NEWS

WATER RESOURCES RESEARCH INSTITUTE

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CONTENTS

NORTH CAROLINA WATER RESOURCE FRAMEWORK STUDY

A framework study designed to serve as a guideline for State water resources planning is currently being prepared by the N. C. Department of Natural and Economic Resources. The study, which examines needs, problems, and opportunities involved in water use on a State-wide basis, represents the initial step toward a fully developed State Water Plan.

Designed as an aid in decision-making, the Framework Study first consolidates State legal and administrative policies affecting management of water resources into an overall, consistent water resources planning policy for the State. This policy, which has been reviewed by State, local and Federal agencies, will eventually be considered for adoption by the State as the official guideline for State water resources development.

In addition, the study contains a comprehensive analysis of the current water resources situation in North Carolina including consideration of such factors as State population and economy, hydrology and climatology, water supply in urban and rural areas, relation of water resources to future electrical generating sites, water quality, flood management, drainage and soil erosion throughout the State, and the relation of wildlife resources, environmental quality, forestry, water-based recreation and cultural resources to specific water resources projects.

The Framework Study also contains a "blueprint for action" in which sets of alternatives are considered for various geographical areas across the State. For each area, three alternative frameworks are presented. The first framework contains projects which will promote economic development, while the second includes proposals for the enhancement of environmental conditions. The third framework contains a mix of economic development and environmental quality features found in the first two frameworks. One of the bases for selecting a component of this latter mixed objective framework is its effect upon social well being. In addition to proposing specific future alternatives and projects, the Framework Study also contains a 1976 priority list, in which projects are prioritized on a categorical basis. New priority lists will be prepared for 1977, 1978, and succeeding years.

Policies and priorities established in the Framework Study will eventually serve as the basis for the development of a more detailed water plan. Consisting of a series of basin plans and related subject chapters, the detailed plan will present specific options and alternatives for water resources and related land use planning. Scheduled to be started at the beginning of the 1977 fiscal year, the State Water Plan will be open to review and participation by all individuals and groups interested in water resources development.

. . . *John D. Wray, Acting Chief*
Water Resources Planning Section
Division of Resource Planning & Evaluation, NCDNER

NATIONAL COMMISSION ON WATER QUALITY REPORT

The National Commission on Water Quality has submitted its report to the Congress. Since the recommendations are expected to result in amendments to the Federal Water Pollution Control Act, they are reproduced in full for the benefit of *News* readers.

RECOMMENDATIONS (SUMMARY)

THE 1977 REQUIREMENTS

I. *The Commission recommends that*

A. Congress authorize granting extensions of time to municipal, industrial and agricultural discharges to meet the 1977 requirements on a case-by-case basis where:

1. The discharger can demonstrate reasonable progress toward compliance with the July 1, 1977 deadline; or
2. Lack of Federal construction grant funds has caused delay; or
3. The discharge can demonstrate other good and sufficient cause;

Provided that in no case shall such extensions of time extend beyond (a specified date such as September 30, 1980) or until the cause for delay has been removed.

B. Congress authorize waiving, deferral or modification of the 1977 requirements on a case-by-case basis where the discharger demonstrates to the satisfaction of the Administrator (or a state administrator where a state has been certified) that adverse environmental impacts of such action will be minimal or nonexistent, or that the capital or operation and maintenance costs are disproportionate to projected environmental gains.

C. Congress authorize waiving, deferral, or modification of the 1977 requirements on a category-by-category basis for near shore ocean discharges of publicly owned treatment works, pretreatment requirements, existing publicly owned oxidation ponds and lagoons, and de minimus situations where the Administrator determines that the adverse environmental impacts of such action will be minimal or nonexistent, or that the capital or operating and maintenance costs are disproportionate to projected environmental gains.

THE 1983 GOAL AND REQUIREMENTS

II. *The Commission recommends that*

A. Congress retain the national goal, ". . . that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983;"

B. Congress postpone the deadline by which municipal, agricultural and industrial discharges shall be required to meet the 1983 requirements from July 1, 1983 to (a date not less than five and no more than ten years after 1983) provided the following interim actions are assured:

1. Effluent limitations for 1977 are reviewed periodically and revised, if appropriate, to reflect advances in practicable control technology;
2. Periodically review and aggressively enforce higher levels of treatment than required by the 1977 effluent limitations where the 1977 requirements will not achieve Federally approved state water quality standards and where more stringent limitations will significally help in achieving water quality standards;
3. Review and alter new source performance standards periodically as technology is perfected to ensure a high level of control or treatment of new pollutant sources;

4. a. Where possible, toxic pollutants in toxic concentrations shall be controlled in applicable effluent limitations and permits;

   b. Effluent limitations based on technology to eliminate the discharge of toxic pollutants in toxic concentrations into the nation's waters shall be implemented as soon as possible but no later than October 1, 1980;

5. a. Apply control or treatment measures to combined storm and sanitary sewer flows and to urban stormwater flows when these measures are cost effective and will significantly help in achieving water quality standards;

   b. Control or treatment measures shall be applied to agricultural and nonpoint discharges when these measures are cost effective and will significantly help in achieving water quality standards. For these measures, Congress should utilize the capabilities of existing institutions and their resources, and may wish to consider additional Federal resources to carry out the necessary programs;

6. An on-going national assessment of the quality of the nation's waters shall be undertaken to determine progress toward water quality goals and objectives, and the progress periodically reported to the Congress; and

7. No later than 1985 a Commission similar to the National Commission on Water Quality shall evaluate progress toward these goals and make appropriate recommendations, at which time Congress may consider whether uniform application of more stringent effluent limitations than the 1977 requirements is justified and desirable.

DECENTRALIZATION

III. *The Commission recommends that*

Congress authorize certification, upon application, to any state to exercise full authority and responsibility for planning, and for administration of the discharge permit and construction grant programs, provided:

A. A statewide water quality plan and program is approved at the time of certification.

B. The state demonstrates

   1. It has the appropriate statutory authority and directions, manpower and appropriations, administrative or judicial penalties and remedies; and

   2. It meets such other qualifications as the Congress may determine necessary to perform such functions.

C. That certification be for a period of five or more years renewable after that based on progress toward improved water quality, and that the state agrees the certification may be withdrawn, after public hearing on a showing of unsatisfactory progress, but that such certification shall continue in force unless and until it is withdrawn by the Administrator.

As the certification process proceeds, the Federal role in the national water quality program should be that of formulation of criteria review and approval of state programs, allocation of Federal resources, research and development and technical assistance, review of state progress and performance and more detailed supervision of those functions not certified to the states.

FEDERAL FINANCIAL ASSISTANCE

IV. *The Commission recommends that*

Congress provide stability for the program of Federal grants for the construction of publicly owned control or treatment works by authorizing and indicating its intent to fund the program at (not less than $5 billion nor more than $10 billion per year) for a fixed term of years (not less than five nor more than ten) at 75 percent of the cost of construction, provided that:

A. Priorities for the award of grants for eligible publicly owned treatment works within a state shall be established by the state provided that the ordering of priorities shall be based upon cost effectiveness and upon the ability of a project to contribute substantially toward the "goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water."

B. In pursuit of the objective of ultimate self-sufficiency for the construction, operation and maintenance of publicly owned treatment works, the Congress reexamine the rationale and the actual performance to date of the user charge, industrial cost recovery, and pretreatment provisions in the Act.

ELIMINATION OF THE DISCHARGE OF POLLUTANTS AND RESEARCH AND DEVELOPMENT NEEDS

V. *The Commission recommends that*

A. The Congress redefine the goal of the elimination of discharge of pollutants by 1985 to stress conservation and reuse of resources while striving to achieve the objective of restoring and maintaining ". . . the chemical, physical, and biological integrity of the Nation's waters."

B. The Congress re-enforce the mandate and provide adequate financing to accelerate research directed toward the development and demonstration of promising techniques for recycling, reuse, land application, and other resource-conserving options for waste management, and that the Congress further encourage:

1. Increasing efforts by industry, agriculture and the public sector, directed toward the development, refinement and application of sound control technologies and treatment options that conserve and reuse water, resources of the production process, and water-borne nutrients in human and animal waste;

2. Intensified research focused on the development and applications of more efficient and cost effective alternatives for the control and treatment of separate and combined sewer overflows; and

3. Appropriate use of the resulting waste managment techniques, through an Environmental Protection Agency - sponsored technical assistance program, to advise communities, industries and agricultural discharges on the availability and adaptability of cost effective and environmentally sound treatment options to meet the needs of these dischargers.

C. The Congress should encourage accelerated research on the identification and measurement of toxic pollutants and their effects, sources of toxic pollutants in the environment and the nation's waters, the fate of toxic pollutants in the aquatic environment and their impacts upon organisms and upon human health, and the identification of sound control technologies for the elimination of toxic pollutants.

D. Expanded efforts on the collection, evaluation and utilization of data on pollutant discharges and permit compliance, and their relationship to the measurement of improvements in water quality should be initiated at once.

E. Congress should vest leadership for the above recommended research and development programs with the Environmental Protection Agency, while encouraging such research at other levels of government and within the private sector.

IRRIGATED AGRICULTURE

VI. *The Commission recommends that*

A. The Congress recognize the variations in the physical, hydrological, institutional and economic characteristics of irrigated agricultural activities and authorize flexibility in the application of control or treatment requirements in this category of discharge, including dischargers from monitoring and permit requirements, provided that:

1. a. An assessment of the irrigated territory of the United States be prepared identifying and classifying by basin and sub-basin and severity of pollution problems, areas where the practice of irrigated agriculture alone or in conjunction with natural conditions and other consumptive water uses may impact water quality through changes in salinity, sediment, nutrient or pesticide concentrations or through other deleterious effects; and

   b. Physical, hydrologic, economic and institutional criteria for exemption from permitting and monitoring requirements are developed; or

2. The water quality plan and program of a state, as well as areawide waste management plans, contain an acceptable strategy for mitigating the effects of irrigated agricultural discharges including a program for permitting and monitoring, as necessary, to achieve and maintain the water quality standards in a state or basin.

B. Congress explore and, where appropriate, support salinity alleviation projects to control or reduce naturally contributed salts to the nation's waters.

GENERAL ACCOUNTING OFFICE CONSIDERS NATIONAL COMMISSION AUDIT

Congressman John D. Dingell has asked the General Accounting Office (GAO) to study the way in which the National Water Commission on Water Quality report to Congress was developed. The GAO has been asked to evaluate the quality of work and any potential conflicts by outside contractors used by the commission in preparing its report. The GAO has been asked to report on internal control procedures used by the Commission to audit the contractor's work.

OWRT AWARDS FOUR MATCHING GRANTS TO NORTH CAROLINA

The Office of Water Research and Technology and the Institute will support four new matching grants. The following projects have been approved:

State Water Resource Planning and Policy

Existing state water resource planning and policy development in North Carolina and most other states are seriously inadequate to meet current and emerging needs. Water quality planning and policy are not integrated with overall water resource planning and policy; furthermore, water resource planning and land use policy and planning are not integrated; and the role of the state vis-a-vis local jurisdictions in water resource planning is ambiguous and subject to arbitrary changes imposed by federal agencies.

The approach to solution lies in remedial actions by the federal government and the states, specifically North Carolina in this case, (1) to achieve integration of water quality planning and overall water resource planning at the national level, (2) to develop a coherent and consistent national approach for promoting integrated state water resource and land use planning and policy development, and (3) to develop a comprehensive state strategy for water resource and land use planning and policy development appropriate to the state's problems and needs, consistent with federal policies and guidelines.

This research should help to solve the problem (1) by providing to the federal government and to North Carolina and other states specific and detailed information and analysis on the current and emerging water resources and land use planning and policy scene as it relates to the role and responsibilities of state government, and (2) by providing to the State of North Carolina (and to other South Atlantic states) specific strategy guidance on how its water resource and land use planning and policy organization and activities could be changed to meet the needs of the state.

Principal Investigator: Dr. Maynard M. Hufschmidt, Department of City and Regional Planning, University of North Carolina at Chapel Hill.

Starting Date: July 1, 1976 *Completion Date:* June 30, 1978

Effects of Large-Scale Agricultural Land Development on Water Resources

Large farming corporations are currently draining and developing huge areas of wetlands and organic soils in the North Carolina Tidewater Region for agricultural production. Legitimate concern has been expressed by the public and by various state and federal agencies about the effects of such massive land changes on the environment. Primary concern has been directed at the effect of agricultural development on the quality and quantity of drainage water entering the receiving streams and estuaries. Presently there is insufficient information available to evaluate these effects. Thus, it is not possible to assess the environmental impact of agricultural development nor to make wise decisions about the long-term management of these land and water resources.

Objectives of the project include the continuous measurement of outflows and sampling for water quality on three paired sites (six sites) on First Colony Farms. The sites are paired such that each pair consists of a developed area and an adjacent undeveloped area with similar soils and drainage conditions. Drainage water will be analyzed to determine the effects of land development on water quality parameters, including selected herbicides and insecticides, the seasonal variation of these effects, and the total nutrient and sediment load leaving the area. The study will also determine the potential for polluting estuarine ecosystems from pesticides used in intensive crop production in the Tidewater Region. Hydrologic analyses of selected rainfall events are to be conducted so that the measured effects of land development on total and peak rates of runoff can be extrapolated for other rainfall intensities and durations. A final objective of the study is to determine the effects of land development on water table elevations, seepage to underlying aquifers, and soil subsidence and the variation of these effects over time.

Principal Investigators: Dr. R. W. Skaggs, Department of Biological and Agricultural Engineering; Dr. J. W. Gilliam, Department of Soil Science; and Dr. T. J. Sheets, Department of Entomology, North Carolina State University.

Starting Date: July 1, 1976 *Completion Date:* June 30, 1979

Land Application of Industrial Wastes

The Federal Water Pollution Control Act places a new emphasis on reclamation and recycling of wastewater through agricultural, silvicultural, and aquacultural production. Land application of wastewater must be included in the review of alternative waste treatment techniques. This alternative is not receiving the attention intended by Congress because industries, consulting engineers, and regulating agencies are not sufficiently familiar with land treatment and tradeoffs with pretreatment to effectively consider the pretreatment land system as an alternative to advanced waste treatment.

In this study a number of industrial waste categories will be evaluated to assess requisite designs and approximate costs of total systems having land as a terminal receiver. It will facilitate consideration of land treatment of industrial wastewater in conjunction with varying degrees of pretreatment through development of a technical and economic screening process as a first step in the analysis of alternatives.

Principal Investigators: Dr. Michael R. Overcash and Dr. Philip W. Westerman, Department of Biological and Agricultural Engineering, North Carolina State University.

Starting Date: July 1, 1976 *Completion Date:* June 30, 1978

Wastewater Spray Transport in Land Application

Large-scale wastewater treatment and disposal by land application is expected to be utilized more frequently by communities in North Carolina as the availability of streams with sufficient self recovery capacity decreases or existing stream capacity is exceeded. At present, the only U.S. design criteria applicable to viable aerosol control from spray irrigation facilities are based on relatively conservative criteria developed by the U.S. Army. Adherence to all of the Army criteria will require costly installations and some design compromises. Buffer zones require additional land purchases with the possibility of the only alternative being a more remote site with increased transport pumping costs. Spraying only during daytime and low humidity conditions requires large holding ponds for wastewater accumulation during nighttime and wet weather. Not all of the current criteria are based on appropriate and definite field data so that some of the criteria may be unnecessary or ineffective.

This research will study the movement of aerosol particles from spray sites and the viability of organisms in the aerosols to provide the types of information necessary to develop such regulatory criteria as minimum degree of pretreatment, need for chlorination, operating conditions, and irrigation design.

Principal Investigator: Dr. Parker C. Reist, Department of Environmental Sciences and Engineering, University of North Carolina at Chapel Hill

Starting Date: July 1, 1976 *Completion Date:* June 30, 1979

COURT SAYS UNSPENT EPA GRANT MONEY MUST BE RELEASED

The U.S. District Court for the District of Columbia ruled May 17 that EPA must release unobligated funds of approximately $136 million from 1973 and 1974 authorized funding of 208 areawide waste treatment management planning. The court order said that these funds must remain available until September 30, 1977.

According to the courts, EPA's own tardiness and inaccuracy in promulgating the funding and planning regulations kept the funds from being obligated.

The court order says that the balance of the money will be available until the end of September at the rate of 100 percent of reasonable costs of developing an initial area-wide waste treatment management plan.

EPA AWARDS RESEARCH CONTRACTS ON LAND APPLICATION OF WASTEWATER

The U.S. Environmental Protection Agency has awarded more than $1.8 million for four research contracts to study long-term effects of applying municipal wastewater to land areas. The results of this study will be used, among other things, to determine the feasibility of utilizing this wastewater-treated land for growing crops suitable for human consumption.

Daniel J. Snyder, III, EPA Regional Administrator said that the study deals only with the land application of sewage effluent, rather than sludge. Effluent is the wastewater remaining after sewage has gone through some preliminary treatment, while sludge is the residue of material removed by the treatment.

"We feel that this land disposal method of sewage treatment, in which wastewater is further purified by downward movement from the surface through open spaces in the soil (percolation), is often an effective alternative to the conventional processes where the effluent from treatment works is discharged into rivers, lakes and other waterways," Snyder said. "In most cases, the wastewater cleansed by the land treatment operation is of higher quality than that treated by conventional physical, chemical and biological techniques."

For small sewage treatment operations -- those processing less than five million gallons a day -- land application systems usually offer operating and capital costs substantially lower than those for conventional operations. Land purchases for wastewater disposal are eligible for sewage treatment construction grant program assistance.

LIABILITY FOR DAMAGES RESULTING FROM ALTERATION OF SURFACE WATER RUNOFF IN LARGE DEVELOPMENTS

The verdict in a United States District Court case in Pennsylvania focuses attention on alterations in surface water runoff from large developments. The effects may result in severe problems for neighboring landowners.

In the Pennsylvania case a farmer found his land no longer suitable for growing strawberries after it was flooded by the increased flow of surface water from a residential development of approximately 38 homes.

Some interesting facets of the Pennsylvania court case are as follows:

a. The municipality was found liable for not enforcing its own regulations governing runoff from development sites.

b. The engineering firm which reviewed the subdivision plan for the municipality was found liable for approving a plan which did not provide for drainage facilities in conformance with municipal regulations.

c. The construction company was found liable for not providing adequate drainage facilities.

d. The jury awarded damages of $36,130 to the farmer on the basis of the defendants negligence.

. . . *Synopsis: L. S. Raymond, Jr.*

NEW INSTITUTE REPORTS

Report No. 111

<u>Availability of Aluminum Phosphate From Alum-Treated Wastewater for Algal Growth</u>

by

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Department of Environmental Sciences and Engineering
University of North Carolina at Chapel Hill

When phosphorus removal from wastewater is necessary to protect the receiving waters, alum coagulation-precipitation is often the removal method of choice. Typically, alum is added ahead of the final settling tank in a ratio of 1.8 aluminum to 1 phosphorus. At this ratio phosphorus precipitates as an $AlPO_4$ complex associated with coagulated $Al(OH)_n$ species. While most (80-90%) of the phosphorus is removed by settling, some carries over into the effluent. Only 10% of the carryover phosphorus is filterable; therefore 90% is in a particulate form. Previous studies indicated that this particulate phosphorus was not readily available for algal growth. The present investigation explored the availability of this particulate phosphorus in a pure chemical system, an open-channel, mixed-culture system (stream channel study), and a unialgal, batch-culture system (bioassay study).

The results indicate that the amount of alum-flocculated phosphorus which becomes available nutrient is dependent upon pH, concentration, and dilution. As pH was increased the degree of undersaturation with respect to $AlPO_4$ also increased. This effect was greater with the actual, treated wastewater than with synthetically prepared alum-flocculated phosphate. In all cases the concentration of total phosphorus was much greater than that of dissolved phosphorus. However, the amount which does solubilize may still allow excessive algal growth.

The growth of the tests alga, *Selenastrum capricornutum* was not inhibited by Al^{+3}. When the concentration of total phosphorus (in alum-flocculated form) was 0.5 mg/l, growth was equivalent to that with an equivalent concentration as K_2HPO_4. However, when the total phosphorus (as alum-flocculated phosphate was 0.186 mg/l) growth was less than that with an equivalent amount as K_2HPO_4.

Report No. 114

<u>Agricultural Water Demands in North Carolina</u>

by

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Department of Biological and Agricultural Engineering
North Carolina State University

The objectives of this study were three-fold: (1) to determine total water requirements for a given level of agricultural activity in an area; (2) to determine for a given level of water available in a specified area, the optimum level of agricultural activity; and (3) to determine economically feasible irrigation water requirements for each crop grown in an area.

In the humid east, water use for agriculture has, for the most part, been ignored by planners because of the difficulty of obtaining reliable information on present and future agricultural water use. Historically, irrigation water use has been governed by rainfall patterns; however, this appears to be changing somewhat as farmers look more at irrigation as a production tool. To assist in providing more reliable agricultural water use data to planners and to agencies such as the Corps of Engineers and the Soil Conservation Service, a tool with the capability of rapidly analyzing many alternative types and levels of agricultural activity and of comparing results of alternatives considered is needed to make decisions relating water resources and levels of agricultural activity. A logical tool for making such decisions is a computer. A model has been developed to determine water needs under certain known conditions. A description of this model and reports of tests to establish the credibility of the model were included in an earlier document.

EVERETTE KNIGHT NEW DIRECTOR OF THE DIVISION OF ENVIRONMENTAL MANAGEMENT

A veteran state employee has been appointed director of the state Division of Environmental Management. W. Everette Knight, 58, in his twenty-third year with the department, has been named by George W. Little, Secretary of the Department of Natural and Economic Resources, to direct the state environmental regulation programs.

Knight has been acting director of the division since February, 1976. He will direct and enforce programs affecting air and water quality, sedimentation and dam safety. Knight has served in a variety of positions in water and air quality programs since joining the state in 1953.

He was named assistant director in 1973.

He has a B.S. from UNC-Chapel Hill, M.S. from East Carolina University, and is a registered professional engineer.

Knight says the state water pollution control efforts are among the oldest in the nation and are still making smooth and rapid progress.

UNC'S OKUN IS ELECTED FELLOW

Dr. Daniel A. Okun of the University has been elected a Corporate Fellow of the Institute of Water Pollution Control.

Okun is Kenan Professor of Environmental Engineering in the School of Public Health and a member of the National Academy of Engineering.

The Institute of Water Pollution Control was founded in 1901. Members are professionals in the field of water pollution control in the United Kingdom and some foreign countries.

This is the first year an American fellow has been elected. Okun is the only American who has given the Institute's Croll Memorial Lecture.

Former head of the Department of Environmental Sciences and Engineering, Okun joined the faculty in 1952 and served as chairman of the department from 1955-73. He was a visiting professor to University College in London 1973-75.

Okun specializes in water resources engineering and has served as consultant for the World Health Organization. He is a member of the Water Resources Research Institute Board of Directors.

EPA PUBLISHES REPORT ON MOVEMENT, INTERACTION AND FATE OF HEAVY METALS IN SALT MARSH ENVIRONMENTS

The movement, geochemical interactions and fate of mercury, cadmium and other heavy metals in southeastern salt marsh environments have been summarized in a new report by the U.S. Environmental Protection Agency.

Titled "Geochemical Interactions of Heavy Metals in Southeastern Salt Marsh Environments," the 36-page publication presents the findings of a three-year study conducted by the Skidaway Institute of Oceanography for EPA's Corvallis Environmental Research Laboratory.

Major conclusions of the heavy metals study include:

-- Southeastern rivers are similar in their concentrations of dissolved mercury and cadmium. In this regard, heavily-industrialized rivers do not differ from those that are undeveloped, suggesting that metal inputs are not reflected in the water column but are probably evident in sediments.

-- High levels of dissolved and particulate organic matter in rivers can influence the fate of metal pollutants.

-- Industrialized estuaries differ from undeveloped estuaries only in the concentration of heavy metals in bottom sediments.

-- Estuaries act as sinks for iron and manganese. This probably is true for other transition metals as well.

-- The accumulation of mercury in salt marsh sediments may be due to methylation. This results in long-term, localized environmental problems related to accumulation in organisms.

-- Mercury levels in coastal waters vary seasonally due to seasonal atmospheric inputs.

-- The residence time of mercury and cadmium in coastal waters is estimated to be 17 and 3 weeks, respectively.

Single copies of "Geochemical Interactions of Heavy Metals in Southeastern Salt Marsh Environments" are available in limited quantity through the Office of Public Affairs, Corvallis Environmental Research Laboratory, 200 S.W. 35th Street, Corvallis, OR 97330. Ask for report No. EPA-600/3-76-023.

EPA HAS NEW TECHNOLOGY TRANSFER PUBLICATIONS

Land Treatment of Municipal Wastewater Effluents

The publication, entitled "Land Treatment of Municipal Wastewater Effluents," consists of three separate volumes: Design Factors I, Design Factors II, and Case Histories. The Information included in this publication was developed for the Technology Transfer Seminar Series on Land Treatment by Metcalf and Eddy Engineers, Palo Alto, California; CH_2M/Hill, Denver, Colorado; Culp, Wesner, and Culp, El Dorado Hills, California; and Michigan State University.

Logging Roads and Water Quality

This publication was prepared by EPA's Region X, Seattle, Washington, and addresses good and bad management practices pertaining to logging roads. There are over 250,000 miles of logging roads just in the Pacific Northwest and an additional 12,000 miles per year of these roads are being constructed or reconstructed.

Revised Phosphorus Removal Design Manual Available

The Technology Transfer Process Design Manual for Phosphorus Removal, originally prepared by Black and Veatch Consulting Engineers and published in October 1971, has been revised and is now available.

This revision was prepared in order to incorporate information on newly developed and demonstrated techniques and to include subsequent experience gained and data produced on those methods covered in the initial edition of this manual. In addition, a description of an EPA computer model for evaluating 22 alternative phosphorus removal strategies is included as an appendix to the manual. This model reports to the user the total cost of a selected strategy for removing phosphorus. The contractor used in completing this revision was Shimek, Roming, Jacobs and Finklea of Dallas, Texas.

Choosing the Optimum Financial Strategy For Pollution Control Investments

This publication is intended to alert decision makers to the availability of and qualifications for some of the financing incentives from federal, state, and local governments, and to demonstrate that it is well worth spending time analyzing the special methods of financing pollution control expenditures and the available tax treatments. Obtaining optimum financial and tax benefits could save a company tens of thousands of dollars over the life of the equipment.

The publication shows the businessman the type of financial analysis that should be accorded any type of pollution control expenditure in an effort to substantially reduce funds expended and to smooth out what could develop into a case flow trauma. It also contains a discussion of the tax and financing positions of three hypothetical firms with different management goals but with similar capital expenditures for pollution control.

A separate financial analysis is presented specifically for firms which have a choice of wastewater treated onsite or by a municipality.

Copies of the above publications may be obtained by writing to Technology Transfer, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.

WASTEWATER DISCHARGE CERTIFICATION SOUGHT FOR McGUIRE NUCLEAR STATION

The Duke Power Company, Post Office Box 2178, Charlotte, North Carolina, 28242, has made application to the North Carolina Division of Environmental Management for certification that the discharge of wastewater from the McGuire Nuclear Station into the waters of Lake Norman and the Catawba River will not violate applicable water quality standards.

Duke Power Company is building and proposes to operate a nuclear fueled electric generating facility with a net generating capability of 2360 megawatts. The McGuire Nuclear Station is located approximately seventeen miles northwest of Charlotte, North Carolina, near the Cowans Ford Dam in Mecklenburg County.

Additional information concerning the project may be reviewed at the Offices of the Water Quality Section, Division of Environmental Management, 216 West Jones Street, Raleigh, North Carolina. Copies of such materials will be furnished to any person requesting copies upon payment of the costs of reproduction.

The Division of Environmental Management proposes to take final action in the issuance of the certification on or after June 28, 1976.

INDUSTRY SPENDING $9 BILLION FOR POLLUTION CONTROL IN 76

A McGraw-Hill Survey indicates that industries plan to spend better than $9 billion for pollution control in 1976. This represents a 23 percent increase over that spent last year.

Some $5.2 billion of the expenditure will go for air pollution abatement or 20 percent more than was spent last year.

Water pollution expenditures by industries are expected to be $3.2 billion this year or 32 percent increase over last year.

The McGraw-Hill survey shows that solid waste expenditures for 1976 are expected to be $1.1 billion or up 14 percent this year.

Expenditures for total pollution control will represent 7.4 percent of industry's planned capital investment for this year compared with 6.8 percent in 1975. By 1979 capital investment for this purpose is expected to be 5.9 percent. Copies of the survey are available for $7.50 from McGraw-Hill, 1221 Avenue of the Americas, New York, NY 10020.

AMENDMENTS TO DREDGE AND FILL PERMIT PROGRAM TO BE INTRODUCED

A coalition of important environmental groups are endorsing recently introduced legislation to amend the Section 404 dredge and fill provision of the Federal Water Pollution Control Act. An amendment expected to be introduced by James C. Cleveland (R-NH) is designed to ease agricultural community concerns that minor farming activities could require Corps of Engineers 404 permits. The amendment would provide a statutory basis for the general permits approach now included in the Corps' regulations, and it is designed to provide a statutory requirement that the Corps study the dredge and fill program and present its findings to Congress by December 31, 1977.

Under Cleveland's amendment no Section 404 or 402 permit would be required for discharge of dredge and fill materials resulting from normal farming silviculture or ranching activities, "such as plowing, cultivating, seeding, and harvesting for the production of food, fiber, and forest products." Also under the amendment, permits would not be required for discharge of dredge and fill materials placed "for the purpose of construction or maintenance of farm and stock ponds and irrigation ditches and the maintenance of drainage ditches."

USER CHARGE SYSTEM REQUIRED IN WASTEWATER CONSTRUCTION PLANS

Detailed plans and schedules for implementing a user charge system must be submitted with Step 2 applications under the construction grants program. Applicants must develop an approvable plan and schedule for implementing a user charge system in Step 2 and show evidence of carrying out the plan in Step 3 of the granting process. EPA has indicated that greater detail and attention to user charge systems is needed in the 201 facilities plans for wastewater treatment and management.

JURSES, CONFERENCES, AND SYMPOSIA

Water Reuse Conference

Technology Transfer, in cooperation with the American Insitute of Chemical Engineers, is cosponsoring the Third National Conference on Complete Water Reuse to be held June 27-30, 1976, at the Netherland Hilton Hotel in Cincinnati, Ohio. The theme of this year's Conference is: "Symbiosis as a Means of Abatement for Multi-Media Pollution."

Symbiosis is the association of two or more dissimilar entities when such an association is mutually beneficial. An example of a simplistic symbiotic approach would be the use of a process wastewater effluent, either with or without treatment, as the influent to another wastewater-producing process. In this situation, the symbiotic approach would reduce the total process raw water demand and the possible requirement to treat two process wastewater effluents. The economics of control could be greatly modified by this approach.

For further details write or telephone: Lawrence K. Cecil, Consulting Chemical Engineer, 418 Lincoln Building, 44 Main Street, Champaign, IL 61820, Phone - 217/356-8258.

Summer Course on Environmental Litigation

The American Law Institute - American Bar Association Committee on Continuing Professional Education will offer a one-week course of study on Environmental Litigation on July 11-16, 1976, at the University of Colorado School of Law at Boulder. The intensive week-long course in environmental litigation will deal with the practice, procedures, and techniques in a variety of types of environmental court and administrative actions and proceedings.

For further information write Donald M. Maclay, Director, Courses of Study, ALI-ABA, 4025 Chestnut Street, Philadelphia, PA 19104, or telephone 215/387-3000.

Seminar on Lagoon Systems for Maximum Solids Control

A seminar sponsored by Resources Rescue to be held in Raleigh July 19 has the objective of disseminating information to use in designing lagoon systems to achieve maximum solids removal. The seminar is being presented for practicing engineers and regulatory personnel who are responsible for the design or the approval of design, of low-energy, low-maintenance wastewater treatment systems. The Raleigh seminar will be held at the Ramada Inn, U.S. 1 and N.C. 55 at Apex. For details write or call Resources Rescue, Box 1185, Clemson, South Carolina 29631, Phone - 803/654-2507.

Short Course on Applications of Stormwater Management Models

Implementation of Section 208 of PL 92-500 requires planners and engineers to examine the stormwater pollution problem. Because of the complexity and variability of stormwater problems in urban areas, computer assisted models have been developed to aid planners and design engineers. These models account for the stochastic and deterministic components of the stormwater management problems and include consideration of both the quantity and quality of stormwater.

This five-day short course is designed for engineers and technical personnel associated with consulting, regulatory, governmental and educational organizations with an interest and responsibility in the control of storm and combined sewer overflows.

The short course is sponsored by the U.S. Environmental Protection Agency in cooperation with the Department of Civil Engineering and University Conference Services, University of Massachusetts/Amherst.

The course is being held July 19-23 on the campus of the University of Chicago. For more details contact: Mr. Richard Muetze, Program Coordinator, Center for Continuing Education, 1307 East 60th Street, Chicago, Illinois 60637, Phone - 312/753-3185.

Conference on Better Cities Through Water Resources Planning and Management

The Water Resources Planning and Management Division and the Urban Planning and Development Division of the American Society of Civil Engineers is sponsoring a specialty conference for water resource professionals with interest in urban water resource planning. The program, scheduled for August 18-20, covers topics on water resources policy in urban areas, management of urban waters, diffuse source pollution, environmental and social objectives, land use, stormwater management, and urban planning. Contact Tom Richards, Program Director, Department of Conferences, 222 Nolte Center, University of Minnesota, Minneapolis, Minnesota 55455, Phone - 612/373-3157.

International Conference on Finite Elements for Water Resources

Although a considerable amount of work has been carried out by independent research groups in the application of finite element methods in water resources during the last few years, no scientific meeting has focused on the topic. This conference is being organized to bring together researchers in the field and to foster a profitable exchange of ideas.

The conference is sponsored by the National Science Foundation and the United States Geological Survey.

For more information contact Water Resources Program, Princeton University, Princeton, New Jersey 08540.

National Symposium on Urban Hydrology, Hydraulics and Sediment Control

This Symposium is scheduled for July 26-29 at the Agricultural Science Center Auditorium, University of Kentucky, Lexington, Kentucky. It is sponsored by the Colleges of Engineering and Agriculture at the University of Kentucky. For details call Gail McAlister, Symposium Coordinator, at 606/258-5949.

WATER REQUIREMENTS IN PROPOSED OSHA STANDARDS FOR FIELD SANITATION

The April 27, 1976, edition of the Federal Register contains a new proposed OSHA standards for agriculture which deals with field sanitary facilities. OSHA cited numerous health and sanitary justifications in the proposed standards.

The proposed standard is intended to cover all activities "performed in the field or outside of a permanent structure or facility, and which pertain to agricultural operations."

Under the proposed requirements, potable water for drinking purposes must be provided to all employees engaged in agricultural work in the field. Also included are requirements for maintenance and sanitation of piping systems, dispensing means, and arking of safe and unsafe drinking water sources.

The requirements also call for toilet and handwashing facilities at a ratio of one facility for each 40 employees engaged in field work. Requirements on food handling are also included in the proposed standards.

Comments, pro or con, will be considered in OSHA's determination of the contents of the final standard. Requests for additional information and a copy of the proposed standards on Field Sanitary Facilities should be addressed to OSHA - Region 4, 1375 Peachtree Street, N.E., Suite 587, Atlanta, Georgia 30309.

SEWAGE TREATMENT PLANT AND SEWER CONSTRUCTION COST INDEX FOR 1st QUARTER 1976 (1957-1959=100)

	Plant 1/			Sewer 2/		
Cities	Values Mar. 1976	% Change Mar. 1975	% Change Dec. 1975	Values Mar. 1976	% Change Mar. 1975	% Change Dec. 1975
Atlanta	229.3	(.8)	.8	228.2	2.1	1.0
Baltimore	251.8	5.1	1.0	281.6	4.5	.9
National Index Values	256.7	3.8	.5	267.1	5.6	.5

1/ Based on a 1.0-MGD High Rate Trickling Filter Plant with Aeration.

2/ Based on a Hypothetical $1,000,000 Sewer Project in Kansas City, Missouri in August 1962.

POSITIONS AVAILABLE

The Virgin Islands has an opening for the Director of the Water Resources Research Center. Contact Dr. Norwell Harrigan, Caribbean Research Institute, College of the Virgin Islands, St. Thomas, Virgin Islands 00801.

The U.S. Army Corps of Engineers Construction Engineering Research Laboratory (USACERL) is accepting applicants for environmental engineers/scientists for conducting comprehensive long range environmental research in environmental impact analysis, environmental quality management, solid waste, air and water pollution control as related to Army military needs. Positions GS 12, 13, and 14 are being considered. Submit applications to Ms. Lottie Marven, Chicago District Personnel, 219 South Dearborn Street, Room 504, Chicago, Illinois 60604.

WATER RESOURCES CONDITIONS IN NORTH CAROLINA FOR MAY

Streamflow conditions during the month ranged from severe flooding in the Mountains to deficient flows (in lower 25% of record for the month) in the Coastal Plain region. Runoff from heavy rains on the 14th and 15th caused flash flooding from 2 to 12 inches. Major floods occurred along the Pigeon, Cullasaja, and Tuckasegee Rivers and their tributaries. Floodwaters forced about 200 people to evacuate their homes along the Pigeon River in Haywood County on the 15th. The recurrence intervals of most of the flood peaks were 3 to 5 years; however, the floods on the Cullasaja River at Cullasaja and Pigeon River at Canton had recurrence intervals of 100 and 33 years, respectively.

Flash flooding occurred again in the Mountain region on the 28th and 29th. Rainfall amounts ranged up to 8 inches. The most severe flooding occurred along the French Broad, Little Tennessee, and Cullasaja Rivers and their tributaries. Based on preliminary records obtained from U.S. Geological Survey gaging stations, recurrence intervals of flood peaks during the storm ranged from 2 to 55 years, but the recurrence interval of most of the peaks was about 5 years.

Damages from both floods were limited generally to farm crops and private residences. Preliminary damage estimates are as follows: Buncombe County, $1.5 million; Haywood County, $1.5 million; Macon County, $1.0 million; Transylvania County, $120,000; and, Jackson County, $600,000.

No flooding occurred in the Piedmont or Coastal Plain regions during the month. Monthly mean flows ranged from about twice normal flow in the Mountains to only ½ normal flow in the Coastal Plain region.

Ground-water levels rose sharply at the end of the month in the Mountains but continued to decline elsewhere. Ground-water levels were above the long-term averages in the Mountains and below in the Piedmont and Coastal Plain regions.

. . . *U. S. Geological Survey*

COMPUTER-STORED WATER DATA AVAILABLE FROM USGS

More than 150 million streamflow, water-quality, and ground-water measurements collected at more than 100,000 sites across the country are now available through the National Water Data Storage and Retrieval System (WATSTØRE), according to a new U.S. Geological Survey leaflet.

The 15-page leaflet describes the types of data contained in the USGS-maintained WATSTØRE files and provides instructions for obtaining the data from any of 45 Water Resources Division district offices across the country.

The USGS investigates the occurrence, quantity, quality, distribution, and movement of the Nation's surface and underground water resources and provides about 70 percent of the water data currently being used by numerous State, local, private, and other Federal agencies. WATSTØRE was established in 1971 to improve the retrieval and transfer of this water data to other agencies.

The new leaflet, entitled <u>WATSTØRE</u>, is the latest in a series of more than 60 non-technical publications prepared by the USGS to answer questions about the earth sciences and natural resources. Other leaflets in the popular series include: <u>Water Use In The United States</u>; <u>Glaciers, A Water Resource</u>; <u>Water Of The World</u>; <u>The Great Ice Age</u>; <u>Tree Rings, Timekeepers Of The Past</u>; <u>Geologic Time</u>; <u>Volcanoes</u>; <u>Gold</u>; <u>and Topographic Maps, Silent Guides For Outdoorsmen</u>.

Single copies of these leaflets are free upon request to the Branch of Distribution, USGS, 1200 South Eads Street, Arlington, VA 22202.

WATER RESOURCES LEGISLATION IN THE CONGRESS

New Public Laws

S. 2445	To make permanent changes in laws necessary to comply with the changes to the new FY Oct. 1 - Sept. 30. Signed April 21, 1976.
S. 2444	To provide for the orderly transition to the new FY Oct. 1 - Sept. 30. Signed April 21, 1976.
H.R. 11876	Increasing to $2 million funds available to the Water Resources Council for administration of the Water Resources Planning Act of 1965. Signed May 12, 1976.

Bills Passed

S. 2081	Land and water resource policy.

NEW PUBLICATIONS RECEIVED BY THE INSTITUTE

(Residents of North Carolina may borrow these from the Institute for a two-week period. Where individual copies are desired, readers are encouraged to request copies form the organization issuing the publication. The addresses are provided by the *News* for this purpose.)

Abbreviations used throughout as follows:

ARS - Agric. Res. Service
ASCE - American Society of Civil Engr.
CEQ - Council on Env. Quality
DEM - Div. of Env. Mgt.
EDS - Env. Data Service
EMC - Env. Management Comm.
EPA - Env. Protection Agency
ERC - Engr. Res. Center
ERS - Economic Research Service
GAO - General Accounting Office
IWR - Inst. for Water Resources
NAS - Nat'l. Academy of Sciences
NCDNER - N.C. Dept. of Natural & Econ. Res.
NERC - Nat'l. Env. Res. Center
NOAA - Nat'l. Oceanic & Atmospheric Adm.
NPS - Nat'l. Park Service
NSF - Nat'l. Science Foundation
NTIS - Nat'l. Technical Info. Service
NWC - Nat'l. Water Commission
OWP - Office of Water Programs
OWRT - Office of Water Res. & Tech.
RTI - Res. Triangle Institute
SCS - Soil Conservation Service
TVA - Tennessee Valley Authority
UNC-SG - Univ. of N.C. Sea Grant
USDA - U.S. Dept. of Agriculture
USDC - U.S. Dept. of Commerce
USDI - U.S. Dept. of the Interior
USGPO - U.S. Gov. Printing Office
USGS - U.S. Geological Survey
WPC - Water Pollution Control
WQS - Water Quality Standards
WRC - Water Resources Council
WRRC - Water Resources Res. Center
WRRI - Water Resources Res. Institute
WRSIC - Water Res. Sci. Information Center

Water Resources Planning

"An Evaluation of Economic and Demographic Data Useful in Water Resources Planning," (#3), 4/75, by Regional Economic Analysis Div., USDC, for IWR, avail. from NTIS, Springfield, VA 22151.

"An ERTS-1 Study of Coastal Features on the North Carolina Coast," (MR 76-2), 1/76, by G. H. Miller, *et al*, for US Army Corps of Engrs., avail. from NTIS, Attn: Operations Div., 5285 Port Royal Rd., Springfield, VA 22151.

"Improvements for Masonboro Inlet, North Carolina - Hydraulic Model Investigation," (Vols. 1 & 2), 4/76, by W. C. Seaberg for US Army Engr. Dist., Wilmington, avail. from Hydraulics Lab., US Army Engr. Waterways Exp. Sta., PO Box 631, Vicksburg, MS 39180.

"A Study of Alternative Methods to Modernize Water Institutions and Eliminate Problems of Multiple Jurisdiction and Conflicting Objectives," (PRWG122-1), 9/75, by F. W. Haws, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

"Capability of Integer Programming Algorithms in Solving Water Resource Planning Problems," (PRWG175-1), 1/76, by T. C. Hughes, *et al*, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

"Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications" (and) "Appendices," (WR-75-1), 12/75, by M. A. Collins, *et al*, Civil and Mechanical Engr. Dept., Inst. of Tech., Southern Methodist U., Dallas, TX 57275.

"Multi-Objective Planning and Environmental Evaluation of Water Resource Systems," 12/75, by M. Morisawa, *et al*, for OWRT, avail. from State U. of NY, Binghamton, NY 13902.

"Water Problems and Research Needs for Hawaii: 1975," (#95), 2/76, by L. W. Lau, WRRC, U. of Hawaii, 2540 Dole St., Honolulu, HI 96822.

"Proceedings of the Illinois River Workshop," (#4), 4/76, ed. by K. Howard, for Water Resources Center, U. of Illinois at Urbana-Champaign, avail. from Bradley U., Peoria, Illinois 61601.

"Proceedings - Mississippi Water Resources Conference - 1976," by WRRI, MS St. U., MS St., MS 38941.

"Process Studies and Modeling of Self-Cleaning Capacity of Mountain Creeks for Recreation Planning and Management," (PRWG135-1), 6/75, by C. Chen, *et al*, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

"Water Quality as an Approach to Managing Recreational Use and Development on a Mountain Watershed," (PRWA21-1), 6/75, by B. A. Johnson, *et al*, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

"Systematic Development of Methodologies in Planning Urban Water Resources for Medium Size Communities, Phase I," (#74), 4/76, by J. W. Delleur, *et al*, WRRC, Purdue U., West Lafayette, IN 47906.

"User Charges for Inland Waterways: A Review of Issues In Policy and Economic Impact," (#91), 5/76, by L. A. Shabman, VA WRRC, VPI & St. U., Blacksburg, VA 24061.

"Optimization of Water Allocation, Wastewater Treatment, and Reuse Considering Nonlinear Costs, Seasonal Variations, and Stochastic Supplies," (PRWG123-2), 6/75, by A. B. Bishop, *et al*, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

"A Water-Land Use Management Model for the Sevier River Basin," (PRWG150-1), 9/75, by V. A. Narasimhan, *et al*, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

"Water Resources Program," 11/75, by Susquehanna River Basin Commission, 5012 Lenker St., Mechanicsburg, PA 17055

Water Quality Management

"A Field Technique Measurement Virus Decay and Potential Aerosol Hazard From Wastewater Sprinkler Irrigation," (PRWG139-2), 12/75, by M. F. Torpy, *et al*, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

"Biological Impact Caused by Changes on a Tropical Reef," (EPA-600/3-76-027), 4/76, by R. S. Jones, *et al*, for EPA, avail. from NTIS, Springfield, VA 22151.

"Toxicity of Chlorinated Power Plant Condenser Cooling Waters to Fish," (EPA-600/3-76-009), 4/76, by R. E. Basch, *et al*, for EPA, avail. from NTIS, Springfield, VA 22151.

"Effects of Chlorine and Sulfite Reduction on Lake Michigan Invertebrates," (EPA-600/3-76-036), 4/76, by A. M. Beeton, *et al*, for EPA, avail. from NTIS, Springfield, VA 22151.

"The Nutrition of Great Lakes *Cladophora*," (EPA-600/3-76-044), 4/76, by G. C. Gerloff, *et al*, for EPA, avail. from NTIS, Sprinfield, VA 22151.

"Impact of Coal Stripmining on Water Quality and Hydrology in East Tennessee," (#47), 3/76, by Dr. B. A. Tschantz, *et al*, avail. from WRRC, White Ave. Bldg., Rm. 210, 1000 White Ave., Univ. of TN, Knoxville, TN 37916, Price - $5.00.

"Toxicity of Copper to Daphnids in Reconstituted and Natural Waters," (EPA-600/3-76-051), 5/76, by R. W. Winner, for EPA, avail. from NTIS, Springfield, VA 22151.

"Toxicity of Fish of Cyanides and Related Compounds, A Review," (EPA-600/3-76-038), 4/76, by P. Doudoroff, for EPA, avail. from NTIS, Springfield, VA 22151.

"Determination of Minor Elements in Water by Emission Spectroscopy," (Book 5, Ch. A2), by P. R. Barnett, *et al*, for USGS, avail. from USGPO, Washington, DC 20402, Price - 50¢.

"Eutrophication and Fish Toxicity Potentials in a Multiple-Use Subtropical Reservoir," (#89), 7/75, by R. H. F. Young, *et al*, WRRC, U. of Hawaii, 2540 Dole St., Honolulu, HI 96822.

"Time Parameter Evaluation in Dual Flocculant Destabilization in Drinking Water (and) Reproducibility Evaluation of the Flocculation of a Synthetic Latex Colloidal System," (#062), 3/76, by W. A. Barkley, *et al*, avail. from NM WRRI, NM St. U., Box 3167, Las Cruces, NM 88003.

"Studies on Lake Restoration by Phosphorus Inactivation," (EPA-600/3-76-041), 4/76, by W. D. Sanville, *et al*, for EPA, avail. from NTIS, Springfield, VA 22161.

"Bay Springs Lake Water-Quality Study," 5/76, by S. C. Wilhelms, for Office, Chief of Engrs., US Army, avail. from Hydraulics Lab., US Army Engr. Waterways Exp. Sta., PO Box 631, Vicksburg, VA 39180.

"Experimental Studies of Wing-Wall Mixing Control," (#110), 2/76, by W. H. C. Maxwell, *et al*, for U. of Illinois, IL Water Res. Center, 2535 C. E. Hydrosystems Lab., Urbana, IL 61801.

"A Dynamic Water Quality Model for the Neuse Estuary, N.C.," (UNC-SG-75-28), by M. Amein, *et al*, for Sea Grant Program, 1235 Burlington Laboratories, NCSU, Raleigh, NC 27607.

"Non-Point Source Water Quality Monitoring, Inyo National Forest, 1975," (#156), 3/76, ed. by J. Baas, *et al*, for Water Res. Center, U. of California, Davis, CA 95616.

"Quality and Quantity of Nonpoint Sources in Rural Surface Water Runoff on Oahu, Hawaii," (#93), 6/75, by S. K. Yim, *et al*, WRRC, U. of Hawaii, 2540 Dole St., Honolulu, HI 96822.

"Loading Functions for Assessment of Water Pollution From Nonpoint Sources," (EPA-600/2-76-151), 5/76, by A. D. McElroy, *et al*, for EPA, avail. from NTIS, Springfield, VA 22161.

"Biostimulation and Nutrient Assessment, Workshop Proceedings," (PRWG168-1), 11/75, ed. by E. J. Middlebrooks, *et al*, avail. from UT Water Res. Lab., College of Engr., UT ST. U., Logan, UT 84322.

"Nutrient Dynamics and Gas Production in Aquatic Ecosystems: The Effects and Utilization of Mercury and Nitrogen in Sediment-Water Microcosms," (PRWG121-1), 11/75, by D. B. Porcella, *et al*, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

"Naturally Occurring Organic Compounds and Algal Growth in a Eutrophic Lake, " (PRWG137-1), 6/75, by V. D. Adams, *et al*, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

"Acute Toxicity of Certain Pesticides to *Acartia Tonsa* Dana," (EPA-600/3-76-033), 5/76, by F. H. Khattat, *et al*, for EPA, avail. from NTIS, Springfield, VA 22151.

"Modeling Phytoplankton Blooms in a Stratified Embayment," (#8), 6/75, by W. J. Grenney, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

"Currents and Pollutant Dispersion in Lake Michigan, Modeled with Emphasis on the Calumet Region," (#111), 3/76, by P. L. Katz, *et al*, U. of IL, Water Res. Center, 2535 Hydrosystems Lab., Urbana, IL 61801.

"Biodegradation of Polynuclear Aromatic Hydrocarbon Pollutants by Soil and Water Microorganisms," (#113), 4/76, by E. J. McKenna, *et al*, for U. of IL, Water Res. Center, 2535 Hydrosystems Lab., Urbana, IL 61801.

"Proceedings, National Symposium on Urban Hydrology and Sediment Control," (UKY BU109), 11/75, ed. by C. T. Haan, avail. from ORES Publications, College of Engr., U. of KY, Lexington, KY 40506.

"The Natural Salinity of the Colorado River," (#7), 6/75, by J. S. Williams, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

"Design Guidelines for Agricultural Soil Warming Systems Utilizing Waste Heat," (EPA-600/3-76-026), 3/76, by D. L. Slegel, for EPA, avail. from NTIS, Springfield, VA 22151.

"Effects of Suspended Solids on Selected Estuarine Plankton," (MR 76-1), 1/76, by J. A. Sherk, Jr., *et al*, for US Army Corps of Engrs., avail. from NTIS, Attn: Operations Div., 5285 Port Royal Rd., Springfield, VA 22151.

"Temperature Effects on Young Yellow Perch, *Perca flavescens* (Mitchill)," (EPA-600/3-76-057), 5/76, by J. Howard McCormick, for EPA, avail. from NTIS, Springfield, VA 22161.

"Temperature, Infectious Diseases, and the Immune Response in Salmonid Fish," (EPA-600/3-76-021), 4/76, by J. L. Fryer, *et al*, for EPA, avail. from NTIS, Springfield, VA 22161.

"Application of Exchange Resins for Treatment of Textile Dye Wastes," (EPA-660/2-75-016), 6/75, by A. Maggiolo, *et al*, for EPA, avail. from USGPO, Washington, DC 20402.

"Vegetative Study at the Duck Field Research Facility, Duck, North Carolina," (MR 76-6), 4/76, by G. F. Levy, for US Army Corps of Engrs., avail. from NTIS, Attn: Operations Div., 5285 Port Royal Rd., Springfield, VA 22151.

"Development of a Dynamic Programming Model for the Regionalization and Staging of Wastewater Treatment Plants," (PRWA20-2), 6/75, by S. L. Klemetson, *et al*, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

Water Quantity Management

"Dune Stabilization with *Panicum amarum* Along the North Carolina Coast," (MR 76-3), 2/76, by E. D. Seneca, *et al*, for US Army Corps of Engrs., avail. from NTIS, Attn: Operations Div., 5285 Port Royal Rd., Springfield, VA 22151.

"Water Salvage Potentials in Utah - Volume II, Evaporation Suppression by Reservoir Destratification," (PRWA22-2), 6/75, by T. C. Hughes, *et al*, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

"Unsaturated-Saturated Flow Through Heterogeneous Sloping Lands," (PRWG59c-9), 6/75, by F. S. Natur, *et al*, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

"Methodologies for the Determination of Stream Resource Flow Requirements: An Assessment," ed. by C. B. Stalnaker, *et al*, for US Fish and Wildlife Serv., avail. from NTIS, Springfield, VA 22161.

"Ecological and Physiological Implications of Greenbelt Irrigation," (#157), 4/76, by V. B. Youngner, *et al*, Water Res. Center, U. of CA, Davis, CA 95616.

"Regional Analyses of Runoff Characteristics for Small Urban Watersheds," (PRWG87-1), 4/75, by G. B. Shih, *et al*, UT Water Res. Lab., College of Engr., UT St. U., Logan, UT 84322.

Miscellaneous

"Ecological Determinants of Coastal Area Management, Vol. I - An Overview," (UNC-SG-76-05), 4/76, by D. Brower, *et al*, for Sea Grant Program, 1235 Burlington Laboratories, NCSU, Raleigh, NC 27607.

"State of the Art for Assessing Earthquake Hazards in the United States; Plate Tectonics and Earthquake Assessment," (S-73-1), 3/76, by J. L. Walper, avail. from Soils and Pavements Lab., US Army Engr. Waterways Exp. Sta., PO Box 631, Vicksburg, MS 39180.

"Energy From the Oceans: Fact or Fantasy?," (Conference Proceedings), (#76-1), 1/76, ed. by J. Kohl, avail. from Al Lanier, Div. of Continuing Educ., NCSU, Raleigh, NC 27607, Price - $3.00.

"The Fishes of Washington County Arkansas," (#39), 1976, by D. G. Cloutman, *et al*, WRRC, U. of AR, Fayetteville, AR 72701.

"The History of Maritime North Carolina: An Annotated Bibliography," 2/76, by Dr. W. N. Still, Jr., avail. from Inst. for Coastal and Marine Resources, ECU, Greenville, NC 27834.

"Numerical Models of Lake Currents," (EPA-600/3-76-020), 4/76, by W. Lick, for EPA, avail. from NTIS, Springfield, VA 22151.

"Research Reports Supported by OWRT," 7/75 - 3/76, WRSIC, OWRT, USDI, Washington, DC 20240.

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