

STATE OF NORTH CAROLINA
DEPARTMENT OF WATER RESOURCES

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To Addressee:

For practical reasons we cannot individually address this transmittal letter, but you are known to me directly or indirectly as one of a select group of citizens whose advice and help are urgently needed.

In the more than ten years that I have been actively engaged as an appointee of three Governors in the study of North Carolina's water resources and in the search for solutions to the problems entailed, I have found that little can be accomplished without wide understanding, participation, and support by those who are leaders in one or more of the innumerable public service activities of the State. We need improvement in our water laws and we need a greater State participation in planning and programs, particularly if we want to avoid undue Federal management of essentially local or regional matters. And, believe it or not, the more experienced Federal agencies prefer the partnership approach.

This brochure is rather lengthy (some of you will also receive the Appendix material in a second volume) and I have no illusions that you will necessarily read it thoroughly. I do hope you will read the Foreword and Synopsis with extreme care, that you will browse through the remainder as thoroughly as you have time, retain it for reference, and above all give us your advice.

Sincerely,

James R. Townsend
James R. Townsend

STATE OF NORTH CAROLINA
Department of Water Resources

WISE MANAGEMENT OF NORTH CAROLINA
WATER RESOURCES THROUGH LAW

* * * *

AN ORIENTATION BROCHURE

VOLUME I

Raleigh, North Carolina
August 1966

FOREWORD

This study was directed by Resolution 82 (H.R. 1149) of the 1965 General Assembly dated June 14, 1965. A plan for making the study was immediately drafted. The initial phases of this plan called for the assembly of available data, particularly from other states, the preparation of this brochure to present the essential elements of the problem, and a series of three public hearings to give interested citizens of North Carolina an opportunity to present their views. The later phases require for deliberation by the staff, the aid of advisory committees as necessary, the preparation of a draft report, and a final public hearing prior to Board action and submission of the final report to the Governor.

In addition to the foregoing, it became evident as the study began that special attention needed to be given to the Beaufort County ground water problem. On the one hand the Department geologists expressed serious concern about possible adverse effects of heavy pumping while industry geologists were insisting that there was no cause for immediate alarm. This impelled the Board of Water Resources to request emergency funds to retain an independent group of three nationally recognized Ground-water Consultants to study the problem and advise the Board of Water Resources. The funds were authorized, and the consultants were retained. The Consultants met in January, visited the site, and recommended certain exploratory measures. A second meeting took place June 23, 1966; however, it is too early to include any findings or further recommendations in this particular brochure.

In the fall of 1965, about seventy key individuals in government and industry received letters describing the

study plan and soliciting advice. Responses to this request were very gratifying and helpful in establishing the content of this brochure. Many other potentially concerned private and public groups were also informed by special letters announcing the Department's intentions regarding the study.

The foregoing generally describes the activity up to publication time for this two-volume brochure. Plans for completion of the study and the various actions involved must necessarily be flexible and it is contemplated that appropriate newspaper announcements will be made in respect to hearings. Volume 1 of the brochure has been given a broad distribution to citizens interested not only in water problems but in the future welfare and progress of the State. These have included State legislators, State, Federal, County, and Municipal officials, private groups, large water users, libraries, etc. Volume 2, containing specialized technical and reference information, is being given a more limited distribution.

One aim of the brochure is to encourage constructive response to the Board of Water Resources request for advice. It is earnestly hoped that every recipient will submit a statement, if it be no more than an acknowledgment that a better understanding of the problem has been gained. Formal written presentations to the Department are specifically solicited as soon as possible and should include:

- (1) The particular interest represented (farmer, power company, irrigator, well driller, etc.)
- (2) Identification of known water problems, using county highway maps as necessary for notes.

(3) Suggested improvements to existing water laws, or

(4) Comments on possible solutions outlined in this brochure.

Public hearings are planned at Washington, Raleigh, and Asheville at which all interests will be given the opportunity to be heard. These hearings are to be held as soon as practicable.

Following the hearings, the Department will seek to assimilate all suggestions offered, obtain special advice as necessary, and prepare a draft of a proposed final report. A final public hearing will be held in Raleigh to receive comments on tentative recommendations. The remainder of the time required for completion of the task will be devoted to preparation of the report along with suggested legislation.

Board members and staff members have been impressed by the scope of the problem, and by the long continued efforts to find answers in some other states. Extensive and thorough discussion along with educational programs should take place before the comprehensive body of statutory law needed for an adequate water management program can be developed and implemented. With this in mind, it is the consensus that the final report of this study will seek to define needs and programs more effectively, establish goals, and specifically recommend for early enactment only the minimum essential statutory changes.

SYNOPSIS

Active study of North Carolina water resources has been going on for decades but the beginning of the modern era for water study purposes dates from the Corps of Engineers' "308" studies in the thirties and forties and the 1937 State Planning Report. In the period from 1937 to 1963 eight major agencies in addition to the Department of Conservation and Development were created by the legislature to administer water or water-related matters. Today most of the State's water programs are encompassed within the responsibilities of the three commissions (Board of Water Resources, State Stream Sanitation Committee, and Seashore Commission) which supervise and guide the activities of the Department of Water Resources. These agencies have broad responsibilities, but many of them are advisory, and there are limitations of various types on their authorities. (See Chapter 1)

The basic question now before the Board of Water Resources is whether the pattern of water usage and problems that have arisen in the water resources field have progressed to the point where the Board's existing authorities are inadequate. The use of surface water for various purposes, both consumptive and non-consumptive, includes the unavoidable requirement for the dilution and transportation of treated domestic and industrial wastes. Thus far, in most parts of the State, it has been possible to keep these uses in balance. However, the level of demand for non-compatible uses has reached the critical point or is approaching the critical point in the following areas: Pigeon, French Broad, and Tuckasegee Rivers, South Fork of the Catawba River, small tributaries to Catawba River in Mecklenburg County, Rocky, Haw, and Northeast Cape Fear Rivers. Ground Water problems are beginning to emerge in the Coastal Plain where ground waters are a major asset. Problems generally involve salt water encroachment, aquifer contamination by vertical leakage through wells, and heavy pumpage in certain areas. The extremely large pumpage in the Beaufort County area led to

recommendations which prompted the General Assembly to direct this water law study. Other problems relating to ground waters include effects of withdrawals on stream flows, well construction problems, and pollution of ground water supplies. The sequence of events in the Beaufort County pumping operation clearly indicates a necessity for more thorough advance study of large scale projected ground water withdrawals, and a lack of authority on the part of the Board of Water Resources to require adequate safeguards that proposed uses will not be injurious. These findings combined with the fact that surface water use is becoming critical in an increasing number of areas add to the definite conclusion that legislation authorizing adequate management and control measures is needed. (See Chapter 2)

Other states have faced problems equivalent to those in North Carolina and worse. The failure of some states to initiate appropriate water management programs along with the imaginative and bold approaches of other states afford valuable information in considering what should be done in North Carolina. North Carolina's program compares favorably with those of many of these states and is outstanding in the area of water pollution control, but can profit by the experience and activity of other states. The model water use act developed at the University of Michigan, despite several questionable features, is pointed to as a helpful endeavor that deserves study. (See Chapter 3)

It is not the intent of this brochure to place before the public a ready made legislative program as representing the judgment of the Board of Water Resources. This will come after the general public and various State interests have expressed themselves. A summary of possible actions is included which embrace a rather broad spectrum. These actions are categorized as water use regulations, structural and land-use regulation, policy statements and related non-regulatory approaches, data collection and other management tools, and water development programs. A condensed summary of these possible actions (duplicated from page 103 of Chapter 4) follows:

OPTIONAL COURSES OF ACTION

I. Water Use Regulation

- (1) Prior appropriation
- (2) General permit system for surface and/or ground water
- (3) Permit system for problem areas
- (4) Machinery to authorize diversions for water-short areas
- (5) Salt water intrusion controls
- (6) Other controls over rights to use water:
 - (a) Clarification of rights to use diffused surface water (confirmation of absolute ownership rule, adoption of a reasonable use rule, or some intermediate step)
 - (b) Regulation of impoundment levels and releases
 - (c) Clarification of rights of beneficial owners of reservoirs to control downstream use of released water
 - (d) Prohibit injunctions against harmless withdrawals
 - (e) Control uses of one category of water affecting another (e.g., well affecting nearby stream)
 - (f) SDWR controls over drainage projects analogous to present controls over small watershed projects--e.g., to protect ground water recharge and/or fish-wildlife
 - (g) SDWR approval of water rights acquisition for public water supplies
 - (h) Controls on artesian well waste
 - (i) Any other regulations needed to protect particular interests
- (7) Extension of eminent domain powers and/or reasonable use doctrine

II. Structural and Land Use Regulation

- (1) Reservoir site reservation
- (2) Dam safety licensing and inspection
- (3) Floodway regulations (State) and flood plain zoning (local)
- (4) Well construction standards

III. Policy Statements and Related Non-regulatory Approaches

- (1) Adoption of policy statements concerning various matters, such as:
 - (a) Rights to use diffused surface waters
 - (b) Interdependence of hydrologic cycle
 - (c) Water resource control and use as a matter of statewide concern
 - (d) Interbasin transfers
- (2) Voluntary mediation services by SDWR and referral of water policy issues to SDWR
- (3) Payments to State for water withdrawals
- (4) Watchdog legislative committee
- (5) Special treatment for favored industry regarding water use, etc.
- (6) Sale of project water shares
- (7) Surplus water planning

IV. Data Collection and other Water Management Tools

- (1) Improved topographic mapping
- (2) Better data collection in areas of special need (e.g., irrigation water use--possibly through County Extension Chairmen and SCS Unit Conservationists)
- (3) Finance a strong Water Resources Research Institute
- (4) Finance adequate staff for N. C. water plan

V. Water Development Programs

- (1) State participation in recreational development of Federal reservoirs
- (2) State participation in municipal water supply development
- (3) Additional State participation in P.L. 566 projects

The second volume of this brochure (See Table of Contents), which has a limited distribution, contains valuable reference information on North Carolina statutes, case law, policies, organization, plans, Federal relationships, availability of water, and research.

WISE MANAGEMENT OF NORTH CAROLINA
WATER RESOURCES THROUGH LAW

An Orientation Brochure

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WISE MANAGEMENT OF NORTH CAROLINA WATER RESOURCES
THROUGH LAW
AN ORIENTATION BROCHURE

CHAPTER I

INTRODUCTION

The North Carolina State Legislature by Joint Resolution in June, 1965, directed the Board of Water Resources to study the need for state regulation of water usage and report with recommendations through the Governor to the 1967 General Assembly. It was specifically directed that consideration be given to the views of the following groups:

Members of the General Public
Users of Large Quantities of Water
State Government Agencies
N. C. Water Resources Research Institute
County and Municipal Governments

Also consideration of legislation in other states was directed.

This brochure is intended for wide distribution to provide background information which will inform all groups concerned of the various considerations relating to the regulation of water usage in North Carolina, some of the factors for or against regulation, possible types of regulations, experience in other States, references and extracts to facilitate independent study of those interested, and the plan of action to accomplish the study.

It does not constitute a complete or all-inclusive survey, but it is intended to stimulate thoughtful consideration of the problem and helpful presentations to the Board

of Water Resources by written communication or by statements submitted during public hearings.

EARLY INVESTIGATIONS IN NORTH CAROLINA

Most of the early investigations into North Carolina water problems were sponsored by the U. S. Army Corps of Engineers, the North Carolina Geological and Economic Survey, and a scattering of universities, power companies, and government agencies. Dr. Thorndike Saville was active in making various water power investigations during the twenties. Probably the most significant of these earlier reports are the so-called "308" reports prepared by the Corps of Engineers mostly in the 1930-1940 decade. The oldest major dam in the State as listed in the 1963 USCOLD Register of Large Dams in the U. S. is Blewett Falls built in 1907 by the Carolina Power and Light Company.

Probably the first broadly based study of North Carolina's water resources by a State agency is entitled A Planning Report on Water Resources of North Carolina, issued in October 1937 by the North Carolina State Planning Board. The letter of transmittal signed by Capus M. Waynick, Chairman, emphasized that the complexity of the problem and a deficiency of basic data combined to make it impossible to present at that time a complete coordinated plan. The report reviewed the general conditions obtained in each of the major fields of water use, gave certain detailed information about each drainage basin, and provided summary statements of needs and recommendations for action to be taken and policies to be adopted.

Certain comments in that report are of special interest to this day, especially in the citation of problems. Water is assigned the responsibility for North Carolina's

characteristic pattern of development in the following statement: "The abundance of water supply, from both surface and underground sources, facilitated the development of cities and towns in such widespread manner as to mark the State as one characterized by many medium sized towns, widely scattered, and with the absence of any very large centers of population."

Coastal erosion, water pollution, the need for high quality process water and soil erosion were cited as the major problems with other water-related problems being less pressing. Major recommendations included a plea to expand all basic data activities and to pass pollution control legislation. The development of hydroelectric power was seen as a subject requiring formation of State policy and to this end formation of a study commission was recommended.

Also recommended was the continuation and enlargement of coastal erosion studies, the completion of the Intracoastal Waterway, the construction of a terminal at Morehead City, and the provision of slack-water navigation to Fayetteville, as well as other projects.

A comprehensive investigation and study was recommended to review the status of existing drainage districts, of malaria control work, and of areas where future drainage work might profitably be undertaken. Flood control was found to be economically justified on parts of the Tar River, on the Neuse River, and on the Upper Yadkin, if combined with hydroelectric power development. It was recommended that flood control be included in future multiple purpose development. Continuation of soil conservation and reforestation activities was also recommended. No recommendations were made relating to recreation and wildlife conservation, and irrigation was considered unnecessary.

The 1937 report can be considered as marking the beginning of the present era in water resource planning and development. No shortage in water supply was noted or predicted. Knowledge of ground water was slight and comprehensive ground water investigations were recommended. There is little indication that this first comprehensive report had much impact upon the State. However, the onset of World War II following so soon after probably contributed to the lack of attention given to water resources until the early fifties. One other series of reports is particularly noteworthy. These are the "water resources" booklets prepared by the Department of Conservation and Development mostly in the 1950-1960 decade.

The following chronology provides a general indication of legislative activity in matters relating to water or associated endeavors:

	<u>Year of First Enactment</u>
State Soil and Water Conservation Committee	1937
State Ports Authority	1945
N. C. Recreation Commission	1945
Wildlife Resources Commission	1947
State Stream Sanitation Committee	1951
Board of Water Commissioners	1955
Board of Water Resources	1959
Seashore Commission	1963

Governor Umstead took office about the time of the Korean cease-fire agreement and soon concluded that a definite, clear-cut water program was essential to the State's continued progress. He appointed a committee to study the water situation and to make recommendations to the 1955 General Assembly. Those recommendations, which made major changes to the riparian rights principles, were considered too drastic by the Legislature. Milder recommendations also encountered opposition and it appeared that no water legislation would be enacted.

Thereupon, Governor Hodges, who had succeeded Governor Umstead in the interim appeared before a joint House and Senate Committee and urged that some action be taken to initiate at least a study of the State's water resources and related problems. Chapter 857 of the 1955 Session Laws resulted and will be discussed hereafter.

RECENT INVESTIGATIONS

Governor Umstead also sought answers to problems affecting the Coastal region and the next major report was a survey and report entitled Inland Ports and Waterways of North Carolina prepared in 1954 by a firm of consulting engineers. This report made 27 recommendations on a wide variety of subjects pointed in general toward water resources and waterway development, some of which have since been carried out.

The report contains a brief statement on water supply which justifies quotation:

"Among the State's natural resources too much stress cannot be given to the importance of industrial and domestic water supply. Modern industry requires vast quantities, particularly in some of the chemical processes where purity is often a requisite. Although North Carolina, like other states, has not been too foresighted in avoiding practices leading to pollution of its surface flows, underground supplies constitute an almost inexhaustible reserve in many parts of the State, and particularly the Coastal Plain. With a better realization of the critical importance of water, measures are gradually coming into use which should assure the continued availability of this vital commodity. With proper management this factor can be classed as one of permanent advantage." (Underlining added)

The inland ports and waterways report touched on various other water related problems and particularly emphasized the necessity for action to reduce coastal erosion damage. Figuratively speaking, the ink was hardly dry on this report before North Carolina was struck by four severe hurricanes in 1954 and 1955. In October, 1955, the Council of State authorized the Council of Civil Defense to begin the initial phases of a Long Range Hurricane Rehabilitation Project. The Council was asked to make recommendations and the ensuing report was issued December, 1955. The recommendations generally proposed (1) The use of special development districts to plan and supervise protective works, (2) the preparation of individual locality plans, (3) State financial assistance, (4) collection of additional data, (5) strengthening of emergency rehabilitation programs, (6) comprehensive damage insurance, and (7) the assumption of leadership in hurricane damage programs by the State.

Chapter 857 of the 1955 Session Laws was entitled "An Act to Provide for a Board of Water Commissioners of North Carolina to carry on a Program of Conservation and Education in the Use of Water: and to Provide for the Allocation of Water Under Certain Emergency Conditions." The Board held its organizational meeting August 30, 1955, just before the last of the four destructive hurricanes mentioned and several months before the issuance of the Hurricane Project Report. Its first biennial report was issued for the period ending June 30, 1956.

This report made six recommendations concerning education, studies, and basic data. It was suggested that methods be devised or emphasized to encourage greater soil conservation by farmers, that topographic-mapping be accelerated, that the stream gaging system be expanded, that sedimentation and salt water intrusion receive intensive

study, and that the support of cooperative ground water studies be increased.

Three legislative measures were recommended. A better law controlling irrigation was sought. A need for licensing well drillers and requiring submission of boring samples was expressed. Finally, a law to control the construction of impounding reservoirs was proposed.

This report surveyed the status of ground water, the study of which had been begun in 1941 through a cooperative agreement between the Department of Conservation and Development and the U.S. Geological Survey. It was concluded that no overdevelopment existed in the Coastal Plain area but problems of quality and quantity did exist. The statement was made that a vast quantity of additional data needed to be collected before there could be a firm basis for understanding and developing the ground water potentialities of North Carolina. It was felt that more information would be required before any law setting up adequate measures for the conservation of ground water could have meaning. It was stated that experience of other eastern states had shown that growth of population and industry brought on critical problems requiring regulatory legislation. (Note: Between June 30, 1956 and June 30, 1965, the combined State and U. S. Geological Survey expenditures on ground water studies are estimated at \$1,300,000).

During the 1954-1958 period two governors and numerous influential citizens, stimulated to a considerable degree by severe droughts in 1952, 1953, and 1954, concluded that State water laws needed revision and strengthening, and that State organization required improvement in those areas concerned with the development and management of water

resources. The Seventh Report of the Commission on Reorganization of State Government expressed concern over (1) the uncertainty of the State's future role in the water program, and (2) the duplication of responsibilities among particular agencies. The Board of Water Commissioners was given the responsibility to consider these matters, whereupon the Board recommended to the Commission that a single agency coordinating all water resource activities was desirable. The Eleventh Report of the Commission on Reorganization of the State Government (Nov. 21, 1958) recommended:

1. The creation of a Department of Water Resources to which would be transferred the existing functions of the State Board of Water Commissioners; the Division of Water Resources, Inlets, and Coastal Waterways of the Dept. of Conservation and Development; and the ground water research functions of the Division of Mineral Resources of the Dept. of Conservation and Development.
2. (a) The State Stream Sanitation Committee be transferred to the Department of Water Resources and (b) the Department of Water Resources be designated to act as the administrative agent of the State Stream Sanitation Committee to investigate the waters of the State, and to issue permits and certificates of approval in accordance with the policies established by the State Stream Sanitation Committee. (Editor's Note: While the Committee was transferred to the Department as recommended and the Department was designated as the administrative agent of the Committee through its Division of Stream Sanitation and Hydrology, the power to issue permits and certificates of approval was retained by the Committee.)

The second and last report of the Board of Water Commissioners covered the biennium ending June 30, 1958, and was released in November of that year. The seven recommendations made in this report called directly or indirectly

for legislative action, either through passage of water law or provision of funds for programs. These recommendations were:

1. Accelerate U.S.G.S. Topographic Mapping Program
2. Improve the irrigation law
3. Provide authorizing legislation for establishment of Watershed Improvement Districts in connection with Public Law 566.
4. Make available funds to permit the State to finance additional storage in flood control projects for future water storage.
5. Study the need for capping free flowing but unused artesian wells for conservation.
6. Make provisions to assure that no structure placed in a stream will reduce minimum flow.
7. Establish state grants in aid to supplement the Federal program of grants for waste treatment plant construction.

The conclusion of this report re-emphasized the need for data on water supply, surface and ground, and water use. Irrigation was cited as fast becoming one of the largest problems in the State.

Irrigation occupied the attention of this Board and the agricultural community for two reasons. The status of the irrigator in the context of the riparian rights principle is unsettled and the occurrence of localized drought conditions in certain parts of the State had caused individual farmers to look to irrigation to save their crops, with results that were sometimes dramatic, both in water supply depletion and in crop benefits (1954 in particular).

In reviewing the results of a survey of local water problems the Board noted a need for definition of water rights. It was stated that considerable confusion existed among water users throughout the State regarding their rights to use water for beneficial purposes. Competition between municipalities, between urban and rural users, and between upstream and downstream irrigators was believed to be becoming intense and it was felt that conflicts would become even more heated as agricultural, industrial, municipal and other water requirements increased. In the absence of clearly defined rights, each water user was given little choice but to take unilateral action to insure his own supply regardless of adverse effects on others.

THE DEPARTMENT OF WATER RESOURCES

The present Board and Department of Water Resources were created by the 1959 General Assembly (See Chapter 779, Session Laws of 1959 in Appendix B). The remarks made by Governor Hodges to the new Board on August 28, 1959, are pertinent to this day and are repeated in part:

"May I open my brief remarks this morning by expressing my sincere appreciation to each of you for accepting the great responsibility and the very obvious challenge that membership on this Board involves. I would be negligent in my responsibility if I didn't point out to you the importance and complexity of the job that you have undertaken. The future of North Carolina may well rest upon actions of this Board in the months and years ahead. Each of you has had experience that will help the State on this water problem.

"The establishment of a Department of Water Resources is a pioneering venture among the states of the Nation. Few other states have taken this forward step. We, in North Carolina, are doing so because experience and exhaustive investigations have convinced us that such an agency is needed to insure the conservation and wise use of

all-important water resources. The step has been taken with confidence, based on the conviction that definite, clear-cut water program is essential to this State's continued progress.

"This Department, will provide North Carolina, for the first time in its history, with the machinery for a coordinated effort to develop a comprehensive water program.

"This places the responsibility for the future of all our water resources squarely in the hands of this Board. The development of our great river basins, the preservation of our vast ground and surface water supplies, our navigable streams--these are the elements of our responsibility. North Carolina has the water--a supply adequate to more than meet our present and future needs. Your task is to develop the means by which this great abundance can be stored and distributed in the manner that will most effectively benefit every citizen of this State.

"This is a tremendous challenge--one that will require from each of you much thought, much vision and, above all, much courage. You must use thought and vision to determine what must be done. And you will need courage to implement your decisions. You will need courage to develop the bold program that the future will require and the people of this State deserve. And, finally, you will need courage to go before the people and their representatives in the General Assembly with the program that you devise. The road ahead will not be an easy one, but you can draw encouragement and incentive from the knowledge that you will be making an unprecedented and lasting contribution to North Carolina."

The activities and accomplishments of the Department of Water Resources in the period July 1, 1959, through June 30, 1964, have been considerable as outlined in the three biennial reports now available. The Department has sponsored two reports of general importance which are summarized in later paragraphs.

Early in its administration the Department found that the statute authorizing the Department to issue permits for the withdrawal of surface water for irrigation (Subsection (c) G. S. 143-355) was not clear and difficult to administer. Questions had also been raised concerning its validity. The Board of Water Resources formally suspended the issuance of permits on March 25, 1960, pending the Attorney General's advice concerning appropriate changes in the statute which might be considered advisable. After further consideration and with the Attorney General's advice, the Board concluded that the permit law was unworkable in its present form and recommended its repeal in order to clear the air and to lay a foundation for a better ultimate solution. The General Assembly of North Carolina accepted the Board's recommendation and on May 2, 1961, ratified Chapter 315, Session Laws of that year, which repealed the cited subsection.

At the close of the 1962 biennium the Department was engaged in two studies, assisted and supported by the Institute of Government and the Tennessee Valley Authority. One study nearing completion at the close of the biennium was published in January 1963 under the title Flood Damage Prevention in North Carolina. Prepared under the supervision of this Department by the Institute of Government in collaboration with the Tennessee Valley Authority this report was distributed to members of the General Assembly, officials of local political subdivisions, other state agencies, and to interested individuals.

The report outlined the extent of flood damage problems in North Carolina citing \$25,000,000 in property damages in the first half of 1962 alone. Then consideration was given to possible corrective and preventive measures, existing programs of the Federal Government in North Carolina, programs of the State Government, programs of the local

governments, and programs in other States. After a discussion of legal aspects, several case studies were made notably concerned with the French Broad Area, coastal hurricane problems, and the Crabtree Creek Small Watershed Project.

In conclusion the report surveyed the elements of a broad flood prevention program which the North Carolina State Government could undertake. These deserve restating here: A first and obvious action could be the adoption of legislation to provide for regulation of encroachment on channels and floodways. This is the practice in several states. Second, legislation could be enacted requiring the checking of dams and levees for safe design and construction. More than 35 states have laws of this sort. Third, the public acquisition of land or easements to prevent undesired obstruction or settlement of flood-prone areas could be undertaken. Fourth, the public acquisition of desirable dam and reservoir sites could be undertaken to preserve them for use when needed. Fifth, the topographic mapping program could be accelerated. Sixth, three other measures were mentioned in passing as possible but unlikely, that is: flood insurance, erection of warning signs, and tax adjustments.

The second study, entitled North Carolina Water Resource Planning, was begun in 1962 and completed in 1964. It is "a comprehensive survey of water resource planning activities in North Carolina today; an inventory of existing plans; a generalized projection of short, medium and long-range program needs; and a preliminary blueprint of some planning guidelines for the future."

This study was actually an independent survey of matters pertaining to water resources planning by the Institute of Government, based in part on discussions with Department employees and a review of current applicable literature.

The various recommendations included in the report are for the purpose of reference, advice, and guidance to the Department.

In other portions of the report, various problems were touched on to include (1) the need for strengthening the small watershed program, (2) the lack of control over dams and impoundments, (3) the need for improving statutes relating to well drilling, (4) the importance of ground water pollution control, (5) the necessity to survey and analyze sources for public water supplies, (6) the need to develop policies and laws to foster and control irrigation, (7) the need for industrial water planning, (8) the necessity to develop well balanced water recreation facilities, (9) the need for carrying out the recommendations of the report, Flood Damage Prevention in North Carolina, (10) the importance of finding ways to arrest beach erosion, (11) the need to stabilize inlets from the ocean, (12) the need to expand and improve navigation and harbor facilities, (13) the need to resolve conflicting use problems, (14) the need to clarify the Department's control of water quality as released from impoundments, (15) the need to modify basic water rights law, (16) the need for more comprehensive basic data collection, (17) and the lack of a central planning agency to coordinate and support specialized planning such as water resources.

The foregoing seventeen items constitute a simplified listing of problem areas cited in the report. In concluding the report cited several planning objectives:

"Absorbing the stresses upon water supply and waste disposal facilities imposed by increasing urbanization and industrialization of the Piedmont.

"Meeting the needs of water supply and waste disposal for the increasing rural non-farm population and industries in such areas.

"Developing and properly using the storage reservoirs that will be required to augment stream flows to meet greatly increased waste dilution requirements.

"Supplying the water recreational facilities needed to serve an expanding demand.

"Providing water rights laws and other laws and institutions to resolve intensified and more complex disputes among water users."

RECAPITULATION

To summarize the events of the last 30 years, there have been eleven significant reports on North Carolina water resource problems, five of which have been biennial reports of water agencies. These reports have contained many analyses of water problems and a number of recommendations for laws. Not all of the recommendations have been adopted, but it is significant that virtually all of the major agencies having a water or related land resource responsibility have been instituted since 1945.

Not unexpectedly, the emphases of these reports have changed depending upon the conditions of the time. The first report mainly stressed the pressing need for data, cited the pollution problem, and supported various navigation improvements. Shortly after the war serious drought periods led to a study committee's recommending drastic changes to the basic laws of water rights. The recommendations were coolly received and later proposals have been more conservative. The major report of the Governor Umstead era had to do with navigation and developments that might provide tonnage for

water haul. Then a succession of hurricanes led to concentrated study of measures to cope with them, to protect the coasts, and to minimize damage.

During the era of Governor Hodges there began a more comprehensive consideration of water problems and particularly the State's administrative means of managing water resources. Thus came the two reports of the Board of Water Commissioners and the formation of the Department of Water Resources. The water shortage years were still fresh in the minds of the Water Commissioners and they gave much attention to the problems of irrigation and the effects on water rights.

During the Sanford administration the Department concentrated on consolidating its ground administratively, the promotion of a series of comprehensive water studies by Federal agencies, improvement of basic data, and the publication of major reports on flood control and planning. The effects of this ground work are now beginning to show. The staff skills and manpower available to the Department during its first six years have been overwhelmingly concentrated in the fields of stream pollution control and ground water investigations. Consequently, progress has been more pronounced in these fields.

Basic proposals for revision in water law have been made, but the role of the various groups cited have been educational and advisory and they have not generally drafted specific legislation in detail or organized campaigns to promote such legislation.

PRESENT DAY POWERS

In 1966 the State Stream Sanitation Committee, the Board of Water Resources, and the Seashore Commission, came

closer together through the completion of the placement of all permanent employees within the Department of Water Resources. The laws governing the Board, the Committee, and the Commission are included in Appendix B. A summary of what these agencies can do and, perhaps by indirection, cannot do follows:

Board of Water Resources

1. Plan and educate regarding long-range conservation and use of water resources.
2. Advise the Governor how water research activities might be coordinated.
3. Notify municipalities of potential shortages or emergencies together with recommendations.
4. Seek suggestions from water interests on legislation.
5. Initiate procedural steps to request the Governor to declare a water emergency.
6. After emergency is declared, is authorized to permit water diversions, can make rules and regulations for use of diverted water, can authorize rights of way for temporary lines, and can provide for payment for resulting losses or damages.
7. Organize and supervise the work of the Department of Water Resources.

In connection with Public Law 566, Small Watershed Projects, the Board may, subject to availability of funds, require installation of measuring and recording devices for inflow and outflow, establish the intervals for readings, and require periodic reports of such records.

The Board is responsible for approval of watershed work plans provided they:

1. Provide for proper and safe construction.
2. Will not appreciably diminish the flow of water otherwise available to downstream users during critical periods.
3. Otherwise comply with law.

The Board is required to establish the form in which districts will submit operation plans and will accept initial plans. The district is required to secure Board approval for changes.

Counties which create Watershed Improvement Commissions as county programs are subject to Board supervision in the same manner as districts.

The Board has the authority to hold hearings to determine if operations are in accord with plan and to issue necessary orders for compliance if they are not.

Drainage District Law (156-59 G.S.) requires Board recommendation for any drainage engineer appointed to a Board of Viewers.

State Stream Sanitation Committee

The Government of North Carolina assumes responsibility for the quality of water resources. The State Stream Sanitation Committee is charged with the duty and authorized to establish methods to protect water requirements for health, recreation, fishing, agriculture, industry, and animal life. It is responsible for:

1. Establishing classifications for the waters of the State and standards for each classification.
2. Surveying and assigning classifications to the waters of the State according to specified guidelines and after public hearings.

3. Issuing permits, temporary permits, and Certificates of Approval with appropriate conditions and limitations for disposal of wastes, all of which may be modified or revoked upon due notification to persons affected.
4. Issuing pollution abatement orders, after appropriate hearings.
5. Investigating fish kills and collecting cost of investigations and damages resulting therefrom.
6. Conducting research, through the Department of Water Resources, or by contracts and grants.
7. All relationships with the Federal Government in matters of Federal water quality laws as official State agency.
8. Establishing regulations in conjunction with neighboring States for protection of waters of mutual interest, subject to approval of the General Assembly.

North Carolina Seashore Commission

The Seashore Commission has the responsibility to:

1. Assist in developing plans to preserve the shoreline.
2. Assist in sound development of seacoast areas with emphasis on travel attractions and traveler accommodations.
3. Assist in planning, promoting, and developing recreational and industrial developments.
4. Coordination of all agencies for the above purposes. (Also a responsibility of the Board of Water Resources and the Department which is the official agency for such matters).

Department of Water Resources

The Department of Water Resources is responsible for:

1. Initiation, planning, and execution of long-range water resource development programs, including protection activities.
2. Recommending legislation.
3. Seeking Federal fund support.
4. Engineering studies, plans, designs, and supervision of construction of water resource projects that may be authorized. Preparation and maintenance of water resource inventory.
5. Cooperation with the U. S. Army Corps of Engineers and the U. S. Coast Guard.
6. Providing professional advice and to discuss desirable programs with Federal, State and local officials.
7. Making investigations and reports as requested by the Governor and General Assembly.
8. Participation in activities of national, private, and public agencies concerned with water resource development.
9. Maintaining water resource records accessible to the public.
10. Budgeting for directed functions.

The Department is the official State Agency for water resource investigations, and for cooperation required with Federal, State, and other political subdivisions. The Department supervises the Well Driller Registration program and obtains required information from drillers, petroleum and mineral drillings being excepted.

The Department (through its Division of Stream Sanitation and Hydrology) also serves as the administrative agent for the State Stream Sanitation Committee, and subject to the General policies of the Committee, is responsible for:

1. Administering the responsibilities of the State Stream Sanitation Committee as set forth in Article 21 of Chapter 143, General Statutes and other related laws.
2. Performing such other duties relating to water resources and the control of pollution as the Committee and Board of Water Resources may from time to time assign.

The Department is responsible for staff assistance and facilities necessary to carry out the work of the North Carolina Seashore Commission (by delegation from the Board of Water Resources).

Limitations

The Board cannot normally allocate water.

The Board cannot compel periodic reports of water use.

The Board cannot adjudicate water rights.

The Board cannot control or limit ground water use.

The Seashore Commission has no authority to require coordination with the Commission or to participate in operational programs or to require that undesirable actions be terminated.

The Committee does not exercise control over the disposal of sewage and wastes from public schools and State and local institutions; raw milk dairies, farm slaughter houses, shellfish processing plants and similar establishments; and those food and lodging establishments which are supervised by the State Board of Health under other State laws. Likewise, the Committee may not approve and issue a permit for the discharge of wastes into waters either used or classified for use as sources of public water supply until the State Board of Health determines and advises that the proposed method of treatment is approved by that agency.

The Department must obtain funds from the State Legislature or through Federal grants approved by the Legislature.

CHAPTER 2

The Need for Regulatory Powers

This Chapter is predicated upon the assumption that additional regulatory powers are needed whenever withdrawals of ground or surface water: (1) do not operate to the best interests of the people of the State, (2) indicate a tendency to limit future economic development due to unwise usage, (3) create disputes between water users, (4) open the possibility of lowering water quality, (5) limit the ability of a stream to assimilate wastes and perform its mission as classified by the State Stream Sanitation Committee, and (6) upon a finding that existing law does not provide adequate protection against these possibilities. It is important to understand that this need, when established by water resources engineers, requires early action of some kind, even though the majority of our citizens may not be aware of or impressed with the need.

Our review of the problem will distinguish between ground water and surface water even though they are mutually interdependent, merely constituting different phases of the hydrologic cycle.

SURFACE WATERS

North Carolina is endowed with an abundance of water for which there is a constantly growing demand. The rapid population and industrial growth of the State is and will continue placing greater and greater stresses upon available water resources in order to satisfy mounting requirements. An important usage made of the waters of the State, particularly the surface waters, is to carry away the wastes from our homes, industries, and cities. This has long been recognized as a valid and

essential usage throughout the Nation. Moreover, the stream sanitation law of the State recognizes this important usage by providing for the issuance of permits for the disposal of treated municipal, industrial, and other wastewaters. While small quantities of wastes may be discharged into the ground, it is necessary that the wastewaters from most municipalities and industries be disposed of by discharging them into surface waters. It is, therefore, vital that opposing uses be reconciled if our waters are to serve the best interests of the people. The ability of existing water resources to meet future requirements will be governed largely by the effectiveness of the State's water management program. Maximum utilization can only be assured through an adequate water pollution control program, the objectives of which must be the improvement and maintenance of water quality wherever it is found.

The history of stream pollution and efforts to control it in this State follows very closely the experience of other States and the country as a whole. As urban communities developed and industries became established, stream pollution increased and in some sections to an alarming extent. Public concern with stream pollution was, therefore, first manifested primarily from the standpoint of protecting sources of public water supply and the prevention of public health nuisances. The North Carolina State Board of Health has devoted attention to the problem of municipal sewage disposal since passage in 1893 of the first State laws relating to the protection of public water supplies. These laws, with subsequent amendment, were primarily concerned with protecting streams used as sources of public water supplies, and little or no protection was afforded other streams, particularly with respect to pollution by industrial waste discharges.

Although considerable progress was made during this period in the control of the public health aspects of stream

pollution, increasing population and industrial growth revealed a compelling need to control pollution from the standpoint of all water uses. Consequently, in 1951 the General Assembly of North Carolina enacted the present Stream Sanitation Law (Article 21 of Chapter 143, General Statutes of North Carolina). This Act created the State Stream Sanitation Committee.

The State Stream Sanitation Committee has established and is managing a program designed to maintain the quality of the surface water resources for protection of the water requirements for health, recreation, fishing, agriculture, industry, and animal life. The surface waters of the State have been surveyed and studied, pollution survey reports have been issued, public hearings have been held and, all the streams of the State have been classified in accordance with their present or contemplated "best usage."

The pollution abatement and control program, which takes into consideration the necessity of utilizing streams for disposing of treated wastes, is based upon maintaining water quality in accordance with assigned classifications under critical conditions of high stream temperature and the average 7-day minimum flow with a recurrence interval of 10 years. This approach recognizes that at extremely low flows the water quality standards may well be temporarily violated in some respects. The treatment required in each situation is, however, designed to raise, in respect to existing pollution, or maintain, in respect to new pollution, water quality above the minimum standards in order to provide for reasonable population and industrial growth.

Many small and even some of the large municipalities are located near the headwaters of streams which must receive their wastes. Likewise, a number of the State's

industries, especially the older ones, are located near the headwaters of streams. Although the wastewater treatment facilities for these municipalities and industries (which have been approved and constructed) have been designed to permit reasonable population and industrial growth, there is little, if any, waste assimilating capacity remaining in the receiving streams. It follows, therefore, that additional population and industrial growth will require other measures. If some reserve waste assimilating capacity remains, it is possible that tertiary treatment of the waste will afford adequate protection for the stream, but in many cases, where a higher degree of treatment will not protect a given stream, other measures will be necessary such as discharging the treated wastes to other watersheds. In instances of this type the withdrawal of water from such streams, either above or immediately below treated discharges of waste, would violate assigned water quality standards. It is also evident that any stream could be overloaded under critical temperature and flow conditions to the detriment of riparian owners and the beneficial uses being made of the receiving waters.

In addition to the measures discussed, two other possible measures are worthy of consideration in the prevention of pollution and for increasing the waste assimilative capacity of streams. The first is that of providing reservoirs for impounding water during periods of high stream flow to be released for purposes of low-flow augmentation (water quality control) during periods of dry weather (recreational benefits may also be created as a valuable by-product). The second involves the regulation of withdrawals of water where such withdrawals would reduce stream flow to the extent that installed pollution abatement measures are rendered ineffective, or the pollution problem is aggravated.

In the first instance, the Federal Government has recognized the value of storage of water for low-flow augmentation by requiring Federal agencies to consider the inclusion of storage to permit increased stream flows for water quality control; provided that water releases for this purpose must not be in lieu of adequate treatment or other methods of controlling waste at the source. Examples of this type of planning in North Carolina include the provision of such storage in the authorized New Hope Reservoir on Haw River and the Falls Reservoir on Neuse River.

No State agency appears, at this time, to have specific authority to regulate water withdrawals from surface or underground sources. Riparian owners may secure relief from unsatisfactory stream conditions due to withdrawals of water above their properties, through court action, although this is apt to be cumbersome and time consuming without necessarily protecting the public interest. The State Stream Sanitation Committee may, by withholding permits for waste treatment facilities, effect some control over the withdrawal of water by prospective industries, but it has no power to limit or prevent the withdrawal of water as such.

The following watersheds are included among those where critical conditions prevail or may prevail in the relatively near future:

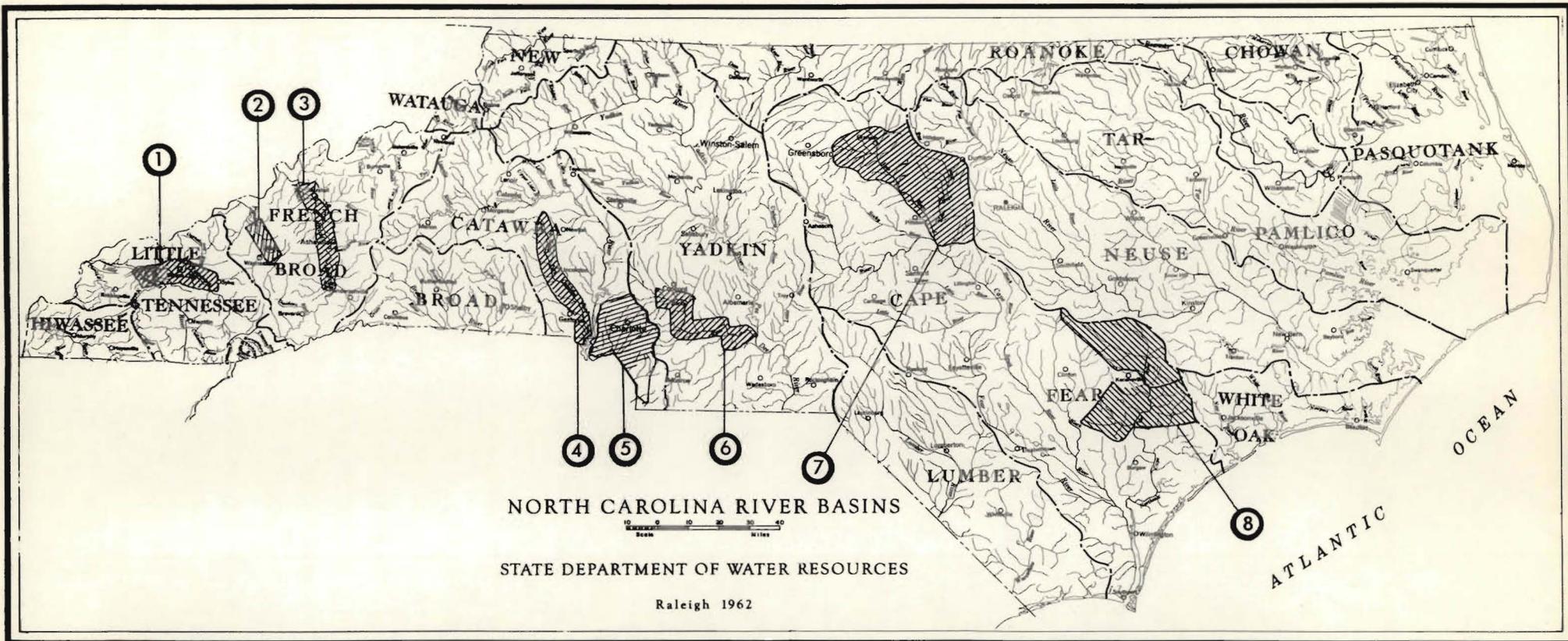
Pigeon River (Plate 2-1, No. 2)

The Pigeon River and its tributaries in the upper reaches of the drainage area are used for both public and industrial water supplies. The main stem of the river in this general area is used extensively for the disposal of sewage and industrial wastes. A high degree of treatment is necessary at all waste sources to protect essential

stream uses. Pigeon River is a regulated stream due to tributary storage and withdrawals of water for industrial and municipal purposes. At times, heavy withdrawals have reduced the amount of dilution water in the river to critical levels. Future population and industrial growth will require special planning because of the exceeding low flow during dry periods. Even under present conditions, increased withdrawals of water from the river and its tributaries for irrigation or new industries may jeopardize present stream uses. It is obvious that the expected population and industrial growth will aggravate this situation unless appropriate measures are undertaken. Two remedies are pertinent: upstream storage for low-flow augmentation and regulation of water withdrawals.

French Broad (Plate 2-1, No. 3)

The French Broad River is not used extensively as a source of water supply, but many of its tributaries do supply large amounts of water for municipal and industrial purposes. Therefore, the river is in some measure regulated by virtue of these withdrawals. The heaviest pollution loads are discharged to tributary streams; however, the main stem is also directly used for the disposal of wastes and is considerably affected by the wastes discharged through some of its tributaries. Several tributary streams are used not only as sources of water supply, but also for the disposal of wastes. Such multiple usage compounds the problem of adequately disposing of the wastes even after extensive treatment. Where storage is provided for purposes of water supply, the problem of waste disposal is further aggravated through the regulation imposed on the stream during dry weather periods, particularly in cases where all or most of the water is withheld other than that used for domestic and manufacturing purposes. In such situations the 7-day, 10-year flow normally used in evaluating the adequacy of waste treatment works design becomes meaningless.



This also applies to unimpounded streams when their normal yields equal or approach the 7-day, 10-year flow and the water is used for domestic, agricultural, or manufacturing purposes. Here again it is readily apparent that withdrawals of water for consumptive purposes or further industrial development could create very undesirable stream conditions and impose undue burdens upon present riparian owners. This is another situation which suggests that, in addition to the need for a rather high degree of waste treatment, upstream storage of water for low-flow augmentation, and regulation of withdrawals will be essential to future growth.

Tuckasegee River (Plate 2-1, No. 1)

The essential uses made of the water in the Tuckasegee River require that the waste discharges entering the river directly or through its tributaries receive a high degree of treatment and control. Although much of the waste discharged to the river and its tributaries is not presently receiving adequate treatment, considerable progress has been made toward planning adequate waste treatment or other control measures, and it is expected that within a reasonable period of time, the receiving waters will be adequately protected. Tuckasegee River is highly regulated by upstream hydroelectric power projects from which water releases cause wide variations in flow. The 7-day, 10-year minimum flow, based upon natural conditions, has been estimated by the U. S. Geological Survey to be 103 M.G.D., while the minimum daily regulated discharge of record has been but 64.6 M.G.D. and the minimum instantaneous flow of record only 22.6 M.G.D. at Dillsboro. Such wide departures from the design flow create special problems for municipalities, industries, and the State Stream Sanitation Committee, which must approve the plans for waste treatment facilities. A remedy suggested by these problems is proper regulation of

water releases from upstream hydroelectric power developments in keeping with the public interest.

South Fork, Catawba River (Plate 2-1, No. 4)

The South Fork Catawba River and its tributaries are extensively used for irrigation and as sources of water supply for domestic and industrial purposes and in some instances for recreation, particularly in the South Fork Catawba River arm of Lake Wylie. The river and many of its tributaries are also used for the disposal of municipal and industrial wastes. Therefore, in order to protect these streams as sources of public and industrial water supply and for other essential uses, all waste discharges must receive a very high degree of treatment. Recently, a town in this watershed found it necessary to change from a well water supply to a surface water supply. The headwaters of one of the streams flowing through the town were reclassified for protection as a source of public water supply. This same stream is used for the disposal of wastewater below the recently constructed water supply dam. The withdrawal of water from this reservoir will reduce stream flow and will necessitate additional waste treatment facilities which are now under consideration. Also, a new industry has proposed to come into the area and discharge a considerable amount of additional waste into the already overloaded stream. It has become necessary, therefore, to recommend the discharge of new wastes to a larger stream at a more remote location.

Examination of the 7-day, 10-year flow data for the overloaded stream indicates approximately 40 percent of the flow originates above the site of the new dam. This town, like many towns in the State, is struggling to improve its economy and has plans to double the size of the new water treatment plant when it becomes necessary in the future. This means that during a dry period about half of the 7-day, 10-year minimum

flow in the creek will be used for public water supply purposes leaving but half of the streamflow for dilution, of the resulting waste, unless water is released from the water supply reservoir for this purpose. The present municipal authorities understand the necessity for maintaining a suitable flow in the creek at all times, nevertheless, it is conceivable that during droughts at least 40 percent of the design flow could be retained in the new reservoir. This is another instance where regulatory authority is needed to insure adequate water releases from an impoundment during dry weather periods. The present demands being made upon South Fork Catawba River and its tributaries will undoubtedly increase in the future and as pressure mounts for use of these streams, every available expedient will be required to maintain a satisfactory balance between the essential uses.

Catawba Basin Streams in
Mecklenburg Co. (Plate 2-1, No. 5)

The City of Charlotte and Mecklenburg County are the fastest growing areas in the State. The existing sources of pollution and those from new developments, including industry, housing, and mobile home parks are placing an ever-increasing pollution load upon the streams in the areas. It has already been found necessary to recommend tertiary treatment before further developments on certain headwater streams can be permitted. While little use is made of the streams tributary to Catawba River for purposes of water supply, the main stem is so used. This usage of the main stem requires that all wastes reaching it must have received a high degree of treatment. This is also true in connection with the essential uses of the tributary streams which in general have little or no flow during extended periods of dry weather.

Particular mention is made of Sugar Creek and its tributaries which ultimately discharge to Catawba River in South Carolina. These streams, regardless of the degree of waste treatment provided, will in the future become overloaded. It seems inevitable that the effluents from wastewater treatment plants in the area must be transported a long distance to Catawba River, if essential uses of Sugar Creek and its tributaries in both North Carolina and South Carolina are to be safeguarded. Even now the waste flows reaching these streams in North Carolina are several times the estimated 7-day, 10-year minimum flow of Sugar Creek in South Carolina. This undesirable ratio can be expected to increase; therefore, the control of withdrawals from Sugar Creek and its tributary streams will be essential to the prevention of unsatisfactory conditions, even though all tributary wastes are highly treated. Water storage on these creeks for low-flow augmentation could be a partial answer to some of these problems; however, the rapid urbanization of Mecklenburg County may usurp the necessary sites.

Rocky River (Plate 2-1, No. 6)

Although Rocky River is not presently used for the direct disposal of wastes, water quality in the main stem has been lowered by discharge of wastes into tributaries. Nevertheless, great progress has been made in protecting Rocky River and its tributaries for their essential uses. Some construction activities are presently underway to better protect the streams and planning is in progress to reduce the remaining sources of pollution. In view of this, the river and its tributaries should be adequately protected in the near future insofar as present waste discharges are concerned.

Rocky River is not presently used as a source of water supply; however, water is derived from impoundments on

several tributaries for municipal and industrial purposes. Since these impoundments release little if any water during dry weather periods, the 7-day, 10-year minimum flows become meaningless on such regulated streams and the river itself is undoubtedly affected by tributary regulation. If this drainage area experiences the population and industrial growth now predicted, the river will have to be used for the disposal of properly treated waste, especially in the Kannapolis-Concord Area. Secondary treatment is provided or planned for the waste reaching Irish Buffalo Creek and its tributaries, but eventually such treatment will not be sufficient and the waste will undoubtedly have to be piped to Rocky River. It is of interest to note that the estimated 7-day, 10-year minimum flow of the river upstream from Irish Buffalo Creek is only about 11.6 million gallons per day while the present and projected waste load on Irish Buffalo Creek and its tributaries alone, based upon waste treatment plant design, is about 14.6 million gallons per day. It would appear that, in addition to the necessity of a high degree of treatment for all waste discharged to the streams, future consideration of waste problems in this area should include the storage of water for low-flow augmentation as well as the control of water withdrawals.

Haw River (Plate 2-1, No. 7)

The tributaries of Haw River are used extensively as sources of public and industrial water supply, whereas the main stem of the river is not extensively used for these purposes. Yet the upper segment of the river has recently been reclassified as a source of public water supply and further demands will undoubtedly be made for such usage. Haw River and its tributaries are also used extensively for disposing of treated sewage and industrial wastes. In most instances, the sources of water supply are presently located

above sources of waste, but the reverse is true in some cases, making it necessary to prohibit waste discharges in certain reaches. It may be expected that this type of conflicting use will become more prevalent in the future thus requiring special measures. The main stem of Haw River and some tributaries were grossly polluted at the time of the Pollution Survey Report in 1957. Great improvement has been made through the cooperation of the municipalities and industries in the area. A recent review of the progress made in pollution abatement shows that, while the volume of waste discharged increased from 26.5 million gallons per day to 40.5 million gallons per day and the population equivalent of the wastes before treatment increased from 492,000 to 600,000, the reduction by treatment of the organic loading reaching the waste treatment plants was increased from 36 percent in 1957 to 81 percent in 1965. Only a few places remain where adequate waste treatment is not being provided and these sources of wastes can be expected to be satisfactorily treated within a reasonable time.

Even with a high degree of treatment, it is presently difficult and, as waste loads increase in the future, it will be increasingly more difficult to maintain the required minimum water quality standards due to the low-flow of many of the small receiving streams in dry weather. Therefore, withdrawals of water for consumptive purposes or for other purposes which would result in additional waste loads on these streams will create disastrous conditions. During the stream studies in 1954, withdrawals of water for purposes of public water supply from Haw River and one or more of its tributaries, above the waste flowing into the river from Reedy Fork and waste discharged from the Burlington Area, resulted in an observed minimum flow of only 515,000 gallons per day for dilution purposes. Needless to say, the reduced amount of water available in Haw River then for diluting waste entering the river greatly aggravated conditions in the river in the Burlington area and

downstream. In spite of the great improvement in waste treatment which has been effected, such withdrawals must surely be detrimental in future droughts. Above the pending New Hope Dam and reservoir, it appears that future industrial and population growth will require other provisions for disposal of waste. These may include the storage of water for low-flow augmentation and strict regulation of withdrawals of water from streams of the area.

The rapid growth of the Research Triangle Park area entails problems in waste disposal. Northeast and Burdens Creek drain much of the Park area and presently receive effluents from small waste treatment facilities serving individual establishments. It is now proposed to consolidate waste from the various developments for treating at a central plant to be located at the junction of Northeast and Burdens Creeks. A temporary stabilization lagoon has been proposed at the site to be followed later by a 3 M.G.D. activated sludge type waste treatment plant with provisions for chlorination. Thereafter, the waste stabilization lagoon will be used as a tertiary treatment facility. The effluent from this plant will be discharged to Northeast Creek at its confluence with Burdens Creek. The 7-day, 10-year flow at the junction of Northeast and Burdens Creeks is about 130,000 G.P.D.; therefore, the highest degree of waste treatment possible will be required. Similar treatment is also indicated throughout the New Hope River drainage area, portions of which will become the main arm of the New Hope Reservoir when it is constructed. Even now the City of Durham is researching the provision of tertiary treatment for the municipal wastes going to the New Hope basin.

After the New Hope reservoir is completed, the backwaters will extend to the site of the waste treatment plant for the Research Triangle Park area which will have

to be protected from flooding. By that time, in anticipation of the Research Triangle Park growth, the effluent from this plant and other plants in the basin will require transportation many miles downstream to a point below the New Hope Dam if recreational and water supply uses of the reservoir are to be properly protected. In the meantime, close control of water withdrawals from Northeast and Burdens Creeks and other tributaries will be essential.

Northeast Cape Fear (Plate 2-1, No. 8)

Northeast Cape Fear River and tributaries are typical sluggish streams of the Coastal Plains Region and are classified as "Swamp Waters." These streams are not only sluggish in movement but have a relatively small flow in dry weather. This is well illustrated by the fact that Northeast Cape Fear River near Chinquapin, having a drainage area of 600 square miles (35 percent of the total drainage area of the Northeast Cape Fear) has a minimum flow of record of only 3.4 M.G.D., while the estimated 7-day, 10-year minimum flow is merely 7.8 M.G.D. It is readily apparent then that the smaller tributaries which receive most of the wastes discharged in the drainage area have little or no flow during extended dry weather periods.

Although neither Northeast Cape Fear River nor any of its tributaries are used as sources of public water supply, the absence of any great amount of dry weather flow in the streams dictates a high degree of treatment for all wastes to protect essential stream uses. Two recent occurrences have emphasized the need for thorough consideration of treatment or other measures at points of waste disposal.

First, a new industry proposed to locate near a progressive municipality which has been seeking to expand its

economy. Upon review, the Stream Sanitation & Hydrology Division was compelled to recommend tertiary treatment as a condition for approval of the industrial waste discharge.

Second, an existing industry in the same area has discovered a major expansion is possible because of abundant suitable ground water for its particular manufacturing purposes; however, the dry weather flow of the streams in the area would create special waste disposal problems. Consideration was given to the construction of one or more reservoirs on streams in the area to augment the dry-weather flow to properly dilute the highly treated waste expected from the desired expansion. The industry concluded that they could not afford to buy all the riparian rights between the proposed reservoirs and the point or points of waste disposal. Pipelines necessary to convey the water to points of use may also be too expensive. Finally, there is presently no assurance that water released from the proposed reservoirs for low-flow augmentation would not be withdrawn for other purposes by downstream riparian owners before reaching the planned points of usage. The State Stream Sanitation Committee could establish some control over such withdrawal of water if used to create waste. However, the Committee has no authority to deny the withdrawal of water for other purposes even when such withdrawal diminishes essential dilution flows. This situation demonstrates the need for specific authority to regulate water withdrawals if downstream riparian needs are adversely affected within the reasonable use concept.

Summary

The State's municipalities and industries have cooperated well in helping to solve problems entailed in cleaning our streams. Nevertheless, economic growth may very well overwhelm the facilities in many areas. See Plate 2-1. The

State Stream Sanitation Committee plans a pollution abatement and control program which will be comprehensive in the future as in the past and expects to support research and any other measures feasible to assure water quality suitable to meet all reasonable water uses. At present the Stream Sanitation Laws may not provide all the powers needed to do this; therefore, a major purpose of this study is to find the statutory action necessary to reach the desired goals.

GROUND WATER

Extensive problems resulting from overuse or misuse of ground water are relatively few in North Carolina, but use of ground water is increasing and this is expected to cause a proportional increase in the number and magnitude of these problems. In the Mountain and Piedmont areas problems will tend to be isolated or localized. In the Coastal Plain problem areas will undoubtedly be extensive in size and without clearly marked boundaries.

Plate 2-2 shows the location of areas of relatively heavy ground-water pumpage and some past and current problem areas as of the spring of 1965, some of which are further discussed. The contours represent the approximate configuration of the piezometric surface and tend to indicate some of the effects of relatively large ground-water withdrawals as well as natural recharge and discharge areas.

The area of highest water levels is in the western part of the Coastal Plain where ground elevations are highest. Generally, the piezometric surface slopes toward the sea, although the configuration is greatly modified by the effects of recharge and major artificial or natural discharge. The flow of water is normally from highest to lowest head in the direction of steepest hydraulic gradient.

Salt-Water Encroachment at a Limestone Quarry near New Bern

At many places near the larger estuaries along the coast, saline ground water occurs in the aquifers at rather shallow depths. At many such places, there is no impermeable barrier between the shallow aquifers and the stream, permitting a direct hydraulic connection. When there is excessive

lowering of the fresh water level by pumping, the shallow fresh-water aquifers become subject to contamination by salt water from the underlying formations, from the river, or from both. There has been contamination of an aquifer near New Bern as a result of these conditions.

In early 1957, a limestone quarry was opened close to Brice Creek near New Bern. The quarry area was 20 acres, and the process required removing 10 feet of overburden to quarry about 25-35 feet thickness of limestone below. Dewatering the limestone, a productive artesian aquifer, required pumping at a reported rate of 8,000 gallons per minute (about 11.5 million gallons a day) and lowering the water level as much as 45 feet below land surface, contrasted to normal water levels which were less than 20 feet below land surface.

The resulting depression in the piezometric surface intercepting Brice Creek and the Trent River caused a reversal of ground-water flow, and a recharge of salt water to the aquifer. By April of that year, many of the wells in the vicinity, which were about 20-35 feet deep, began yielding salty water or became dry because of the decline in water levels. Most of these wells were deepened in an effort to obtain fresh water, the new depths ranging from 80 to 210 feet. However, the salinity increased with depth and some wells yielded water containing more than 3,000 parts per million of chloride.

A water sample collected in 1953 from a well about 80 feet deep contained 760 ppm of chloride. A sample collected from this well in October 1957 contained 3,450 ppm of chloride. A sample collected from the quarry in October 1957 contained 960 ppm of chloride. The quarry was closed in 1959.



At least one law suit¹ was filed against the operator of the quarry. The court upheld the company under terms of the "reasonable use" doctrine but awarded minor damages to the plaintiff for reasons not connected with this doctrine.

Aquifer Contamination by Vertical Leakage Through Wells

At many places close to the coast the deeper artesian aquifers contain saline waters that are a potential source of contamination for the overlying fresh water aquifers. Generally, the artesian pressure-head in the deeper aquifers is somewhat higher than in the overlying aquifers. Consequently, in a well open to all aquifers, water from the aquifers of higher head will move up the well and out into formations of lower head. If the deeper water is salty, contamination of the other aquifers will result.

Although contamination by vertical leakage through wells is not yet common, it has probably occurred to some degree at several places. An example of this type of leakage apparently occurred in a gravel-pack well drilled at Wilmington.

According to information available, the well was drilled to provide water for a heat-pump but penetrated an aquifer containing brackish water and was abandoned. Abandonment and filling of the well with sand, however, did not stop the flow of brackish water from the deeper aquifer up through gravel and sand and into other aquifers above. Nearby wells with bottoms ending in the upper aquifers were reported to be yielding water which increased in chloride

¹Boyer vs. Teer Company; Vol. 256, N. C. Reports.

content as upward leakage continued in the abandoned well. So long as the artesian head in the deeper formations is higher than the head in the shallow aquifers, the vertical leakage and contamination through such wells will continue.

Similar conditions exist in many other parts of the Coastal Plain, such as in Beaufort County, where test wells showed differences in artesian head between aquifers of up to 14 feet. At a depth of 130 feet in a well drilled west of Washington, the artesian head was 14 feet above sea level and the water from this depth contained about 95 parts per million chloride. At a depth of 620 feet the artesian head was 28 feet above sea level and the chloride content of the water at this depth was 720 ppm. Thus, a multiple-screened well or gravel-pack well, completed in the area to a depth of 600 feet, would result in the transfer of highly mineralized water from the lower to the upper aquifers. Natural vertical leakage through the confining beds probably occurs to a considerable degree in much of the Coastal Plain where there is a difference in head of several feet between aquifers.

Chloride Contamination of Ground Water in Northwestern Beaufort County

In 1961, a ground-water supply was developed to serve a facility constructed near Leggets Cross Road in northwestern Beaufort County. The water supply was obtained from a well completed to a depth of 400 feet in a sand aquifer and screened from about 380-400 feet. The well yielded about 100 gpm. The chloride content of the water from this depth was reported to be about 35 to 40 ppm when the well was drilled.

Analysis of water from the well in January 1962 showed a chloride content of 45 ppm, well within the limits of acceptable quality for general use. However, by September

1962 the chloride content had risen to about 355 ppm, and to about 510 ppm by January 1963. The well was abandoned in June 1963, at which time the chloride content of the water was about 670 ppm.

In March 1964, a new well was completed at a depth of about 154 feet in another artesian aquifer, screened from 132 to 140 feet. The new well yields an adequate quantity of water with a chloride content of about 20 ppm.

The increase in the chloride content of water from the original well emphasizes the need for extreme care in developing ground-water supplies where the balance between salt and fresh water is delicate.

Ground-Water Pumpage in Northeastern Lenoir County

An area of very intensive development of ground-water resources is in northeastern Lenoir County. Presently, municipal and industrial use of water in the area is about seven million gallons per day or more. The depression created in the piezometric surface by continued pumping at this rate is a prominent feature of Plate 2 which shows water level contours. The hydrograph of the well at Grifton showing a decline in the water level of more than 6 feet from 1957 to 1961, reflected the expanded use of water during the period.

The development of ground water in the Kinston area cannot yet be considered excessive; however, the effects of current rates of pumping clearly illustrate the need for planning and management in future expansion of water supplies, both on a local and regional scale. With the expected increase in water use, the effects of pumping

at municipal and industrial sites throughout the Coastal Plain will continue to expand, and will eventually coalesce at many places. Thus, the selection, location and development of industries using large quantities of water should be carefully considered against the projected needs of existing industries and municipalities.

Ground-Water Withdrawals at Franklin, Virginia

Large quantities of ground water have been withdrawn for many years at Franklin, Virginia, for paper manufacture. As reported by C. L. McGuinness, in U.S.G.S. Water-Supply Paper 1800 (1963) the paper mill began pumping about 7 million gallons per day in 1941 and continued at that rate until 1954. From 1954 to 1960 the rate of pumping increased to about 22 mgd. At the present time, the pumping rate is about 25 mgd. and expansion to about 40 mgd. is planned during the next few years.

The ground-water supply at Franklin is withdrawn from sand aquifers at depths beginning at about 300 feet and going to more than 600 feet. These aquifers extend into North Carolina and are the principal source of water for municipalities and industries in much of the northern Coastal Plain. Water levels in these aquifers are now at a depth of more than 100 feet at Franklin and the observable effects of pumping extend well in North Carolina. At Murfreesboro, more than 15 miles from Franklin, water-level observations indicate a decline of about three feet in artesian head since 1958.

If the planned expansion of withdrawals at Franklin, Va., is carried out, the lowering of water levels is expected to continue and to extend over a much broader area. Thus, larger quantities of water would be diverted from North

Carolina to Virginia. Excessive lowering of the water levels will require the lowering or replacement of pumps, and eventually may induce salt water into the fresh-water aquifers in some parts of the area. Thus, careful planning, management and protection will be required as the ground-water resources of this area are developed, and a need for a special interstate understanding is suggested.

Effects of Surface Drainage on Ground Water Recharge

A considerable part of the Coastal Plain has relatively poor surface drainage. Extensive projects are in progress or have been planned for installation of surface drainage systems to lower the water table to improve and reclaim land for agricultural and other uses. This includes some of the P. L. 566 projects of the Soil Conservation Service.

Most of these areas comprise major areas of recharge to the extensive aquifers of the Coastal Plain. The swamps and areas where the water table is near the surface contain vast quantities of water that at present exceed the recharge requirements of the principal aquifers. However, continued development of these aquifers throughout the Coastal Plain will cause the recharge requirements to increase and these may eventually be greater than the capacity of the surface and near surface storage. Thus, reduction of storage by draining swamps and lowering the water table may greatly reduce the potential ground-water supply in many areas.

Preliminary results at a few localities suggest some lowering of water levels in relatively deep aquifers may have been shortly after completion of surface drainage

projects. The reduction of recharge may have already depleted the supply and reduced the potential for future increased recharge.

Effects of Ground-Water Withdrawals on Streamflow

The sustained flow of surface streams consists primarily of ground-water discharge through springs and seeps. Interception of natural discharge of ground water into streams by withdrawals from wells adjacent to a stream can substantially reduce the flow of the stream locally, and heavy withdrawals from wells over a large area could greatly affect a large drainage system. Thus, in some portions of the State, it would be possible to take most or all of the water from a stream through a system of wells located some distance from the river shore. Such a reduction of streamflow by nearby pumping wells would not constitute a withdrawal or use of water from the stream under existing statutes that do not recognize surface and ground water as parts of the same hydrologic system.

Problems Related to Well Construction

Problems resulting from improper installation, development and use of wells are common throughout the State. Many of these problems are erroneously attributed to the inadequacy or failure of the water bearing formation and most could be avoided if installation and use of the system conformed to existing conditions. Some common causes of problems include:

- Wells located near source of pollution
- Wells not properly spaced
- Drilled too deep or too shallow
- Well bore not straight

Casing - insufficient; improper seat; improper seal; damaged; substandard quality; diameter too small

Screen - not used where needed; wrong slot size; wrong diameter; slotted pipe substitute; not set at proper depth; insufficient length

Wells not adequately developed and tested

Records inadequate or inaccurate

Wells not sterilized

Pump - inefficient; not properly maintained; improper size; improper depth setting; no access for checking water level, sterilizing, or treatment for encrustation, inefficient pumping rate and schedule; no records kept

The large number of problems resulting from improper construction and use of wells and well fields emphasizes the need for establishing minimum standards of well construction and procedures for development and management of ground-water systems, based on geologic, hydrologic and other environmental conditions. Also, there is an obvious need for an effective system of licensing or registering well drillers so that only persons and firms capable of constructing wells according to established standards may be permitted to do so.

Pollution of Ground Water Supplies

Pollution of individual wells and local pollution of aquifers from septic tanks and other waste disposal, gasoline storage, insecticide storage and similar sources has occurred to some extent in most parts of the State, although the incidence has not been determined.

The most favorable conditions for pollution exist in built-up residential areas without central waste-disposal systems and with water supplies obtained from individual wells completed in sand or weathered rock at depths of 15 to 50 feet. Disposal of waste into the aquifer through individual septic tanks creates ideal conditions for pollution. A central waste collection and disposal system would generally provide ample protection of such shallow aquifers and individual supplies, if the wells are properly constructed.

Contamination of individual wells generally results from close proximity to a source of pollution, improper well construction, or a combination of these circumstances. Although a well may be within a short distance of a surface or near surface source of pollution, contamination is not likely if the well is cased and sealed properly. Thus, construction of the well is generally the principal factor in avoiding contamination, particularly in rural areas.

There is a growing need for some degree of control to insure protection and proper development of the sources of ground-water supply. Such controls should include standards for water-supply development and well construction, based on geologic, hydrologic and other environmental conditions of the particular area, that would be adequate from the standpoint of health and safety and would insure best development and use of the available water supply.

Summary of Ground Water

Ground water is a vital asset in Eastern North Carolina and an important asset elsewhere. Under present conditions the assurance of the most beneficial use of this resource requires a high degree of technical coordination concurrently with the exercise of considerable voluntary restraint by many well

EVENTS LEADING TO
THE DEPARTMENT'S REQUEST
FOR ADDITIONAL POWERS

The historical information in Chapter 1 indicates that the Board of Water Resources has been conservative in proposing new legislation to the General Assembly. In fact, the Board recommended repeal of one law which did not effectively serve its intended purpose. The two major reports released under Board sponsorship have pinpointed several problems requiring new law. Nevertheless, the Board has deferred submitting proposed statutes until such time as a reasonable support emerges from consideration of published reports. The preceding delineation of surface water and ground water use problems clearly shows an emerging necessity for legislation.

An acceleration of events stem from efforts of the Department of Conservation and Development to identify commercially valuable mineral resources and to stimulate development in the economic interest of the people of the State. A large area in Beaufort County had been under exploration for some time in the course of which large phosphate ore bodies were discovered. The State of North Carolina advertised for lease certain areas belonging to the State. These areas were the lands and bottoms under the waters of the Pamlico River and its navigable tributaries in Beaufort and Pamlico Counties and the lands and bottoms under the waters of the Pungo River and its navigable tributaries in Beaufort and Hyde Counties.

When the State Stream Sanitation Committee and the Board of Water Resources became aware that lease agreement negotiations were in process, both groups became alarmed over the possibility that lease provisions might not include sufficient protection for water resources, particularly water quality.

On June 15, 1962, the Director of the Water Resources Department and the Secretary of the State Stream Sanitation Committee met with the Governor along with the Director of the Department of Conservation and Development, the State Geologist, and others. Upon hearing a recitation of the problem, the Governor agreed that the matter should be thoroughly discussed and suitable action taken. He directed the conferees to further explore the subject.

Additional meetings were held June 18 and 21 with representatives of companies considering leases and various others, wherein stream sanitation requirements and possible company industrial processes were reviewed. On July 25, 1962, the Chairman of the State Stream Sanitation Committee submitted to the Governor a report entitled An Evaluation of the Effects of Proposed Phosphate Operations upon Waters of Pamlico and Pungo Rivers in North Carolina by E. C. Hubbard and W. R. Clary, dated July 20, 1962.

On August 3, 1962, it was announced that the Governor and Council of State had voted unanimously to proceed with an agreement with one company covering 9,200 acres of Pamlico River bottom and with another company covering 16,312 acres of Pungo River bottom. The options to lease provided that the State Stream Sanitation Committee would have the right to inspect operations at all times as well as to intervene and halt any operations that resulted in pollution violating State Stream Sanitation laws. It should be noted that up to this time emphasis was placed on the stream sanitation aspects of phosphate mining. Ground water effects were expected but the nature of these effects and the potential for harm depended upon choice of mining processes as well as general ground water data collection.

Although the Director of the Department of Water Resources participated in some of the initial meetings concerning the proposed phosphate mining operations and correctly foresaw a potential ground-water problem, the burden of activity fell primarily upon the State Stream Sanitation Committee. But fairly early in 1964, the problem began to exhibit facets which required the Board of Water Resources to enter into the matter. Even so, the issues were somewhat hazy at first because of State laws regarding State-owned properties and water resources.

Those parts of the North Carolina Water Resources Department Act which would appear to have a bearing on phosphate mining proposed are as follows:

G. S. 143-351 - "It is hereby declared that the general welfare and public interest require that the water resources of the State be put to beneficial use to the fullest extent of which they are capable."

G. S. 143-352 - "The purpose of this article is to create a State agency to coordinate the State's water resources activities, to devise plans and policies and to perform the research and administrative functions necessary for a more beneficial use of the water resources of the State, in order to insure improvements in the methods of conserving, developing and using those resources."

G. S. 143-355 (b) (2) and (3) - These sections require the Department to act toward "preservation" of "rivers" and "public tidewaters."

G.S. 143-355 (b) (8) - This section enjoins the Department to provide professional advice on matters relating to tidewater development, river works, and watershed development.

The Department of Administration is given general control over State-owned lands under the provisions of Chapter 146 of the General Statutes. This includes such matters as acquisition, management, control, and disposition, and all State agencies must transact through the Department of Administration all matters having to do with land. Swamp lands and submerged lands or lands created by raising from navigable waters come within this jurisdiction.

State rights in navigable waters are inferior to Federal rights, so that any person wishing to perform dredging, mining, or other operations in the coastal area may have to secure approval from the Federal Government, State Department of Administration, State Board of Water Resources, State Stream Sanitation Committee, State Board of Conservation and Development, and, conceivably, other agencies in some instances.

In a memorandum on April 6, the Director of the Department of Water Resources, after conference with the Secretary, State Stream Sanitation Committee, concluded that the problem of compliance with stream sanitation laws posed no insuperable problems; that the Board of Water Resources had responsibilities as to destruction or pollution of underground water resources, and the elimination or reduction of a surface-water resource; and that close surveillance of the situation was needed.

During the May 6, 1964, meeting of the Board of Water Resources, briefing information was provided by the

staff to the Board on phosphate mining. The belief was expressed that land mining operations could be carried on without seriously affecting water quality on the Pamlico River, but that mining within the River would create problems, the effects of which could not then be accurately evaluated. The Chief of the Ground Water Division announced he had prepared a report with some preliminary maps, showing that one company in test mining operation had pumped the influent seepage of artesian water from the test pit for about two weeks before stopping, throughout which time the artesian ground water levels fell. He also stated that the effects of pumping extended several miles, that certain water levels had been lowered to sea level, and that it would only be a matter of time in these conditions before a noticeable salt water encroachment would occur.

On July 10, 1964, this company addressed a letter to the Director asking for approval of a drainage system to replace Lee's Creek upon its closure¹ and by inference the approval of its closure.

In July of 1964 the Division of Ground Water issued Ground Water Circular No. 2 entitled Preliminary Report on Ground Water in Beaufort County with Special Reference to Potential Effects of Phosphate Mining. This report concluded that both the phosphate deposits and the ground-water resources of the county were extremely valuable resources and that large-scale pumping from the principal aquifers on a continuous and long-term basis would lower the water table and artesian pressures sufficiently to permit salt water

¹A request to "close" a stream is in fact a request to destroy the stream and to replace it with whatever measures might be deemed practical to remove the water previously carried by the stream.

encroachment into these aquifers unless effective preventive measures were taken. The minimum protective measures recommended were:

1. Determine the depth of saline water at the site of withdrawal before the start of pumping operations.
2. Install and maintain at each withdrawal site water-level and water-quality monitoring stations to provide records of changes in levels and quality caused by pumping.
3. Undertake measures to restrict significant pumping effects to the immediate vicinity of pumping sites.
4. Undertake measures to hold water levels and pressures to a sufficient height above sea level outside the immediate area of groundwater withdrawal to prevent encroachment of salt water into the aquifers.

On August 11, 1964, the Director wrote the company which had previously sought approval of drainage measures, inviting an application to close Lee's Creek, providing a sample form for petition, and serving notice of the Board's alarm over possible ground water effects. He invited the company to make pertinent proposals. The company response on August 21, 1964, announced they were working on the proposed petition, had incorporated suggestions on drainage received from the Department, and that they had undertaken a study of potential salt water intrusion beginning in September 1963, the results of which were not yet conclusive.

Partly as a result of the Department's concern, the concern of the Stream Sanitation Committee, and the expressed concern of wildlife interests over the proposals to lease the bottoms under Durham Creek, the Department of Conservation and Development announced a public meeting for September 3, 1964, in Washington, N. C., to provide an opportunity for those interested to express themselves. The Director appeared at this meeting and outlined the Board's responsibilities, its need to take all necessary measures to protect the public interest, and its strong hope that a successful mining operation could be carried out to contribute to the area's economic development. The consensus of the meeting was favorable to leasing.

The Board of Water Resources met on the 24th of September at which time the Director presented the Company's request (1) that they be permitted to close Lee's Creek, and (2) that the ground-water problem be considered separately with the understanding that the company would have definite proposals by January 1965. The Board granted both requests.

On January 4, 1965, the Company wrote the Director that their engineering consultants had submitted a ground water evaluation. The data accumulated to that date was to be delivered to the Department within ten days. The Company stated that they did not have sufficient information as yet to make definite proposals concerning salt water intrusion. Ground Water problems were considered to be a permanent subject for study which would include observance of effects on surrounding wells, aquifer recharge, and possible salt water intrusion. In conclusion the Company stated it would establish a program to predict any movement of salt water, and advise the Department sufficiently in advance of any serious problems to assure time for remedial measures.

On February 4, 1965, the Company announced the availability of a Technical Memorandum Evaluation of Pumping Tests, Performed for Design of the Dewatering of the Production Pit, prepared by their consultants. The Company representative stated that the report showed no reason for immediate concern over the intrusion of salt water in the Castle Hayne coquina. The complete report, although made available to the Department, was classified as "confidential."

The Company's continuing ground water program was described as follows:

- "1. Water sampling of domestic and other wells tapping Castle Hayne aquifer in the area for the purpose of chemical analysis. This program is underway and results will be available within the next two months.
- "2. The chloride contents of the sampled wells will be examined to determine whether any pattern exists which would be indicative of the location of a salty ground water front. We plan to drill out-post observation wells at critical locations and take water samples from them regularly.
- "3. Chemical analyses of water samples taken from our own dewatering wells will be made regularly to detect any changes or trend in chloride content."

A point was made that the Company's initial requirements would exceed 60,000 gpm of fresh water and that the Company processing operations depended upon this water remaining fresh. In other words, the Company itself might be

adversely affected if significant salt water intrusion occurred.

The first Board of Water Resources meeting of 1965 was held on February 4th. This meeting was attended by representatives of the Company and their consultants. In discussing Company problems and plans the Company representative predicted that a salt water problem in less than 10 years was unlikely. At this same meeting the Ground Water Division submitted a significant paper concerning exploratory plans entitled Exploratory Drilling and Multiple-Well Data Stations in the Coastal Plain.

After the Board meeting the Division of Ground Water reviewed detailed technical information furnished by the Company along with Division data. It was concluded from this review that a pumping rate of 100,000,000 gallons per day was a distinct possibility, that this rate was higher than previously considered, and that consequent effects could be expected to be more pronounced than previously estimated. At such a rate, it would not be economically feasible to restrict the effects to the vicinity of the mining area or to prevent salt-water encroachment into the principal aquifers. It was recommended that withdrawal be limited to a safe perennial yield which was roughly estimated to be 5,000,000 gallons per day.

At the March 5, 1965, meeting of the Board of Water Resources, analysis by the Division of Ground Water was submitted. In amplification of the analysis the following information was presented to the Board. First, it was judged that the Company's thinking on the mining process had been evolutionary beginning with deep dredging, then shallower dredging, and finally dry mining. Next the Company's informal statements and its reports submitted in February were incomplete in that certain pertinent matters were not covered to

the degree necessary if the Board of Water Resources were to be expected to retreat from previous tentative conclusions of alarm. It had not been possible for the staff to bring up these matters in February because it was given no opportunity to study the Company's presentation in advance.

Assuming a daily pumping rate of 100,000,000 gallons per day for a year, the Division of Ground Water expected that the water level would be 150 feet below sea level at the pumping wells, at sea level in Washington, and five feet below sea level at Cherry Point. In all of Pamlico County and a large part of Beaufort County water levels in the Castle Hayne formation would be below sea level. The equilibrium between fresh and salt water would be disturbed and Belhaven would probably be one of the first communities affected by salt water contamination. Ground water supplies might be affected as much as 100 miles from the pumping site or over an area of 2,500 square miles. Salt water intrusion could come from the river, from underlying formations, or through the Castle Hayne aquifer itself.

A discussion of the legal powers of the Board ensued. The attorney to the Board stated that the Attorney General's office had concluded the Board was limited in its specific authority to make rules and regulations pertaining to the withdrawal or diversion of ground water resources. Should the Board make a finding that ground water resources at any location were being diminished beyond a degree consistent with public interest it could request the Attorney General to seek an injunction. Whether such an injunction would be granted could not be established from any precedents. Furthermore, it was possible that if saline pollution occurred the whole problem might be determined as beyond the purview of the Board and in the jurisdiction of the State Stream Sanitation Committee.

Therefore, it was determined that the Director and selected advisors should brief the Governor on the situation. This was done March 24, 1965, and the conference was attended by the Director, the two Chairmen (Board and Committee), the Chief of the Ground Water Division, and others. It was concluded that a conference with the Company should be sought. It was also a consensus that the Board's power to adopt rules and regulations and reasonable regulations enacted as a result of use of this power should have some standing in court, but that legislation should be sought from the then current General Assembly if the Board decided legislation was needed.

The Director sought the conference with the Company by letter dated March 26, 1965, but was unable to consummate such a meeting. In the circumstances the Board felt impelled to seek legislation to strengthen its powers and the bill included as Appendix A in Volume 2 of this Brochure was introduced.

ACTION OF REQUEST AND SUCCEEDING EVENTS

The General Assembly, nearing the end of its session and having already faced the problems and work loads normal to a new Governor's program did not have the time to give the relatively simple bill close scrutiny. Some legislators were not convinced that the problem demanded this immediate action. Industrial interests, fearing that the proposed act as written could be used in a very restrictive manner, opposed the bill. There was no time to debate the issue properly, to consider modifications, or to enlist public support. Therefore, a joint resolution was passed instead directing this study.

During the period the proposed law was under consideration and for some weeks thereafter the press of the State displayed a considerable interest. Opinion as expressed in a number of editorials seemed to favor providing the State powers to conserve water resources. There was a tendency to encourage a newspaper debate over technical matters which fortunately did not progress very far since debate would be less enlightening than cooperative review of the facts on hand or to be obtained.

On August 24, 1965, the local manager of the Company furthest advanced in production appeared before the Board of Water Resources, and made an oral presentation illustrated by maps which effectively described the Company's program and repeated previous assurances that ground water resources would be preserved. At the same time he described a Company program to replace or modify ground water facilities operated by farmers and others. This meeting was well attended by consultants for other companies, state officials, and farmers. An able presentation was made by a spokesman representing area farmers, who expressed appreciation for measures the Company had taken in alleviation, but doubted the measures went far enough. The Chairman of the Board requested the Manager to supply for the record the content of the talk and any other material corroborating his assurances.

At the same Board meeting, thinking specifically of the problems in Beaufort County and the probability that the public might not fully respect the divergent viewpoints of Department Geologists and company geologists, Mr. Glenn Tucker, a Board Member, moved that steps be taken to obtain nationally known independent consultants to study the problem and make recommendations. This move was adopted, funds were obtained from the Contingency and Emergency Fund by direction of the Governor, concurred in by the Council of State.

The Board of Water Resources, called on the American Society of Civil Engineers, the U. S. Geological Survey, and the State Board of Registration for Engineers and Land Surveyors, as well as prominent consulting engineers for advice as to consultants. Ultimately a Board of three individuals were selected, one from the retired ranks of the U. S. Geological Survey, one from teaching, and one from private consulting practice. The State of North Carolina is very fortunate to have obtained such outstandingly qualified individuals as:

Dr. Roger J. M. De Wiest
Department of Geological Engineering
School of Engineering and Applied Science
Princeton University
Princeton, N. J.

Dr. C. E. Jacob
C. E. Jacob & Associates
Groundwater Consultants
295 West 1st North
P. O. Box 163
Provo, Utah 84601

Dr. A. Nelson Sayre
Groundwater Geologist
4212 Yuma Street, N. W.
Washington, D. C. 20016
(Formerly head of Ground Water Division USGS)

This Consulting Board met in Raleigh and visited the sites of the operations in Beaufort Co. and elsewhere during the week of January 10-14, 1966. Their studies are expected to be complete by late spring or early summer 1966.

One of the results of their advice is a cooperative program between the Department and the Company for installation of certain additional wells and special tests involving temporary reduction or cessation of pumping operations.

Recapitulation

It is concluded that competition between uses for surface water at certain critical locations already show the necessity either for augmentation of water supplies and development of economically more effective means of optimum waste treatment, or statutory controls of water withdrawals, or both.

It is also concluded that a few locations where ground water withdrawals are having significant effects on existing or potential uses require that the State be authorized to manage the use of this resource to the extent necessary to protect the interests of all.

Finally, the highly publicized Beaufort County phosphate mining incident should be recognized not in terms of controversy between a specific industry and the Board, but merely the first major example of a need for regulation in this State which ground water hydrologists have been predicting for years. To give some reasonable perspective to this problem, the following points are made:

- (1) The existing powers of the Board of Water Resources to regulate the use of ground water are essentially non-existent. The "clarification" which the Director sought from the legislature was a statutory assurance that certain very limited water emergency powers of the Board could be made applicable.

- (2) The Board has a duty to make known to the public its concern over any potential damaging use of water resources.
- (3) As early as August, 1964, the Board sought a technically detailed report from the Company outlining its position and supporting that position with data collected by mutually acceptable ground water authorities. A report, prepared by Company officials was submitted May 17, 1966.
- (4) As a result of conflicting views between Company officials and Board representatives, the decision was made to retain an independent Board of Ground Water Consultants. Other factors contributing to this decision were the Company's rapid progress toward full production, delays in receiving a report from the Company, and the desire of the Board to insure completely impartial advice on a matter of such importance.
- (5) The Board's sole interest in this matter is that of fulfilling its statutory responsibility to insure the preservation and most beneficial use of the State's water resources in the best interest of all the people.

CHAPTER 3WATER MANAGEMENT LAWS IN OTHER STATES

It is not possible to do justice to the entire field of water management legislation in the space of this chapter; so the coverage given here must be selective. We have chosen to concentrate on a brief summary of recent legislative developments, mainly in the eastern states, followed by a more detailed review of a few examples of the kinds of legislation which seem most relevant to North Carolina's current situation. By emphasizing eastern experience we hope to highlight analogies that are likely to be most useful for North Carolina today. A more detailed state-by-state analysis of water use law will be published by the Department later this year. In this chapter, recent legislative developments concerning water quantity management will be considered; water quality management is largely excluded from the discussion.

SUMMARY OF RECENT DEVELOPMENTS

State water management laws and programs have varied widely, both in concept and level of effort. At one extreme lies the approach that was characteristic of early riparian and appropriation doctrines and which still persists in some areas today. Here the state government through its judicial and legislative machinery laid down a few simple rules of conduct, relating the use of water to such easily applied factors as access or seniority. At the other extreme lies the complex mixture of detailed regulation and extensive state participation in developmental activities that is exemplified by the State of California. In California today the producers, distributors and consumers of water are with good reason termed the "water industry", and the state government increasingly deals with this industry from

top to bottom--from resource to consumption--as a public utility.

Western States

Before turning to the eastern states a brief review of the western situation is in order.

All of the 17 "arid" western-most states* have subjected flowing surface waters to the appropriations doctrine, either exclusively or in combination with riparian rights. Almost all of these states have now subjected underground waters, both flowing and percolating, to the appropriation doctrine--a marked change since 25 years ago, when less than half of them had done so. In a number of the western states, state officials have been authorized by statute to designate critical underground areas or basins for special control or management.

Other common features of ground water management codes in western states include well driller licensing laws, artesian well control statutes, and legal requirements that logs be kept on all wells. One recurrent pattern has been the adoption of these management devices as a prelude to full fledged appropriation laws.

All but one of the 17 western states operate their water rights systems through administrative boards or officials. The single exception, Montana, utilizes its courts for this purpose. Most of these states have legislation

*The 17 "arid" western states are: Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington and Wyoming.

authorizing the appointment (or in the case of Idaho, the election) of water masters or water commissioners to supervise water use and administer water rights within local districts. This concept of a water master who controls the gates to the ditches of irrigators and other water users points up one of the practical difficulties in transferring western water law institutions to eastern circumstances. In the west where ditch irrigation is a prevailing practice, a water master may be able to allocate water use effectively by controlling the gates to a limited number of ditches. In the east, instead of a single fixed ditch supplying one or more large irrigators, the typical pattern is a number of small mobile sprinkler irrigation systems serving small acreages. The sprinkler irrigation system, with movable intakes and pipes, presents a far more vexing water rights enforcement problem than the irrigation ditch.

Supplementing their statutory ground and surface water controls, some of the western states have launched substantial water resource developmental programs. Best known of these is the California Water Plan, a multi-billion dollar effort entailing massive transfers of water under state government auspices from areas of surplus to areas of shortage.

Eastern States

Prior to the early 1950's the eastern states had done very little in the water management field, either of a developmental or a regulatory nature. A long-term pattern of adherence to riparian doctrines with minimal state direction or guidance remained largely unbroken.

Today, a dozen years later, the picture has changed markedly. Several eastern states have made substantial inroads

on traditional surface and ground water doctrines. A number of states have enacted less extensive legislation or are now considering major new action. A few states are beginning to go into the business of developing sources of water supply for the benefit of agricultural, industrial and public uses.

Geographically the pattern of change has involved a clustering of state activity around several growth or resource centers: the Middle Atlantic region, radiating out from New Jersey; the Gulf States, with Florida and Mississippi in the lead; and the Lake States, reaching down into Iowa, where a tradition of public interest in natural resources is strong.

Two factors have largely stimulated eastern water law innovation: cyclical drought conditions and developmental pressures associated with population growth and industrialization. Periodic droughts alone would not ordinarily suffice as a reason for revolutionizing water laws and institutions, though, and this may be an appropriate comment on the abortive effort in 1955 to revise North Carolina law. However, at some point along the rising curves of population and economic growth, problems of local scarcity or overdevelopment of water resources become sufficiently chronic and widespread to demand new water laws and institutions. This has apparently happened in several eastern states within the past decade, and there is every reason to believe that it will happen in North Carolina. Because such changes can be disruptive and expensive, and will probably tend to freeze water use patterns, it is only wise to consider carefully whether the time to act has indeed arrived. This is the decision that now confronts water resource policy makers in North Carolina.

* * * * *

Chart 1 on page 74 indicates the types of regulatory measures currently on the statute books in the eastern states. The labels used in this chart--"limited", "moderate", and "strong" regulation--are intended to give the general reader an over-all impression of the status of regulation in the east today. While some of our designations are probably debatable, we believe that at least at the extremes of "limited" and "strong" regulation there should be little disagreement with our choices.

As the chart shows there are between five and ten eastern states with vigorous regulations affecting both ground and surface waters or surface waters only. Some of these "strong" laws are concerned with legalizing the diversion of waters beyond normal boundaries of riparian or overlying land. Others are concerned with controlling or restraining the use of water within certain areas or on a state-wide basis. Their common denominator is some kind of permit system which in most cases is or potentially can be applied statewide.

To place the matter in its historical context: 15 to 20 years ago there was probably no eastern state which would have qualified as having "strong regulations."

The "strong regulation" group is balanced by a comparable number of states with water codes that depart only slightly, if at all, from traditional surface and ground water doctrines. (One might add to this group several states that have essentially no water use legislation.) These laws, which we have labelled as "limited regulation", include statutes which merely codify parts of the riparian doctrine as well as statutes which contain a declaration of state policy on water resources, coupled with a study commission approach or with partial codification of riparian rights but no regulatory authority.

CHART 1
EASTERN WATER USE REGULATION

<u>Ground Water Only</u>	<u>Surface Water Only</u>	<u>Ground and Surface Water</u>	
S T R O N G A T I O N	Mississippi Wisconsin	New Jersey Iowa Florida Indiana Minnesota	
M O D E R A T E I O N	<ol style="list-style-type: none"> 1. Localized regulation: <ol style="list-style-type: none"> a. Regulation of large wells on Long Island (N.Y.) b. Certification of wells in a limited area (S.C.) 2. Controls on artesian well waste (Ark., Fla., Md., Mich., Minn., N.J., Pa., Va.) 	<ol style="list-style-type: none"> 1. Emergency allocation powers for public supplies (N.C.) or broader purposes (Ark.) 2. Permits for public water supply acquisition (Pa.) 3. Permits for water use and diversions for taconite processing (Mich., Minn.) 4. Local acts authorizing particular diversions (S.C.) 5. Impoundment permits conditioned on maintaining normal flows (Ark., Ky., Va.) 6. Lake level protections (Minn., Wisc.) and reservoir drawdown controls (Ill., Ind., Mass., Mich., N.H., Pa.) 7. Permits for dredging or filling (N.H., N.Y., Conn.) 8. Permits to change course of certain high quality streams (N.Y.) 9. Surplus Water Planning (Mich.) 	Strong regulatory powers diluted by broad exemptions (Ky., Md.)
L I M I T E D I O N	<ol style="list-style-type: none"> 1. Partial codification of riparianism (Ga., La.) 2. Declaration of state policy plus partial codification or study commission (Ill., Mo., Ohio, R.I., Tenn., Va., Vt., W.Va.) 	Registration of large water users (Tenn.)	

In between the extremes lies a middle group of states, larger than either of the first two groups, which has enacted a variety of water use laws--laws having some regulatory effect but falling short of comprehensive water management legislation. Some of these laws are concerned only with ground water, such as localized regulation of ground water use or abatement of artesian well waste. Others deal with surface waters, such as limited or emergency allocation laws; laws sanctioning extraordinary water usage by favored industries; protection of lake levels for the benefit of water recreation or fish life; permits for acquisition of water rights by public water supply agencies; registration of large water users; regulation of sand and gravel dredging in coastal waters; and permits for excavation and fills in navigable waters. One state, South Carolina, has followed a local bill approach authorizing diversions of waters from certain streams for designated public or industrial uses, and in one case requiring a certificate of convenience and necessity for digging wells in a defined area. (New York also has adopted localized regulation of ground water use on Long Island.)

Chart Number 2 on Page 76 summarizes related legislation involving licensing programs and similar matters--well driller licensing; requirements for logs and other reports on wells; dam safety licensing and inspection; and regulation of floodway encroachments.

Turning from regulation to development: several eastern states have authorized state undertakings to develop water supply sources by constructing reservoirs, managing ground water areas, and the like. New Jersey, matching its regulatory leadership, is perhaps the strongest example with two major reservoirs in North Jersey. Other states with laws providing for similar programs include Illinois, New Hampshire,

Ohio, Rhode Island, and most recently Kentucky. West Virginia and Ohio have within the past five years authorized highway agencies to build slack water dams in connection with road fills. In a different vein, Massachusetts and Rhode Island have recently created new agencies to search out and protect public access to water recreation areas. Also, Wisconsin has designated two streams as "wild rivers", and Maine has recently enacted legislation creating the Allagash Wilderness Waterway.

CHART 2

EASTERN LICENSING, INSPECTION AND RELATED LAWS

Ground Water

Surface Water

Well driller licensing and reporting and, in some instances, well installations and well use controls (Conn., Ill., Ind., Md., Mass., Minn., Miss., N.J., N.C. (localized), Ohio, Pa., Tenn., Vt.)

1. Dam safety licensing and inspection (Conn., Ind., Iowa, Ky., Md., Mass., Mich., Minn., N.H., N.J., N.Y., Ohio, Pa., R.I., Vt., W.Va., Wisc.)
2. Floodway encroachment regulation (Conn., Ill., Ind., Iowa, Ky., Md., Mass., N.J., Pa., W.Va.)

Note: In addition to the eastern legislation on the subjects covered by this chart, there are similar laws on all of these subjects in a number of western states. As to surface water legislation, see Heath, "Flood Damage Prevention in North Carolina", N. C. Department of Water Resources (1963). Page 68. As to ground water legislation, see Clark, "Ground Water Legislation in the Light of the Experience in the Western States", 22 Montana L. Rev. 42, 44 (Fall 1960).

DETAILED REVIEW OF SELECTED LAWS

Ground Water and Surface Streams: Strong Regulation

We have been particularly impressed, in reviewing the strong water allocation laws, by their variety of emphasis and content. Notwithstanding some significant efforts to bring about a model or uniform approach in this area, the experience thus far is that local traditions, conditions and needs have been highly influential in shaping the response to pressures for water use regulation in the east.

Some patterns can be found in the new laws, however. Three principal types of allocation laws can be distinguished: a general compulsory permit system; compulsory permits for special problem areas; and machinery to authorize diversion in excess of established minimum flows or water levels. These alternatives can best be illustrated in terms of the laws of Iowa, New Jersey and Florida.

First: The most far-reaching scheme of regulation in the east has been adopted by the State of Iowa. The Iowa law establishes a general permit system. Subject to certain exemptions, it requires that all substantial diversions, storage or withdrawals of water from streams or ground water basins be covered by permits from the state's Natural Resources Council. (Exempt categories include household uses, stock watering, very small withdrawals, existing uses within municipalities, and certain uses from boundary rivers. Some protection, the effect of which cannot be simply stated, is also provided for vested rights. Most areas served by municipal systems, and industrial self-suppliers within city limits, were initially exempted but made subject to future coverage under a provision requiring permits when the usage is increased by more than three per cent.) The principal

standards for testing permit applications are beneficial use and compatibility with a comprehensive state water plan. Permits may be denied also if the proposed use would affect the "protected flow" (the established average minimum flow of a watercourse). Savings clauses were provided for navigability and pollution control laws. Permits under the Iowa law may be granted for renewable terms of no longer than ten years.

General permit systems of the Iowa-type are in force also in Minnesota, for both ground water and surface streams, and in Mississippi for surface streams only. The Mississippi and Minnesota laws, while similar to the Iowa legislation, are by no means identical to it. The Mississippi statute permits appropriations to be made only in excess of computed minimum average stream flows. The Minnesota law exempts, among other things, all uses outside of municipalities prior to 1937 and all uses within municipalities prior to 1959. A number of the detailed provisions of the Iowa law are not paralleled in either the Mississippi or Minnesota laws--by way of illustration, the Iowa provisions restricting permits to a term of years and requiring permits to be compatible with a state water plan.

Maryland and quite recently Kentucky have also enacted general permit legislation of the Iowa-type. Both of these laws, though, are substantially diluted by exemptions.* The Maryland act exempts domestic, farming, municipal and pre-existing uses; while the Kentucky act exempts agricultural, domestic and industrial uses.

Second: A different sort of compulsory permit system geared to the needs of problem areas has been adopted by

*Despite its broad exemptions, the Kentucky statute in particular appears to be one of the more carefully drafted and well considered general permit laws that have been enacted.

New Jersey. Applicable both to surface streams and underground waters, New Jersey's law requires permits for those who divert or obtain substantial amounts of water in areas delineated by the Water Policy and Supply Council--areas where consumptive surface water diversions require regulation in the interest of residents of the watershed, or where ground water diversions exceed or threaten to exceed natural replenishment. The minimum diversion subject to regulation is 100,000 gpd of ground water or 70 gpm (approximately 100,000 gpd) of surface water. The ground water law exempts pre-existing diversions, while the surface water law exempts public water supplies and gives priority to pre-existing diversions. A 25-year maximum term is prescribed for surface water permits, which may be issued only for diversions in excess of low flows (average minimum daily flows).

Indiana has enacted legislation quite similar to New Jersey's, providing for regulation of large ground water diversions in problem areas.

Third: Still another emphasis is reflected by Florida's water management laws. Rather than providing for compulsory permits as a means of state control of water resources, Florida provides machinery to authorize diversions of water in local areas. The Florida law empowers the state Board of Conservation to authorize diversion of surface waters from riparian lands and of ground waters from overlying land. Diversions are permissible only in excess of average minimum stream flows, lake levels, or ground water elevations; and they may not interfere with reasonable existing uses. The Board may delegate its authority to local water management districts.

The same underlying philosophy is applied in Wisconsin to surface water only. Temporary diversions of "surplus

waters" from lakes or streams are authorized, with Public Service Commission approval, for the purpose of restoring a lake level or maintaining stream flow. Non-surplus diversions for agricultural uses (including irrigation) may also be made with Public Service Commission approval.

A narrower version of this approach is reflected in an Indiana statute authorizing the diversion of flood waters of any watercourse with administrative approval. Somewhat akin to this are laws adopted in several states which authorize landowners to impound streams or flood-waters of streams for various uses, so long as they maintain normal stream flows downstream. (Arkansas, Indiana, Kentucky, Virginia.) A law providing for State development of "surplus waters" for riparian use has recently been adopted in Michigan (see p. 91 below).

Model Water Use Act.--No review of this subject would be complete without mention of the Model Water Use Act. This model was drafted after extensive studies by the Legislative Research Center at the University of Michigan Law School. In 1958 it was approved as a model act by the National Conference of Commissioners on Uniform State Laws. It has been enacted by one state, Hawaii, in modified form affecting only ground water. An early draft of the Model is reflected substantially by the Iowa legislation reviewed previously discussed.

The Model Act provides for a general compulsory permit system slightly more comprehensive in scope than the Iowa legislation, and to be administered by a State Water Resource Commission. In brief, its principal provisions are as follows:

- (1) It provides for regulation under a permit system of all waters of the state subject to (a)

exemptions only for domestic uses; and (b) preservation of the right to continue existing beneficial uses, uses in conjunction with pending construction, and uses made within three years prior to enactment--but preserved uses become subject to Commission determination unless declared within three years after enactment. Also, it provides that preserved uses may be extinguished because of non-use for a specified period of years.

- (2) It vests special allocation powers in the Commission to deal with water-short problem areas (comparable to the New Jersey law) and emergency situations.
- (3) It allows the Commission to establish classes of permits and to exempt small uses.
- (4) It limits the maximum permit term to 50 years.
- (5) It specifies as standards for evaluating permit applications: beneficial use; availability of water; no impairment of the most beneficial use of the waters in question by the permit; and no substantial interference with preserved or domestic uses.
- (6) It allows permits to be issued without regard to any common law limitations on use within natural watersheds, use upon riparian land, etc.
- (7) It contains a series of policy declarations concerning beneficial use, conservation, pollution, etc.
- (8) It contains optional provisions: (a) giving water pollution control powers to the Commission; (b) providing for development of a comprehensive plan for most beneficial use of waters; (c) allowing pre-emption of low preference uses by more beneficial uses, on payment of compensation; and (d) empowering the Commission to protect stream flows and lake levels.

Whether or not one agrees with its philosophy, the Model Act is a carefully drafted distillation of the water allocation legislation of many states, both eastern and western. It should be a helpful drafting aid for any new legislation that may be enacted on the subjects within its scope.

* * * * *

Salt water intrusion.--One other statute should be mentioned under the heading of strong regulation: Florida's salt water intrusion law. This law authorizes the State Board of Water Resources to establish salt water barrier lines in areas where intrusion has reached emergency proportions. Inland of this line no canal may be built or enlarged and no stream may be deepened or enlarged which discharges to tidal waters, without a dam or other control structure seaward of the barrier line.

Ground Water and Surface Streams: Other Legislation

In addition to the examples of "strong regulation" reviewed in the preceding section, we believe it will be useful to describe several other recent laws, programs and proposals because of their possible bearing on North Carolina's needs. Some of the examples we have selected involve laws or programs common to several states, while others portray a cross section of an individual state's program.

New York legislation and proposals.--The development of New York's still evolving water resource management laws presents an interesting and instructive story. New York has been chipping away at the task of devising a viable set of water legislation since 1959. In that year it created a

(still existing) Temporary Study Commission on Water Resource Planning, consolidated water management functions in a single Water Resources Commission, and established the framework for a regional water management planning program.

In the intervening years additional legislation has been enacted which, together with laws previously on the books, includes:

- . . . regulation of large wells on Long Island;
- . . . dam safety regulation;
- . . . permits for stream dredging and filling, and for re-channeling some streams;
- . . . centralized control over planning of municipal and irrigation water supply projects to ensure safe construction, protection against contamination, and fairness to other affected municipalities;
- . . . enabling legislation for river regulating and improvement districts, as well as for small watershed programs; and
- . . . a major upgrading of the State's water pollution control program that will ultimately cost billions of dollars.

While these intermediate steps were being taken toward assembling a complete water management program, the Study Commission was considering further possibilities. Among these was a "surplus water" concept advocated by the State Soil Conservation Committee--a proposal to define stream flows in excess of average daily flows as belonging to the State, to be captured and developed for public rather than riparian needs. The Study Commission has flirted with this notion and may yet recommend its adoption. However, the Commission

opened up a new avenue of approach in 1963 and 1964 by undertaking a re-evaluation of the issues in light of a particular watershed development proposal (Flint Creek), and by contracting with the Cornell Water Resources Center for consultant studies on legal, economic and technical aspects.

Under the supervision of Professor William Farnham, retired Cornell law teacher, a careful study of water rights law and administration is now underway. One product of this research has already been enacted, a proposal that harmless interference with the natural condition of a natural watercourse or lake may not be enjoined. (This legislation is designed to overcome a line of old cases holding to the contrary, and to bring New York law fully into conformity with the reasonable use version of the riparian doctrine. Although the question may bear further exploration, it is probable that North Carolina already adheres to the rule embodied in this legislation.)

Proceeding methodically to deal with other technical deficiencies of New York riparian doctrines, the Cornell Center is also recommending new legislation along the following lines: (a) that only unreasonable harm caused to a riparian owner by the addition of foreign water to a natural stream (for transportation in the stream channel) shall be considered actionable; (b) that the person for whom lawfully added foreign water is intended may withdraw it at any point of lawful access; and (c) that no riparian owner downstream from an impoundment may take more water from the stream than would naturally be available to him unless he contributes equitably to its construction and maintenance. These recommendations are relevant to problems that have arisen in North Carolina.

Another group of recommendations by the Center is designed to facilitate the financing of small watershed projects

by sale of water shares in the project, entitling the shareholders to withdraw specified amounts of water annually. This arrangement was devised in response to the expressions of landowners along the Flint Creek project.

The Center is continuing its legal-economic-technical studies and has mapped out an ambitious plan for further analysis of the structure of existing law and of possible improvements.

Arkansas legislation.--A state which has gone somewhat beyond North Carolina's water management legislation, but along similar lines, is Arkansas.

Under a 1957 law the Arkansas State Soil and Water Conservation Commission is empowered (a) to issue permits (maximum 50-year term) for construction of dams to store water for human consumption, domestic use, industrial use, and irrigation, conditioned upon continuous discharge of normal streamflow downstream; and (b) to ratably allocate available water during shortages among those affected, on its own motion or on petition, with preference to sustaining life, maintaining health and increasing wealth, in that order. The former statute bears some resemblance to North Carolina's approach toward small watershed project supervision, while the latter resembles North Carolina's emergency allocation law.

Arkansas has also enacted controls over flowing artesian wells.

Special treatment for a favored industry.--At least three states, Michigan, Minnesota, and Wisconsin, have enacted laws singling out particular industries for special treatment. Michigan authorizes its Water Resource Commission to grant

permits for drainage, diversion, control and use of water in connection with low-grade ore mining installations, if the permits would not unreasonably impair the interest of the public or of riparian owners. The Minnesota statute, framed in similar terms, refers to iron ore mining or taconite (as does the Wisconsin statute). It also expressly grants eminent domain powers to taconite mining companies for land, easements and water rights.

A South Carolina special act mentioned earlier, authorizing a named paper company to divert 100 cfs of water from the Great Pee Dee River at a designated place, might be considered analogous to these Michigan and Minnesota laws.

Lake level controls, laws favoring fisheries and recreation, etc.--Two of the Lake States, Minnesota and Wisconsin, have enacted comprehensive legislation empowering administrative agencies to determine normal levels of lakes and other public waters, and to regulate the fluctuation of those levels--as by fixing a level below which a lake may not be lowered.

A related group of laws, somewhat narrower in scope, requires that water levels be maintained behind dams sufficiently high to preserve fish life, or that the permission of a fisheries agency must be obtained before draining off waters from reservoirs inhabited by fish (Illinois, Indiana, Pennsylvania). One step removed are laws requiring that notice be given to fisheries agencies in advance of drawdowns (Massachusetts, New Hampshire).

Other water use legislation designed to protect fish life includes Indiana and Louisiana laws requiring screens or other devices for large pumps in order to avoid destroying fish life; and a Connecticut law authorizing its wildlife

agency to regulate sand and gravel dredging in the interest of fish and game protection and recreational use. New York has a somewhat broader law requiring that permits be obtained from its Water Resources Commission in order to remove sand and gravel from stream beds, or to change the course of a stream classified AA to C, or to make excavations or fills in navigable waters. Standards under this New York law include protection of public health, safety or welfare, and protection against loss or destruction of natural resources.

A great deal of legislation is on the statute books which establishes anti-pollution safeguards for fish and wildlife, North Carolina's "fishkill law" being a good example. We will not review this legislation here, however, since the scope of this chapter excludes water quality management.

Miscellaneous.--In concluding this section, we note very briefly several other recent laws which we believe merit special mention:

- (1) Florida has earmarked funds from public roads revenues and other sources for annual contributions to an expanded topographic mapping program.
- (2) Indiana has empowered its water resource agency to provide voluntary mediation services in connection with surface water disputes. Minnesota has related legislation providing for referral of water policy questions pending before state agencies and courts to its water resource agency for findings and recommendations.
- (3) New Jersey has established a continuing interim study committee to provide watch-dog service to its legislature, to keep the legislature informed of pending investigations and studies.

- (4) Pennsylvania requires that water rights acquisitions by local water supply agencies be approved by its State water agency as a condition to condemnation of water rights.
- (5) New Jersey requires that payments be made to the State for diverted waters to be used for public water supply, industrial uses and other uses.
- (6) Michigan has recently empowered its Water Resources Commission upon local request to make surveys for possible surplus waters available for impoundment and use. If surpluses above "optimum flows" are found to exist the State may develop the surplus waters for nonconsumptive uses to all riparians, charging back the costs to users.
- (7) Two proposals recommended during the mid-'50's drought for consideration by southeastern states should be mentioned: (a) an extension of eminent domain powers to permit broader use of surface waters by non-riparians or greater security for riparian rights; and (b) an extension of the reasonable use doctrine, along lines suggested by the Restatement of Torts, to sanction any reasonable water uses for riparian or non-riparian purposes, and to make riparian rights freely transferable to non-riparian owners.*

Diffused Surface Water

Most of the eastern states which have actually enacted legislation concerning the use of diffused surface waters have elected to confirm the common law rule of absolute ownership. That is, they have provided by statute that

*Marquis, Freeman and Heath, "The Movement for New Water Rights Laws in the Tennessee Valley States." 23 Tenn. L. Rev. 797, 833 (April 1955).

the owner of land on which such water flows or falls has the unrestricted right to its use. (Arkansas, Indiana, Iowa, Kentucky, Virginia.*).

While these enactments have largely favored the absolute ownership rule, some recent proposals lean toward other solutions. The Model Water Use Act prohibits the impounding or collection of diffused surface waters in substantial quantities without securing a permit from the State. In explanation of this provision, the comments accompanying the Model Act state:

In order to secure intelligent management of the uses of the waters of the state and to avoid interference with these uses when made in accordance with the Act, it is necessary for the Commission to have power over all water resources which reasonably could cause interference with uses sanctioned by the Act. This section recognizes the scientifically established fact that all waters whether above, upon, or beneath the earth are part of one hydrological cycle and that an interference with one phase of the cycle affects other phases.**

(Notwithstanding the literal terms of the Model Act, its principal author has been quoted as saying that it was not intended to apply to farm ponds but only to large uses of water.***).

*The Iowa and Virginia statutes are slightly ambiguous, leaving some room for argument that diffused waters would be subject to regulation in certain circumstances. On balance, though, it seems that absolute ownership is the more likely interpretation. The Mississippi legislation contains some similar ambiguities. A Georgia statute is subject to the interpretation that it codifies the rule of absolute ownership.

**Handbook of the National Conference of Commissioners on Uniform State Laws (1958). Page 204.

***William L. Dolson, "Diffused Surface Water and Riparian Rights: Legal Doctrines in Conflict." Wisconsin L. Rev., Winter 1966, pp. 58, 113-ftn. 231.

Other commentators have suggested that riparian rights and rights to use diffused surface waters ought to be correlated by allowing landowners to make only reasonable uses of diffused waters while on their land. Suggestions to this effect were made over 20 years ago by Hutchins and the Natural Resources Planning Board. More recently Professor William Dolson has also advocated this point of view, at least as to large surface water users. (Exemption of small uses from regulation is almost universally accepted by the proponents of new legislation concerning diffused surface waters.*

The Cornell University Water Resources Center, principal consultant of the Temporary State Commission on Water Resources Planning in New York, has intimated that it would probably favor prohibiting harmful and unreasonable interferences with surface waters which would normally feed a stream. However, the Center intends to study the law as to the use of surface water more extensively before making definitive recommendations in the area.**

In summary, two divergent points should be re-emphasized. First, the existing legislation concerning use of diffused surface water almost without exception codifies the common law rule of absolute ownership. Second, nonetheless, most of the recent published expressions of experts and advisory groups appears to favor statutory modification of

*The entire subject of diffused surface waters and suggested regulation thereof is thoroughly reviewed by Dolson in a 1966 law review article. See preceding footnote.

**Temporary State Commission on Water Resources Planning (New York), Water Resources Management--a 6-Year Review of Progress and Proposals (N.Y. Leg. Doc. No. 27, 1965). Pp. 243-249.

the common law doctrine--either by subjecting it to a rule of reason or by making diffused waters subject to permit-type regulation with exemption of small uses.

CONSTITUTIONAL PROBLEMS

Any substantial change in water law brought about by new legislation will inevitably affect existing water rights in some fashion. And since a water right is generally considered to be a form of property right, if new legislation adversely affects water rights without providing for compensating the owners for their losses, a constitutional question may be raised. In legal terms the issue can be stated most simply in this way: would the legislation represent a valid exercise of the police power, or would it amount to a taking of private property without compensation, in violation of the Federal and State constitutions?

In capsule form, this is the principal constitutional question that is likely to be raised by new water use legislation in North Carolina or, indeed, in any state. That the question can become meaningful is made clear by the fact that several state laws have been held invalid by state courts under this constitutional test.

It would be premature to elaborate now on potential constitutional problems of water use legislation, since the form of any legislative proposals for North Carolina has not yet crystallized. If a proposal is developed which seems to raise serious constitutional questions, however, it may be desirable at a later date to analyze the constitutional implications.

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Legislation

Note: A complete list of citations to the statutes of Eastern states reviewed in this chapter is contained in an enlarged version of this chapter published separately by the Institute of Government. See Milton S. Heath, Jr., "Contemporary Eastern Water Rights Regulation" (U.N.C. Water Resource Paper #17. 1966.)

CHAPTER 4POSSIBLE COURSES OF ACTION

In this final chapter we summarize those findings that bear directly on the task of recommending new legislation--relating to the status of present legislation in North Carolina; the need for further regulation; and the options available to North Carolina. While the primary emphasis is on water use regulation, our studies and findings have broader implications. The complete package of possible recommendations, as we now conceive it, could include at least the following topics:

- Water use regulation
- Related structural and land use regulation
- Policy statements and other non-regulatory approaches
- Data collection and other water management tools
- Water development programs

Each of these topics will be taken into account in the discussions that follow.

First we turn to a review of existing law in North Carolina.

EXISTING LEGISLATIONWater Use Regulation

The existing regulatory powers of State water resource agencies in North Carolina include principally a general rule-making power in the Board of Water Resources, emergency powers of the Board, and the authority of the

State Stream Sanitation Committee to regulate ground and surface water quality.

Under its general rule-making powers the Board of Water Resources may "adopt such rules and regulations as may be necessary to carry out the purposes of the Department of Water Resources Act". (GS 143-354 (a)(8)). This does not in itself authorize the Board to regulate water usage. It has been suggested, though, that some form of water use regulation might be legally justified by reading this provision in conjunction with the preamble sections of the Act. (GS 143-351 declares that the public interest requires that the water resources of the State be put to beneficial use to the fullest extent possible. GS 143-352 states in a very general way that one of the functions of the Department is to devise "plans and policies . . . necessary for a more beneficial use of the water resources of the State".) The argument resting regulatory powers on these provisions does not provide a firm basis for regulation.

Prior to 1961 there was on the statute books of North Carolina an irrigation permit law. Under this legislation persons desiring to irrigate from lakes or streams in substantial amounts were required to file with the Department an irrigation plan and survey and to secure a permit for irrigation. The legal effect of this law was not clear. On one interpretation, it had no teeth to enable the Department to control excessive irrigation. On another interpretation, the law was enforceable but its constitutionality was in doubt. Because of these ambiguities and difficulties of administration, the irrigation permit law was repealed in 1961.

In one very limited area the Board of Water Resources has some potential administrative control over

agricultural water use. Under the State's small watershed enabling law the Board must pass upon small watershed work plans. Its approval of work plans is made contingent upon a finding that the contemplated works "will not appreciably diminish the flow of useful water that would otherwise be available to existing downstream water users during critical periods." (GS 139-35(c)). Since the proportion of irrigation originating from these sources is probably negligible, this branch of the Board's powers has little present significance.

One aspect of the riparian rights doctrine is the proscription that water users may not divert for artificial uses all or a significant part of the flow of a stream to the injury of another water user. The North Carolina General Assembly has added its gloss to this restriction with a series of legislative riders attached to water resource legislation since 1959. Several of these riders simply state that enabling laws (such as the small watershed law) are not to be construed as authorizing diversion of water from one basin or watershed to another. One more recent rider, attached to an enabling law for joint city and county water or sewer services, specifically prohibits diversion of water from any major river basin which flows into other states below the point of diversion. (GS 153-293.)

In addition to its general rule-making powers and its limited control of farm irrigation from small watershed works, the Board of Water Resources has regulatory authority over water use in one other area--local public water emergencies. Upon request by city or county authorities and after an investigation by the Board, the Governor may declare a water emergency in a locality where the needs of human consumption, sanitation and public safety demand such a declaration. When an emergency has been declared the Board may

authorize diversions for these limited purposes of human consumption, sanitation and public safety and may regulate the use of such diverted water in the emergency area. A mechanism is provided for compensating those damaged by the diversions. (GS 143-354(b)-(e)).

Finally, the State Stream Sanitation Committee is empowered to regulate both surface and ground water quality under the Stream Sanitation Law (GS Ch. 143, Art. 21). This entails a procedure of classifying water sources by major areas such as river basins, applying standards of water quality within the classified areas, and requiring polluters to treat their effluents so as to bring the receiving waters up to the established standards and classifications. Experience indicates that a lead-time of several years is required for completing the process of classification and abatement within any major water source area. Although the Stream Sanitation Committee has completed its classifications and pollution abatement plans for the State's surface waters, it has not exercised its powers with regard to ground water and presumably would have to develop a new staff and program in order to do so.

The State Board of Health also has some powers and programs under GS Chapter 130 affecting water quality management, which are primarily concerned with the protection of sources of domestic water supply.

* * * * *

Subject to the limited controls described in the preceding paragraphs, water use in North Carolina is governed by common law doctrines evolved by the State's courts-- riparian rights in streams; overlying rights in ground water; and rights of ownership in diffused surface waters. These concepts are described in detail in Appendix D.

Other Matters

In the other areas under consideration here, existing legislation and programs can be treated much more briefly.

(1) As to structural and land use regulation, two matters are of special interest here: dam-safety laws and floodway encroachment laws. About 30 states have adopted laws providing for licensing or inspection of dams to ensure safe design, construction and operation. Eleven states have enacted laws regulating encroachments on stream channels or flood plains.

North Carolina has substantially no legislation in either category.

Generally speaking, dams constructed or financed or licensed by Federal agencies within the State (such as TVA, SCS, FPC or the Corps of Engineers), are designed and inspected under established safety standards. To a limited extent some State agencies inspect dams or review their design and, in the process, may have occasion to consider safety factors (SDWR review of small watershed plans; State Board of Health inspection of municipal impoundments). With these exceptions, however, no routine safety standards are applied to dam design and construction in the State.

There is no State law or program that controls floodway or flood channel encroachments in North Carolina. In some places this problem may be reached by Federal action, as in the TVA area, or under municipal or county zoning programs. Coastal areas of the State are covered by legislation providing for protection of barrier sand dunes, which was strengthened by the 1965 General Assembly. But these scattered instances of Federal or local attention leave most of the State unprotected in this regard.

(2) As to legislated water use policies, a brief explanation of the relationship between law and policy may be helpful at the outset.

Law and policy are almost indistinguishable terms. Many statutory enactments begin with a statement of policy. When this is not done the law itself is likely to constitute policy. A corporation, an individual, or a government agency may have policies to guide their actions. These do not have the force of law, but may sometimes have an equivalent effect. In short, law may be policy but policy is not necessarily law. It appears desirable for the State to include, as part of legislation, broad expressions of policy for guidelines on which governmental agencies and people may shape their actions, as expressions of goals, and intents such that a course is set for amplifying statutes when they are needed. These policies could possibly have an effect on judicial thinking in disputes that arise.

Existing North Carolina policy is expressed by combining and editing portions of Chapter 139-2, 143-211, and 143-351 G.S. as follows:

It is hereby declared that the general welfare and public interest require that the water resources of the State shall be prudently utilized in the best interest of the people and put to beneficial use to the fullest practicable extent. The State assumes responsibility for the quality of water resources.

It is also declared policy to provide for the prevention of floodwater and sediment damages, and for furthering the conservation, utilization, and disposal of water, and the development of water resources and thereby to preserve natural resources, control floods, prevent impairment of dams and reservoirs, assist in maintaining the navigability of rivers and harbors, protect the tax base, protect public lands, and protect and promote the health, safety and general welfare of the people of the State.

(3) As to water management tools (such as data collection) and water development programs, the legislative element is minimal. Existing programs and possible further steps are summarized under the heading which follows.

OPTIONS AVAILABLE TO NORTH CAROLINA

AND

THE NEED FOR FURTHER REGULATION

Previously we have reviewed the actions taken by other states in regulating water usage, and we have examined the factual case for further regulation in North Carolina. Our detailed findings on these subjects are contained largely in Chapters 2 and 3.

At this point we would like to assemble and condense these findings, which go the heart of this study. This will serve in part to clarify and focus our own thinking. It will also lay the basis and provide a starting point for the public hearings to follow and for the subsequent recommendations.

Available Options

Our point of beginning is the chart on page 103 "Optional Courses of Action."

In this chart we have pulled together the principal options reviewed in earlier chapters. Five categories of possible action are involved:

Water use regulation
Structural and land use regulation
Policy statements and related non-regulatory
approaches
Data collection and other water management
tools
Water development programs

Some of the options embody previous recommendations of the Board of Water Resources. Others are new. Whether new or old, however, no final decision has been reached to include or exclude any one or more of these items in our recommendations to the 1967 General Assembly. Even in those cases where the Board is already on record as favoring action, questions of priorities and timing (if nothing more) remain to be considered.

Findings Concerning Further Regulation

While we have not yet formulated our final recommendations the factual findings of earlier chapters of this report represent an important first step toward such recommendations. On the one hand these findings are intended to serve as justification for whatever action is taken. On the other hand, we anticipate making no recommendations which do not find support in these or later findings.

It is therefore appropriate to conclude this report with a resume of the findings previously set forth concerning the need for further regulation of water usage in North Carolina.

OPTIONAL COURSES OF ACTION

I. Water Use Regulation

- (1) Prior appropriation
- (2) General permit system for surface and/or ground water
- (3) Permit system for problem areas
- (4) Machinery to authorize diversions for water-short areas
- (5) Salt water intrusion controls
- (6) Other controls over rights to use water:
 - (a) Clarification of rights to use diffused surface water (confirmation of absolute ownership rule, adoption of a reasonable use rule, or some intermediate step)
 - (b) Regulation of impoundment levels and releases
 - (c) Clarification of rights of beneficial owners of reservoirs to control downstream use of released water
 - (d) Prohibit injunctions against harmless withdrawals
 - (e) Control uses of one category of water affecting another (e.g., well affecting nearby stream)
 - (f) SDWR controls over drainage projects analogous to present controls over small watershed projects--e.g., to protect ground water recharge and/or fish-wildlife
 - (g) SDWR approval of water rights acquisition for public water supplies
 - (h) Controls on artesian well waste
 - (i) Any other regulations needed to protect particular interests
- (7) Extension of eminent domain powers and/or reasonable use doctrine

II. Structural and Land Use Regulation

- (1) Reservoir site reservation
- (2) Dam safety licensing and inspection
- (3) Floodway regulations (State) and flood plain zoning (local)
- (4) Well construction standards

III. Policy Statements and Related Non-regulatory Approaches

- (1) Adoption of policy statements concerning various matters, such as:
 - (a) Rights to use diffused surface waters
 - (b) Interdependence of hydro-logic cycle
 - (c) Water resource control and use as a matter of statewide concern
 - (d) Interbasin transfers
- (2) Voluntary mediation services by SDWR and referral of water policy issues to SDWR
- (3) Payments to State for water withdrawals
- (4) Watchdog legislative committee
- (5) Special treatment for favored industry regarding water use, etc.
- (6) Sale of project water shares
- (7) Surplus water planning

IV. Data Collection and other Water Management Tools

- (1) Improved topographic mapping
- (2) Better data collection in areas of special need (e.g., irrigation water use--possibly through County Extension Chairmen and SCS Unit Conservationists)
- (3) Finance a strong Water Resources Research Institute
- (4) Finance adequate staff for N. C. water plan

V. Water Development Programs

- (1) State participation in recreational development of Federal reservoirs
- (2) State participation in municipal water supply development
- (3) Additional State participation in P.L. 566 projects

We will not attempt here to pursue methodically every implication of each factual finding for all of the options spelled out on page 103. This we will leave to the enterprising reader. For the time being we seek only to identify and explore some of the more obvious implications.

Surface streams.--The findings of Chapter 2 concerning surface waters highlight a recurring problem of a number of areas scattered throughout the State: centers of growing population and industry located near headwaters of streams are beginning to exert pressures on regional water resources which cannot be met solely by the water quality regulations now practiced in North Carolina. Danger signals are already visible in some locations. Their message is that even a very high degree of treatment of sewage and industrial waste may not long provide a reasonable margin for further economic growth in these areas.

These facts indicate a need for greater attention to the quantity side of water, paralleling existing State programs of water quality management. Broadly speaking we have found that two potential avenues of attack should be explored: some form of regulation of water withdrawals, and development projects to augment and improve stream flows. More specifically, it would be consistent with our findings concerning surface waters in Chapter 2 to consider any or all of the following courses of action:

- *Regulation of withdrawals from streams which might materially affect stream flows in upstream reaches or other water-short areas
- *Regulation of reservoir levels and releases from reservoirs
- *Low flow augmentation by construction of impoundments or by diversion from areas of surplus

*In conjunction with stream flow augmentation projects; legislation may be needed to ensure that the benefits of augmentation accrue to those who finance the projects (e.g., by controls over downstream withdrawals of water released from reservoirs to augment flows)

In appraising these possibilities, we would of course view them in the light of possible technological developments in waste water treatment which could affect the need for other forms of action.

Diffused surface waters.--No detailed factual findings are made in this report concerning the need for controlling the use of diffused surface waters. At several points, however, we have referred to the interdependency of the hydrological cycle in all of its phases, and we have pointed out the possible effects of storing and using diffused waters on related ground water and surface water sources. While the implications for legislative action may not be as plain here as in the case of surface streams, it would be consistent with our findings to seek some legislative clarification of rights to use diffused waters. This might involve legislation having the effect of law, or the lesser step of a legislated policy statement.

Ground waters.--The factual findings of this report concerning ground water usage point up some potentially adverse consequences of overuse or misuse of ground water resources and related surface water resources. The problems we have encountered have been confined mainly to the Coastal Plains Region--the area of most intensive and extensive ground water development in North Carolina. Our findings as set forth in Chapter 2 indicate recurring or potentially widespread problems of the following types:

- *Salt water contamination of aquifers and/or lowering of water levels or artesian pressure in wells, as a result of heavy pumping by large water users
- *Occasional contamination of aquifers by vertical leakage through wells that tap contaminated deeper aquifers of higher pressure
- *Potential reduction of ground water supplies through reduced recharge caused by large scale agricultural drainage projects, combined with increasing development and use of the aquifers
- *Interception of natural discharge of ground water into streams by large withdrawals from nearby wells, with significant reduction of stream flows.

The principal implication of these findings is to suggest the need for exploring some form of new regulatory legislation. Several of the options listed on page 105 are obviously eligible for consideration--a general permit system; problem-area permits; salt water intrusion controls; and controls over drainage projects to protect ground water recharge.

Land use and structural controls.--Although this report makes no detailed examination of the need for land use and structural controls, the subject was carefully studied in an earlier Departmental publication: Flood Damage Prevention in North Carolina. On the basis of the earlier study, the Board of Water Resources has already indicated interest in a comprehensive program of flood damage prevention. Key elements of this proposed program include (a) enactment of a State floodway encroachment law and (b) a State law providing for licensing of new dams and inspection of new and old dams in the public interest to ensure safe design, construction and operation of dams.

Data collection and related matters.--A moment's reflection will show the need for adequate data collection, research and staffing in support of water management and regulation programs. There are several critical gaps in these areas that have been repeatedly emphasized in this report as well as earlier studies.

Foremost among long unmet needs is the provision and maintenance of adequate topographic mapping coverage for the State. Large areas of the State, especially in the growing Piedmont region, are today inadequately--even pitifully--mapped. Until this deficiency is remedied, fully effective water management and regulation cannot be achieved. Any regulatory controls adopted in North Carolina--whether of water usage, of structures, or of land use--must be accompanied by an upgrading of our topographic maps.

Another essential service to accompany water use regulation is improved data concerning water usage. An area of glaring deficiency is irrigation water use. Here it may be hoped that a cooperative arrangement could be made involving the services of farm agencies already in the field, such as the local outposts of the Extension Service and the Soil Conservation Service.

Any substantial new programs of management or regulation will demand additional staffing to supplement the already overextended forces of the Department of Water Resources and Stream Sanitation Committee. Estimates of additional staff needs will accompany any recommendations of the Department pursuant to this study.

Finally, the State cannot hope to mount any significant new programs of regulation and management without an underpinning of a substantial and continuing research

effort. Currently, the greatest opportunities in this direction appear to lie in strengthening the Water Resources Research Institute of the University of North Carolina.

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Appendix B	-	Thomas G. Harton and W. S. Johnson, Jr.
Appendix C	-	Thomas G. Harton, Herbert Eagon, U. S. Army Corps of Engineers, and Milton S. Heath, Jr.
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Appendix E	-	David H. Howells, N. C. Water Resources Research Institute, Milton S. Heath, Jr., and Thomas G. Harton
Appendix F	-	Ray M. Clary and Julian R. Taylor, and Harry Peek with assistance of USGS
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