement of water resources policy of the State and pertains to the Virginia portion of the New River Basin.

This statement of water resources policy and subsequent revisions thereof will be furnished to appropriate State and Federal agencies and to governing bodies of affected political subdivisions of the Commonwealth.

Respectfully,

Carlisle H. Humelsine
Chairman

NEW RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN

Volume VI - Implementation of Development Alternatives
Planning Bulletin 206

Commonwealth of Virginia

Department of Conservation and Economic Development

Division of Water Resources

Richmond, Virginia

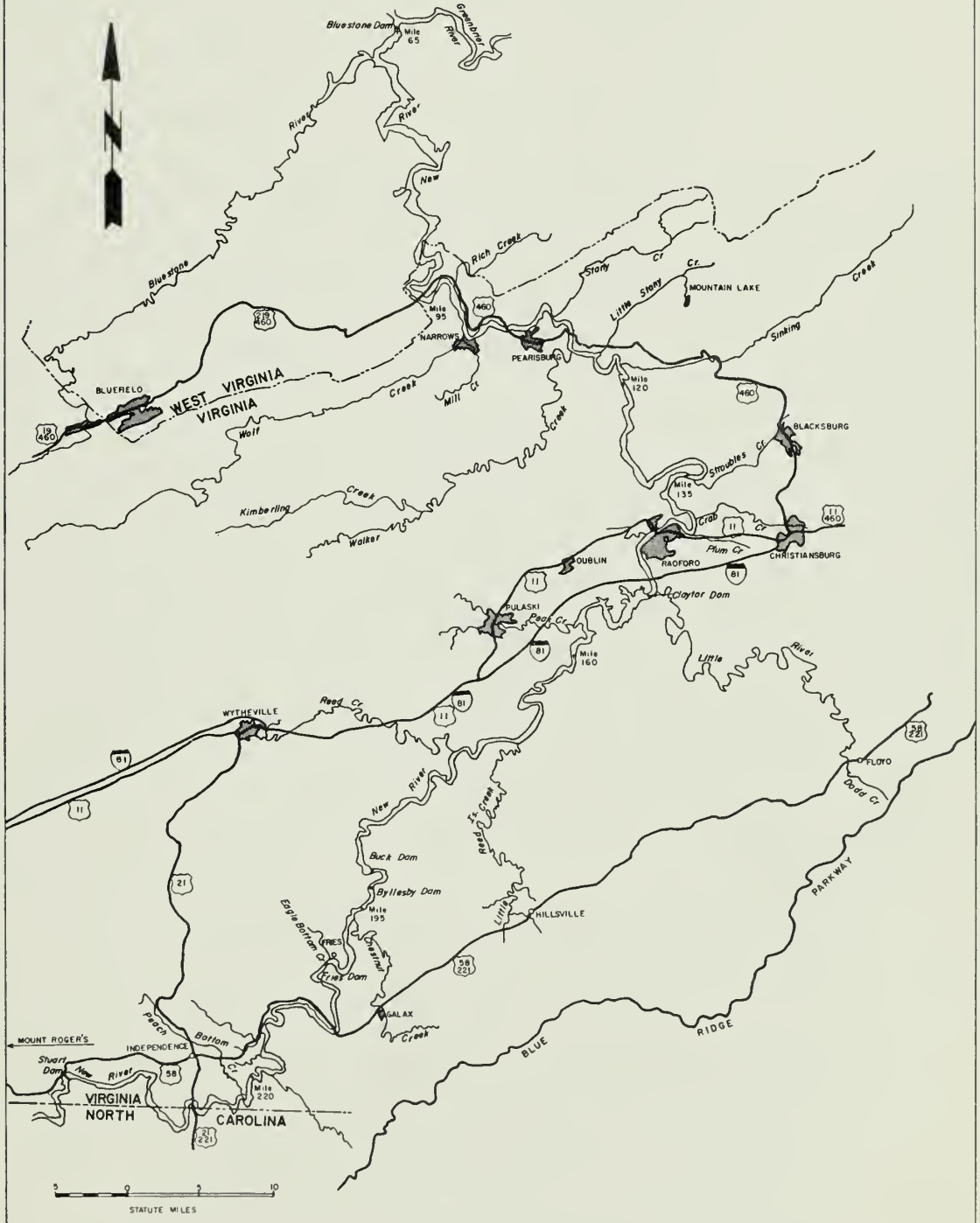
December - 1967

BE IT RESOLVED by the New River Basin Advisory Committee, in a meeting assembled February 2, 1968, that the said Advisory Committee after careful study, herewith supports the recommendations made by the Division of Water Resources in Volume VI - Implementation of Development Alternatives in the Comprehensive Water Resources Plan of the Virginia New River Basin.

Adopted this 2nd day of February 1968.

Roby K. Sutherland — Pulaski County
Dabney P. Newman — Grayson County
A. L. Giles — Galax City (Vice-Chairman)
Sam C. Walton — Radford City
Howell W. Barnes — Giles County
V. R. Marshall — Floyd County
W. H. Hankins — Tazewell County (Secretary)
Edmund Lewis — Wythe County
Claude B. Stoddard — Bland County
J. Gilbert Cox — Montgomery County (Chairman)
E. R. Murray — Smyth County
Wayne R. Griffey — Craig County

NEW RIVER



DIVISION OF WATER RESOURCES	SC. BAR	DATE 8-3-67		SHT. 1	OF 1
NEW RIVER	DE.	DR. M.N.F.	APP.	REV.	NO. 101

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ACKNOWLEDGMENTS

In Volume I, Planning Bulletin 201, of the New River Basin Comprehensive Water Resources Plan in Virginia, December 1966, the Division of Water Resources of the Virginia Department of Conservation and Economic Development gratefully acknowledged the contributions of a number of Federal, State, and local governmental agencies and corporate or private organizations. Twelve of the contributing departments and divisions of the Virginia State Government were listed along with the names of the eleven counties and two cities of the New River Basin in Virginia whose officials and citizens have cooperated in the survey. The continuing interest of all of these in the survey and the subsequent bulletins is appreciated.

FOREWORD

The Comprehensive New River Basin Water Resources Plan is contained in six volumes.

Volume I - Introduction

Volume II - Economic Base Study

Volume III - Hydrologic Analysis

Volume IV - Water Resource Requirements

Volume V - Engineering Development Alternatives

Volume VI - Implementation of Development Alternatives

Volume I of the Comprehensive Study is an introductory volume having the primary function of assisting the reader in becoming more aware of certain factual data concerning the New River Basin in Virginia. Salient points are presented concerning the history and economic characteristics of major political subdivisions within the Basin to include comments related to climate, geology, and topography. An inventory of existing water related developments is also contained in Volume I.

Volume II is an economic base study of the New River Basin in Virginia. Information relating to population growth and areas of future industrial growth are contained in the volume. The volume in general contains an assessment of the economic factors which will influence water requirements and water resource development in the Basin.

Volume III contains an analysis of certain aspects of the hydrology of the Basin. Detailed analyses of low flow and flood flow in various streams of the Basin are presented, and a discussion of climate prevailing

in the Basin is included in the volume. An analysis of ground-water production potential is included with a presentation of the lithology and hydrology of geologic aquifers of the Basin.

Volume IV is an analysis of projected water resource requirements. The water resource requirements studied include the areas of public and private water supply, industrial water demand, thermal electric generation cooling water demand, waste assimilation water requirements, agricultural irrigation water demands, livestock water demand, and demand for outdoor recreation. An analysis of projected electrical power requirements is also included in the volume.

Volume V includes discussions of development alternatives to meet the water resource requirements outlined in Volume IV. The volume also contains an analysis of the potential value of the water resource in the Basin under a scheme of ultimate development.

Volume VI contains a recommended plan for development and management of water resources in the New River Basin. The recommendations range from definite project support with some management modification in the case of the proposed Appalachian Power Company Blue Ridge Project to recommendations for further study in those areas of water resource development and protection where adequate data is not available.

Development of the New River Basin in Virginia for the benefit of areas downstream from Virginia may be proposed in the future. An analysis of the possible effect of three additional reservoirs in the Basin on low flow in the New River is indicated in Volume VI. The value of these reservoirs to states downstream from Virginia would be great, and if properly managed, the structures would be of considerable benefit to Virginia.

The New River Basin Comprehensive Water Resources Plan will become a portion of the overall water resource plan for Virginia and will be used to guide future water resource development in the Basin.

NEW RIVER BASIN

COMPREHENSIVE WATER RESOURCES PLAN

THE ORDER OF PRESENTATION OF THE SEVERAL RECOMMENDATIONS

DOES NOT INDICATE PRIORITY OF VALUE OR IMPORTANCE

RECOMMENDATION 1

DEVELOPMENT OF THE BLUE RIDGE SITE BY THE APPALACHIAN POWER COMPANY UNDER THE DIVISION OF WATER RESOURCES MANAGEMENT PLAN

Development of the Blue Ridge site is essential in any comprehensive water resources plan for the New River Basin. Plate 1 shows the proposed location for the Appalachian Power Company Blue Ridge Project. This project, if constructed by the Appalachian Power Company under the water resources plan proposed by the Division of Water Resources, will be of great value to the area and the State. The Division of Water Resources management plan calls for an allocation of 50,000 acre-feet of storage in the reservoir to be released during periods of low flow for water quality control downstream in the New and Kanawha Rivers. Re-regulation of the releases from Blue Ridge at Claytor Dam to provide a 1-day 30-year low flow of 1,200 CFS at Radford is an element of the plan. Minimum instantaneous releases from the Lower Blue Ridge Dam would be 260 CFS with weekly average releases of 600 CFS.

The allocation of this storage and the additional release for power generation purposes would limit drawdown in the pool to about 10 feet. This limitation on drawdown will provide a pool having the capability to supply high grade, water-oriented recreation; and, coupled with Claytor Lake, it would provide recreational resource opportunities for thousands of Virginia residents and out-of-State visitors each year. State parks are contemplated in the area of the proposed Blue Ridge Project contingent on management of the reservoir under the Division of Water Resources Plan.

Site development at the Blue Ridge location by the Appalachian Power Company would add potential value for recreation, public and industrial water supply, water quality control, and thermal-electric power generation cooling water. Approximately $28 million per year of potential value for these uses would be added in the Basin.

The United States Department of Interior has proposed an allocation of 500,000 acre-feet of water quality storage at the Blue Ridge site for water quality control. The Division of Water Resources has analyzed the plan proposed by Interior (see Volume V) and has concluded that development under that proposed plan would result in a potential annual value reduction of $7.5 million when compared to the Division of Water Resources Plan. This reduction is exclusive of the value of hydro-electric power that may be realized. The Interior plan would provide additional benefit to the Charleston, West Virginia area; however, this benefit would in large part be gained at the expense of value lost to Virginia.

PROPOSED APPALACHIAN POWER COMPANY
BLUE RIDGE SITE DEVELOPMENT

DIVISION OF WATER RESOURCES	SC.	DATE	SHT. 1 OF 1
	DE.	DR. M.N.F. APP.	REV. NO.

PLATE NO. 1

RECOMMENDATION II

THAT ADDITIONAL RESERVOIRS WHICH MAY BE ESTABLISHED IN THE NEW RIVER BASIN SHALL BE "TRUE MULTIPURPOSE DEVELOPMENTS"

FUTURE RESERVOIR SITES WHICH SHOULD BE GIVEN PRIME CONSIDERATION ARE ON LITTLE RIVER, BIG REED ISLAND CREEK, AND REED CREEK

Development of the Blue Ridge site by the Appalachian Power Company under the Division of Water Resources Management Plan should provide ample water to meet the Virginia New River Basin needs until 1990. Further development of the Basin's water resource may be needed after that date. Water pollution problems in the Kanawha River Basin outside of Virginia may result in future efforts by the Federal Government for further development of water resources in the Virginia portion of the New River.

Development of the water resource in the New River Basin which would aid in overall solution of problems outside the State of Virginia is not an undesirable goal provided that adequate value is left in Virginia for its residents.

At the present time, reservoir sites on Little River, Big Reed Island Creek, and Reed Creek are under investigation by the Corps of Engineers of the United States Army. These sites should be given prime consideration in any ultimate development plan for the Basin. Two of the three reservoirs would discharge water into tributaries of Claytor Lake while the Little River reservoir would release water to Little River, which enters the New River below Claytor Dam. Development at these sites then would increase streamflow along the entire New River below Claytor Dam. Since the heaviest concentration of large water-

using industry is expected in the area between Radford and the Virginia-West Virginia boundary, increases in the minimum flows would be most beneficially used for water supply and water quality control.

A reasonable limitation on drawdown in the reservoirs would also provide additional areas for water-oriented recreation. Volume V of the New River Study indicates the possibility of developing hydroelectric power from sites on Big Reed Island Creek and Little River. Provisions for flood control could be incorporated in all three developments. This flood control storage would be of limited value in Virginia but would have considerable value for flood protection or reallocated flood storage which would be used for water quality storage in downstream States.

The locations of the three reservoirs now under consideration by the Corps of Engineers are shown on Plate 2. An analysis of the potential value which would be added to the New River Basin by additional reservoirs is indicated in Volume V of the New River Study. The potential value that would be added was based upon the recreational value of the lakes, value of released water for downstream industrial and public water supply, value of the released water for waste assimilation and thermal electric generation cooling, value of the sites for hydroelectric power generation and flood control.

The following table indicates certain potential values which development at each site could add to the Basin. A preliminary estimate of the average annual cost is also shown for each reservoir.

Project	Average Annual Cost* (Millions of 1966 Dollars)	Average Annual Potential Value** (Millions of 1966 Dollars)
Little River	1.2	2.8
Big Reed Island Creek	1.7	4.5
Reed Creek	0.9	2.4

*Costs based on 50-year amortization period at 3¼% interest

**Average annual potential value based on value for water supply, water quality control, thermal electric generation cooling water, and recreation.

Although the table above provides preliminary estimates only, it indicates that the projects would be of considerable potential value to Virginia. There may be certain problems in connection with any development of the sites, and a careful evaluation of the advantages and disadvantages of each location would be necessary before definite proposals for site development could be entertained.

Being cognizant of the fact that the Federal Fish Hatchery on Reed Creek would be innudated if the Reed Creek Project is constructed the Division of Water Resources prior to any firm proposal for project development on Reed Creek would carefully evaluate other potential reservoir sites upstream from the Town of Wytheville. This evaluation will enable the Division to gauge development at various locations in the area. However, if the reservoir now indicated on Reed Creek is ultimately developed, the timing of the project should be advanced to a date in the future which will permit the realization of a large portion of the benefits from operation of the existing fish hatchery.

Flows in the New River after development of the sites could be as shown in the table on the following page.

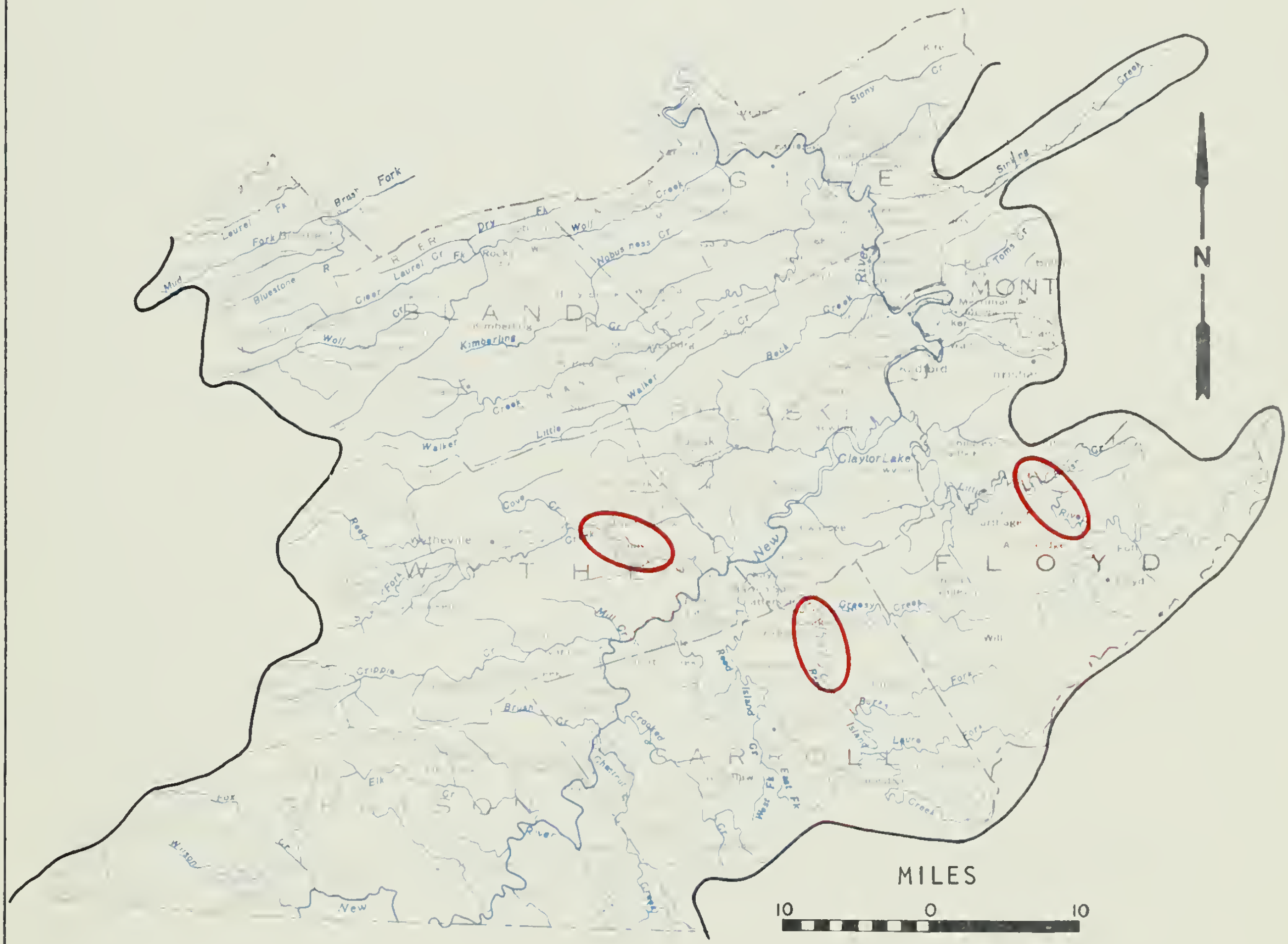
LOW FLOWS IN THE NEW RIVER - ULTIMATE DEVELOPMENT

90% OF THE TIME

New River Station or Location	Existing		With Blue Ridge Project 50,000 A.F.		With Little River Project 27,500 A.F. Regulated		With Reed Creek Project 18,000 A.F. Regulated		With Big Reed Island Project 40,000 A.F. Regulated	
	1-day	7-day	1-day	7-day	1-day	7-day	1-day	7-day	1-day	7-day
Galax	250	340	250	600	250	600	250	600	250	600
Radford	620	950	1200	1500	1566	1700	1666	1800	1890	2025
Glen Lyn	740	1180	1400	1800	1560	1970	1660	2070	1885	2280

Note: All flows in CFS. Flows at the various stations can be expected to equal or exceed those shown 9 out of 10 years.

RESERVOIR SITES UNDER CONSIDERATION FOR ULTIMATE DEVELOPMENT



DIVISION OF WATER RESOURCES	SC.		DATE		SHT. I OF I
	DE.	DR. M.N.F.	APP.	REV.	NO.

PLATE NO. 2

RECOMMENDATION III

ADDITIONAL STUDY OF QUALITY DEGRADATION OF CLAYTOR LAKE AND LONG-RANGE PLANNING TO INSURE ITS CONTINUED USABILITY

Claytor Lake at present is the most valuable water-oriented recreation asset in the New River Basin. It is estimated that approximately $1 million per year is spent for travel and recreational activities at Claytor Lake and Claytor Lake State Park. (See Chapter II of Volume V of the New River Basin Comprehensive Water Resources Plan.)

The effects of water quality degradation in a lake are difficult, if not impossible, to overcome after they have become a fact. The amount of waste that a lake can assimilate without becoming degraded depends upon its hydrological, physical, and biological characteristics. Such characteristics should be determined for Claytor Lake to form the basis for regulatory action to prevent occurrence of adverse conditions.

Adverse quality of water in Claytor Lake may likely be avoided by utilizing the following measures or conditions thereof:

(1) Advanced waste treatment of all waste in Virginia above Claytor Lake to effect nitrogen and phosphorous removal;

(2) Combination of advanced waste treatment and diversion around Claytor Lake.

While at the present time it appears that diversion of waste around Claytor Lake is the least costly alternative to avoid potential problems of Claytor Lake, this may in turn result in similar problems

downstream.

RECOMMENDATION IV

THAT THE REACH OF NEW RIVER BELOW CLAYTOR LAKE AND ABOVE THE CITY OF RADFORD BE PROTECTED IN ORDER TO PRESERVE THIS AREA AS A SOURCE OF SATISFACTORY WATER SUPPLY

It is estimated that future water requirements of the City of Radford and the Blacksburg-Christiansburg-V.P.I. Water Authority will constitute over fifty percent of the public water supply demand in the lower section of the New River Basin by the year 2000. It is necessary that a good quality raw water source be maintained for these two major water suppliers as well as for other communities in the area which may withdraw water from the New River.

The New River between Claytor Dam and the City of Radford is suitable as a raw water source. In fact, the City of Radford now operates a raw water intake above the City. In the event that waste is diverted from the area above Claytor Dam to a point below the dam, it will, of course, be necessary to withdraw water from some location above the waste discharge.

It may be argued that if waste is properly treated, there is no reason to maintain an area of the river which would be free of waste discharge. Although this assumption is sound, treatment standards cannot as a practical matter be maintained one hundred percent of the time. The very rapid water passage time between Claytor Dam and Radford (approximately five hours at a flow rate of 600 CFS at Claytor Dam) makes the problem of contamination

and its effect on downstream water supply very critical.

RECOMMENDATION V

OVERALL SUPPORT OF LOCAL WATERSHED CONSERVATION MEASURES AND SUPPORT OF PUBLIC LAW 566 PROJECTS: ENCOURAGEMENT OF THE PRACTICE OF PROVIDING WATER QUALITY STORAGE IN PROJECTS WHICH INCLUDE ADDITIONAL WATER SUPPLY STORAGE

The United States Department of Agriculture Soil Conservation Service (S.C.S.) is rendering important service in upstream watershed conservation and development. At the present time, legislation regarding S.C.S. type PL-566* projects permits the provision of water supply storage in reservoirs constructed by the Soil Conservation Service. A number of small S.C.S. reservoirs having water supply storage have been constructed in the State.

At the present time, S.C.S. reservoir projects are limited to maximum drainage areas of 250,000 acres. A total maximum reservoir size of 25,000 acre-feet is stipulated in the amended PL-566 project legislation. Benefits which can be provided in these reservoirs are limited to flood control, water supply, recreation, and conservation. Possibly pending amendments would change the existing legislation to permit the storage of water for water quality control downstream and enable the provision of this storage on a cost-sharing basis between the Federal Government and local interests.

Because of the nature of the S.C.S. reservoir program, it is possible to locate reservoirs with water supply storage on watersheds which would have little or no flow in streams below the projects during certain periods of the year. The water removed from the reservoirs for water supply is often converted to waste discharge following

*PL - Public Law, U.S.

use. This waste discharge is then released into the drainage area downstream from the reservoir. When it is realized that each gallon of waste discharged may require between 10 and 20 gallons of fresh water flow to assimilate satisfactorily conventional treated effluent, the implications of providing water supply without an accompanying quantity of water for waste assimilation becomes evident.

RECOMMENDATION VI

THE CONSTRUCTION OF RESERVOIRS IN THE BLUEFIELD AREA ON MUD FORK AND/OR BRUSH FORK FOR PUBLIC WATER SUPPLY AND WATER QUALITY CONTROL

The Bluefield, Virginia-West Virginia, area has the most critical water supply and pollution control problem in the entire New River Basin in Virginia. Existing water supplies for the area cannot meet anticipated public water supply and industrial water requirements without additional development. The Bluestone River below Bluefield is degraded with dissolved oxygen concentrations approaching zero for extended periods during the summer months. Water quality standards have been established which will permit the Bluestone River to be used for industrial water supply. The standards for industrial water supply are relatively low.

Should the public interest dictate, quality of water in the Bluestone River downstream from Bluefield must be improved. Improvement can be accomplished by providing a high degree of waste treatment and by the provision of additional water in the stream during periods of low flow. Additional water supply will be needed during the summer periods in the Bluefield area. Additional water requirements can be supplied from the proposed reservoirs. It is felt that a combination of high degree waste treatment and flow augmentation will best meet the needs of the area if a higher quality water is desired. Provision of flood control storage in the reservoirs will benefit downstream areas.

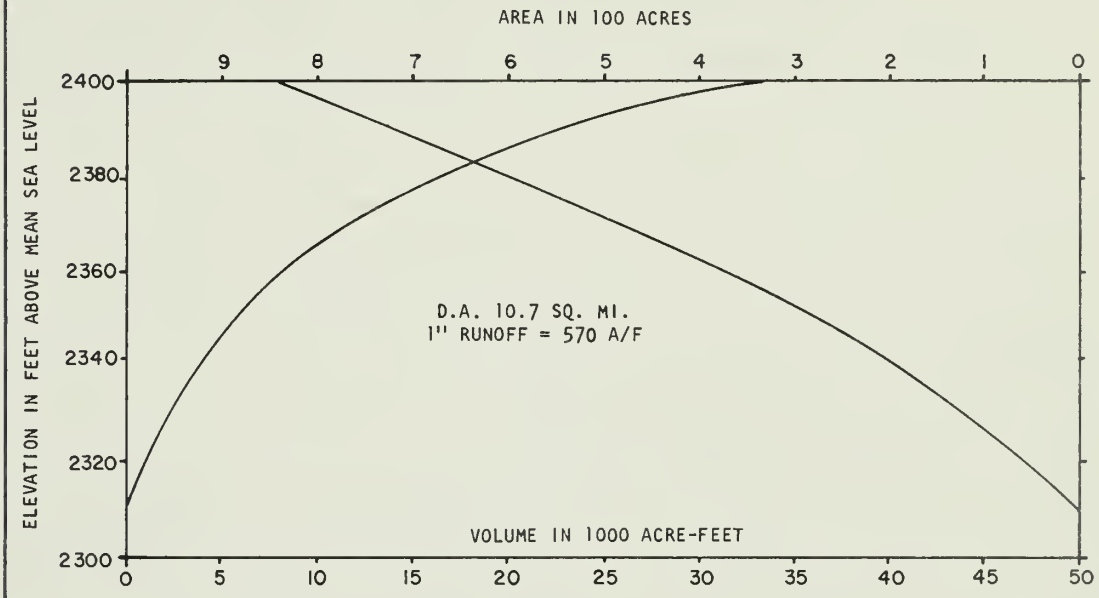
Plate 3 indicates stage-storage and stage-area relationships in Mud Fork and Brush Fork. Water provided in either reservoir

would meet water quality and water supply needs until 1990. The following table indicates preliminary costs for the impoundments and a high degree of waste treatment for the area. It should be understood that approximately 25 feet of reservoir drawdown would be required in each reservoir during the summer months. This drawdown would not permit high grade recreation at the project sites, but a high quality Bluestone River below the Bluefield area would result.

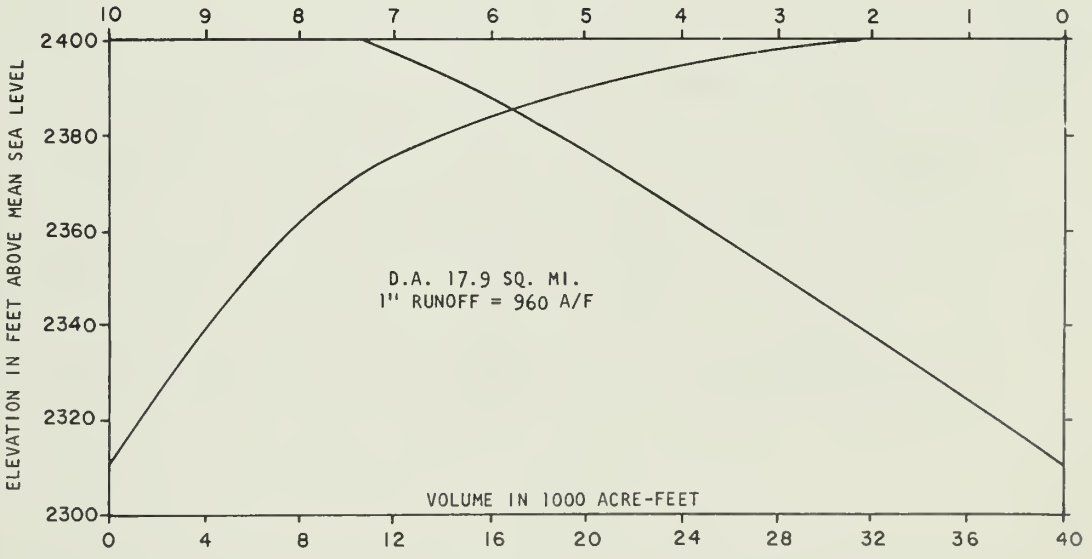
	Average Annual Cost	Capital Investment
Impoundments on Mud Fork, Brush Fork	$314,000	$4,000,000
Waste Treatment and Flow Augmentation Diversion Piping	$271,000	$2,800,000

Note: Above costs include amortization of investment over 20 years at 4½% interest and normal operation and maintenance, secondary treatment assumed. All costs are preliminary and should not be considered final estimates.

BRUSH FORK NEAR FALLS MILLS



MUD FORK NEAR FALLS MILLS



DIVISION OF WATER RESOURCES STAGE-STORAGE AND STAGE-AREA CURVES	SC.	DATE 9-19-67	SHT. 1	OF 1
	DE.	DR. M.N.F.	APP.	REV.	NO.

PLATE NO. 3

RECOMMENDED RESERVOIR SITES
BLUEFIELD VIRGINIA - WEST VIRGINIA AREA

DIVISION OF WATER RESOURCES	SC.	DATE	SHT. 1 OF 1
	DE.	DR. M.N.F. APP.	REV. NO.

PLATE NO. 4

RECOMMENDATION VII

THAT CAREFUL CONSIDERATION BE GIVEN TO THE SUBJECT OF POSSIBLE NUTRIENT ENRICHMENT BY FUTURE WASTE DISCHARGES IN THE NEW RIVER BELOW RADFORD

The New River between Radford and the Virginia-West Virginia boundary has great capability for satisfactory assimilation of organic waste and to maintain desirable concentrations of oxygen. From the standpoint of organic loading and resultant dissolved oxygen, a large increase in waste loading on the stream could be tolerated; however, the existing concentration of nitrogen in the River is above the value considered to be desirable. As waste loading on the River increases, both nitrogen and phosphorous concentrations will tend to rise, and undesirable algal growth may occur.

It is important, therefore, to evaluate the River from the viewpoint of existing nutrient loading and the possibilities of reducing the existing load as well as future nutrient loads, if necessary.

RECOMMENDATION VIII

IMPLEMENTATION OF A FLOODPLAIN INFORMATION STUDY IN THE BLUEFIELD, VIRGINIA-WEST VIRGINIA AREA

The Bluefield, Virginia, and the upper Bluestone River areas suffer average annual flood damages of over $79,000. Areas in the Town of Bluefield, Virginia, are flooded frequently and incur heavy damages from the Bluestone River and Beaver Pond Creek.

A detailed floodplain information study of the Bluefield, Virginia-West Virginia area has never been made. Until the results of such a study are known, it will not be possible to make a meaningful analysis of the flood problem and the cost of alternatives to minimize the flooding.

The Corps of Engineers of the United States Army is authorized to make floodplain studies under provisions of Section 206 of the 1960 Flood Control Act (Public Law 86-645, 14 July 1960). An extract from the Act is as follows:

> "That, in recognition of the increasing use and development of the flood plains of the rivers of the United States and of the need for information on flood hazards to serve as a guide to such development, and as a basis for avoiding future flood hazards by regulation of use by States and Municipalities, the Secretary of the Army, through the Chief of Engineers, Department of the Army, is hereby authorized to compile and disseminate information on floods and flood damages, including identification of areas subject to inundation by floods of various magnitudes and frequencies, and general criteria for guidance in the use of flood plain areas; and to provide engineering advice to local interests for their use in planning to ameliorate the flood hazards: Provided, that the necessary surveys and studies will be made and such information and advice will be provided for specific localities only upon the requests of a State or a responsible local governmental agency and upon approval by the Chief of Engineers."

Data developed in a floodplain information study would include flood profiles, flood records, flood characteristics, flood frequency

estimates, and floodplain delineation.

A floodplain study of the area would give local planners and interests information on which to make logical decisions on floodplain use. The study would also contain technical data which should permit an analysis of alternative means of flood protection.

The responsibility of the governing body requesting this study is fourfold. They must (1) furnish available information (2) make the report available to the public (3) provide copies to public information media and planning and regulatory agencies and (4) preserve and safeguard survey markers. No financial obligation is necessary other than the fulfilling of these four requirements.

RECOMMENDATION IX

THAT A SYSTEMATIC PROGRAM OF FLOODPLAIN INFORMATION STUDIES BE INITIATED THROUGHOUT THE BASIN

Average annual flood damage costs in the New River Basin of Virginia, exclusive of the Bluefield area, are estimated to be $392,000. Of this amount, $57,000 in annual flood damages occur along the New River floodplains and the remaining $335,000 occurs along twenty tributaries to the New River. Unwise development in the future could result in greater monetary losses from flooding. Methods of flood-proofing for existing development could reduce present damages significantly.

There are over 30,000 acres of floodplain along the more than 500 miles of streams in the New River Basin in Virginia. In addition, there is an unknown amount of developable land lying immediately above the undefined floodplains in the Basin which is not being utilized because flood elevations have not been delineated.

The Flood Control Act of 1960, Public Law 86-645, Section 206, authorizes the United States Army Corps of Engineers to make floodplain information studies "only upon the request of a State or political subdivision thereof".

Floodplain information studies provide the necessary criteria for guidance in planning development of the Basin's floodplains. Included in a floodplain information study would be floodplain delineations, maps or mosaics of the valleys, flood profiles, photographs, and a narrative describing the extent of flooding that may reasonably be expected in the future. The Corps of Engineers may provide technical

assistance in interpreting the study report and in flood-proofing.

The responsibility of the governing body requesting this study is fourfold. They must (1) furnish available information (2) make the report available to the public (3) provide copies to public information media and planning and regulatory agencies and (4) preserve and safeguard survey markers. No financial obligation is necessary other than the fulfilling of these four requirements.

Because there is a large amount of developable land in the New River Basin in Virginia, and because there are significant economic losses from floods annually (on an average basis), and because no floodplain information studies are available; it is recommended that the responsible governing bodies request, through the Commissioner of Water Resources*, floodplain information studies for these areas of the New River Basin where the information contained in such a study is deemed to be needed for the proper planning and development of that area.

*Commissioner
Division of Water Resources
911 East Broad Street
Richmond, Virginia 23219

RECOMMENDATION X

THAT INVESTIGATION OF GROUND-WATER OCCURRENCE, DISTRIBUTION AND POTENTIAL BE INITIATED BASIN-WIDE OR IN LOCALITIES WHERE NEED EXISTS OR IS ANTICIPATED

Ground-water development alternatives have been outlined in Volume V of the Comprehensive Water Resources Plan, New River Basin, and implementation of these alternatives is suggested to achieve profitable and equitable utilization and management of ground water.

Services made possible by the science of ground-water hydrology are available to assist in the advancement of utilization of the water resources of the New River Basin.

Various and alternative proposals for the development of ground water may be set forth with respect to financial and organizational means, and geographical and operational aspects. No attempt is made here to comment upon these means and aspects. Choice is made among alternatives by matching results of geological and engineering investigations against requirements. This may be done in a single well project in a large potential well field by county or by other appropriate subdivision of the River Basin.

Upon realizing or foreseeing a need for supply of ground water, it is recommended that planning for the satisfaction of these needs include the typical steps itemized in Volume V, page 68, of the New River Study. In brief review of those items, geohydrologic investigation usually is the first step. It includes an inventory of wells, springs, and usage of ground water which will provide a basis for establishment of observation wells to be used in gaging of fluctuation of reservoir

levels and for monitoring of quality. Pumping tests and observation wells will supply information for determining safe annual yield.

Counties, municipalities, industries, or individuals can obtain reports on ground-water potential and development feasibility by retention of independent geologic and engineering consultants or by requesting a State agency to enter a cooperative agreement to undertake such works, the objective being the profitable and equitable utilization and management of ground water.

RECOMMENDATION XI

THAT A COMPREHENSIVE STUDY OF WASTE DISPOSAL BE MADE IN THE BASIN WITH PARTICULAR EMPHASIS ON THE EFFECT OF SOLID WASTE ON THE QUALITY OF GROUND AND SURFACE WATERS

Water pollution caused by improper solid waste disposal can be a serious problem. The Division of Water Resources has not made studies in the New River Basin to determine the possibility of water quality deterioration by improper solid waste disposal. In order to establish the basis for a program of minimizing solid waste disposal problems in the Basin, it is necessary that a comprehensive study of disposal be made.

The problem of solid waste disposal encompasses factors of environmental health other than water quality deterioration, and any study of the solid waste problem should include a consideration of all environmental health aspects relating to solid waste disposal. The Virginia State Department of Health through its Bureau of Solid Waste and Vector Control has the capability of making necessary studies and developing appropriate recommendations for adequate solid waste disposal. At the present time, the Bureau is involved in a State-wide study of solid waste disposal and has completed a solid waste disposal plan for Pulaski County. It is anticipated that all major political subdivisions in the State will be included in the study, and if the recommendations of the Health Department are followed, the problems associated with improper solid waste disposal will be greatly reduced.

RECOMMENDATION XII

THAT THE COMPREHENSIVE WATER RESOURCES PLAN BE REVIEWED BY THE COMMISSION OF OUTDOOR RECREATION TO DETERMINE THE BASIS FOR EXPANDING THE RECREATION DEVELOPMENTS IN THE AREA

Considering the high potential for outdoor recreation in the New River Basin, a study would be conducted by the Commission of Outdoor Recreation. This study would include specifics for additional recreational development based upon the proposed water reservoirs and the regulated flows in sections of the New River. The New River Basin Advisory Committee, with its knowledge of the Comprehensive Water Resources Plan, would be in a good position to coordinate the recreation study associated with the water resource developments.

RECOMMENDATION XIII

THAT A MINIMUM OF TWO CONTINUOUS WATER QUALITY MONITORING STATIONS BE ESTABLISHED IN THE BASIN AND THAT THE RATE OF FLOW FROM ALL FUTURE MAJOR IMPOUNDMENTS BE CONTINUOUSLY MONITORED

At the present time, the New River throughout its length in Virginia is generally a stream of excellent chemical quality. There are, however, considerable differences in quality in the River above Claytor Lake and below the City of Radford. These changes are explained in part by the different geological areas which the River drains and the different usage of the River in the two areas.

It is anticipated that heavy industrial use will be made of the New River below Radford in the future. Present projections of future industrial growth do not indicate that the River above Claytor Lake will be as extensively used for industrial water supply and waste assimilation as the reach of the River between the City of Radford and the Virginia-West Virginia boundary. Monitoring of the River above Claytor Lake and at Glen Lyn should give a representative picture of river quality in two areas which will vary considerably in their pattern of usage. It is important that monitoring of the quality be on a periodic basis within the daily 24-hour period.

The second part of the Recommendation relates to flow measurement in streams. Major impoundments can greatly affect flow patterns in reaches of streams below the impoundments. The rate of flow from future reservoirs which will be constructed in the Basin must, therefore, be continuously monitored.

RECOMMENDATION XIV

THAT THE NEW RIVER ADVISORY COMMITTEE BE CONTINUED WITH A VIEW TOWARD ITS GUIDING THE WATER AND RELATED LAND RESOURCES OF THE BASIN SUBSTANTIALLY IN ACCORDANCE WITH THE PLAN HEREIN PRESENTED

The recommended plan in Volume VI will serve as an overall guide to future water resource development in the Basin. Over a period of time, however, the timing and the exact nature of required future water resource development will have to be evaluated in greater detail. The Virginia Division of Water Resources has the overall State responsibility for planning water resource development. In order to continue effectively, it will be necessary that communication between the people in the Basin and this Division be continued. The Advisory Committee is comprised of representatives from each major political subdivision in the Basin and is well suited to carry out the necessary liaison.

Problems which are not now foreseen relating to water resources will undoubtedly arise in the future. The Advisory Committee will be able to give careful consideration to these problems and in certain instances may recommend appropriate action to be taken by the political subdivisions. In the future, if the need for local financing is apparent, local governments can coordinate activities with the Committee. It should be noted that Basin planning and implementation of plans will be a matter for continuing consideration, and the need for an active committee will extend far into the future.

CONCLUSIONS

Volume VI, the last in a series of six volumes treating studies leading to the formulation of a New River Basin Comprehensive Water Resources Development Plan, contains a statement of policy for development and management of the water resources in the New River Basin of Virginia. The policy presented in the form of 14 recommendations seeks to fulfill, insofar as the New River Basin in Virginia is concerned, the principles set forth in Chapter 561, 1966 Acts of the General Assembly, and is considered an interim statement of a coordinated State policy for the use and control of the water resources of the Commonwealth. It should be realized that the policy outlined in Volume VI is not inflexible. With the progression of time needs will be defined more accurately, and subjects not treated in the current plan may become factors of significant importance in the future. The policy outlined in Volume VI does present a definite program designed to assist in the making of appropriate decisions, and by which future Basin development can be measured. Recommendations in Volume VI range from specific project support to the acknowledgment of and recommendation for needed additional study, and an assessment of that which at this time appears to be the optimum framework for ultimate development in the Basin.

Views of concerned State agencies as well as those of the citizens in the Basin have been considered in the formulation of the aforementioned policy. These views were obtained through members of the New River Basin Advisory Committee which represent political subdivisions in the Basin and from statements received at a public hearing held at Radford, Virginia, on December 12, 1967. Reports of the study were reviewed by appropriate State, local, and Federal agencies and comments received from the various entities have been carefully considered throughout the preparation of the Plan.