

WATER RESOURCES RESEARCH INSTITUTE

OF THE UNIVERSITY OF NORTH CAROLINA

NORTH CAROLINA STATE UNIVERSITY AT RALEIGH

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CLEAN WATER BOND ACT

May 6 is the date for North Carolinians to vote on the Clean Water Bond Act - a crucial issue for clean water. Brochures explaining the significance of this referendum are available from the League of Municipalities and the Office of Water and Air Resources, North Carolina Department of Natural and Economic Resources.

Unless this Act is passed, North Carolina communities will have to meet 67 percent of the cost of waste treatment facilities. With the new state grants authorized by the Act (25 percent of construction cost) total federal and state aid will rise to 80 percent and the local share will drop to 20 percent. More than twenty states have passed similar legislation and are now receiving the increased federal aid made available through state participation.

NEW MEMBERS APPOINTED TO INSTITUTE ADVISORY COMMITTEE

President Friday recently appointed the following new members to the Water Resources Research Institute Advisory Committee:

Dr. Sam C. McKee, Manager, New Bern Mill, Weyerhaeuser Company
Mr. Jack E. Ravan, Regional Administrator, Environmental Protection Agency, Atlanta.

ANNUAL MEETING INSTITUTE ADVISORY COMMITTEE

The annual meeting of the Institute Advisory Committee will be held at the Velvet Cloak Inn in Raleigh on March 21, 1972. The agenda is as follows:

- 8:30 a.m. Welcome Vice President H. Brooks James
 Opening Comments Dean Ralph E. Fadum, Chairman
 Board of Directors
 Colonel George E. Pickett
 Chairman, Advisory Committee
Present Program David H. Howells
 Director, WRI
- Review of Selected Projects:
 - Effects of Stream Channelization and
 Drainage on Fish and Wildlife..Dr. Garland Pardue
 NCSU
 - Present and Future Status of North
 Carolina Wetlands.....Dr. Arthur J. Hawley
 UNC-CH
 - Public Participation in Water
 Pollution Control Policy and
 Decision Making.....Dr. A. Clarke Davis
 NCSU
 - Water Quality Management in
 Impoundments.....Dr. Charles M. Weiss
 UNC-CH
 - Environmental Considerations in Land
 and Water Use Planning.....Dr. James E. Wuenscher
 Duke University
- 12:15 p.m. LUNCH
 Speaker.....Dr. Arthur W. Cooper, Asst. Secretary
 for Natural Resources
 N.C. Dept. of Natural & Economic Resources
 Subject: Significance of Environmental Impact
 Legislation to North Carolina
- 1:15 p.m. Discussion of Present Program
 Led by.....Mr. Earle C. Hubbard
Proposed Research Program.....Mr. F. E. McJunkin
 Associate Director, WRI
Discussion led by.....Colonel Albert C. Costanzo
Proposed Research Application Program..Mr. J. Stewart
 Extension Specialist
Discussion led by.....Mr. Ralph Heath
- 4:30 p.m. Adjournment

NATIONAL SYMPOSIUM ON COSTS OF WATER POLLUTION CONTROL

International concern for environmental quality will be the theme of the banquet address for the National Symposium on Costs of Water Pollution Control. Dr. William H. Matthews, Massachusetts Institute of Technology, consultant to the Secretary General, will speak on the 1972 United Nations Conference on the Human Environment.

With the announcement of the banquet speaker, the program for the National Symposium on Costs of Water Pollution Control has been completed. Brochures are being printed and will be distributed within the next week.

U.S. POSITION PAPER ON WATER POLLUTION

The challenge of pollution control ranks among the major social and technological issues of this century, and the path to solution will touch on every form of human activity from scientific inquiry to law making, from economics to aesthetics, and from education to health care.

This is the conclusion of three American civil engineers writing a U.S. position paper for the United Nations Conference on Human Environment to take place in the summer of 1972 at Stockholm, Sweden.

Authors are: Earnest F. Gloyna, dean of the College of Engineering and director of the Center for Research in Water Resources, University of Texas at Austin; Dan M. Wells, professor of civil engineering and director of the Water Resources Center, Texas Tech University; and Bernard B. Berger, professor of civil engineering and director of the Water Resources Research Center, University of Massachusetts at Amherst.

The engineers provided extensive background material and recommended 23 courses of action.

"The main problems facing the world today in pollution control are technological and institutional," the authors said. "While both are of major importance, the institutional problems are more formidable."

They pointed out that the institutional problems of creating desired regional wastewater treatment entities involve a "host of problems." Overcoming the reluctance of local, national and international jurisdictions to get together is very difficult, they said.

"Emphasis should be placed on the development of institutions for water resources planning, development and use that overcome the present barriers of political boundary lines at all governmental levels," the paper said.

NEW INSTITUTE REPORTS

Annual Report - FY 1971

A brief summary of the Institute's principal accomplishments in FY 1971. Prepared in a narrative-photograph format suitable for anyone interested in water resources research in North Carolina.

Report No. 2

(Revised January 1, 1972): Water Resource Problems and Research Needs in North Carolina

by

David H. Howells
Institute Director

A revised assessment of water resource problems and research needs prepared with extensive consultation and assistance from members of the Institute Advisory Committee, Technical Committee, Board of Directors, research investigators, and individual professional staff of state agencies. The report was prepared as a source of orientation for the Institute's research program. The first edition was published in 1967. Subsequent revision will be on a biennial basis.

CHEMICAL QUALITY OF NORTH CAROLINA STREAMS

The U. S. Geological Survey has released an atlas of the Chemical Quality of Water in Streams of North Carolina which does a particularly effective job of presenting data on water hardness, nitrate, chloride, color, and total dissolved solids. The graphic mode and accompanying narrative are easily understandable and the Atlas will be very useful for public education as well as of interest to water professionals.

The Atlas includes two sheets. The first shows the various levels of hardness, nitrate, chloride, and color of streams through color-coded maps. Each of the separate figures is accompanied with a brief description of the significance of the chemical measurements. The second sheet is a graphic display of average levels of total dissolved solids from natural and pollution sources.

Copies of the Atlas (Hydrologic Atlas 439) can be obtained for \$1 each from the U. S. Geological Survey, Washington, D. C. 20242.

COMMERCIAL INTERESTS BLOCK CONTROLS OVER WETLAND FILLING AND DREDGING

A proposal initiated by the Corps of Engineers and supported by the Federal Council on Environmental Quality which would have prohibited the issuance of permits for filling and dredging wetlands on coastal areas until land developers could prove that waterfront use was "essential," was dropped from the President's Environmental Message to Congress at the last minute because of the adamant opposition of the Commerce Department.

Commerce took the position that CEQ wanted "to establish the principle that wetlands are biologically productive and environmentally valuable," and that this would be "too hard for developers to bear." It was also alleged to be "unfair to business which might need wetlands for development."

ENVIRONMENTAL IMPACT STATEMENTS

CEQ's 102 Monitor for January listed the following environmental impact statements pertaining to North Carolina:

Department of Agriculture

Agricultural Research Service
(Drafts)

Supplement to draft of September 15. Cooperative Federal-State control and regulatory program for witchweed, involving use of 2,4 - D, and paraquat.

Department of Transportation

(Drafts)

US-52: Winston-Salem to Welcome, Forsyth and Davidson Counties

Fairview Road: Charlotte, Mecklenburg County

US-129, US-19: Cherokee County

US-17 Business: Elizabeth City, Pasquotank County

Supplement to draft of August 20, Information relating to use of part of Guilford College Campus

(Final)

US-220 (Candor-Biscoe-Star Bypass): Montgomery County

Coast Guard

Issuance of Oil Pollution Regulations

Water Resources Council

Establishment of Principles and Standards for Planning Water and Land Resources to enhance national economic development, quality of the environment, and regional development, with application of Principles and Standards applied at all levels of planning.

DETERGENTS AS A SOURCE OF PHOSPHORUS IN WATER

A study of detergents in Logan, Utah, reported in the January issue of the Utah Center for Water Resources Research newsletter, Aquarius, disclosed some interesting findings pertaining to the relative importance of sewage treatment or detergent modification to reduce phosphorus levels in municipal waste effluents.

Results indicated that restriction of detergent use by preventing use of dishwashers and clothes washers led to a 57 percent reduction in total phosphorus content of raw sewage. "Significantly, however, no difference could be detected in the ability of the 'before' and 'after' samples to stimulate growth of algae in water taken from Logan River at the First Dam Reservoir. The reduction of phosphorus by restricting the use of detergents was not sufficient to affect the results of bio-assays." The investigator, Dr. Donald B. Porcella, stated that, "To obtain the phosphorus reduction level necessary for control of algal blooms in lakes receiving sewage, a high degree of treatment of wastewater is necessary.

LOW COST PHOSPHATE REMOVAL

A ten-week study of phosphate removal from municipal sewage at Michigan City, Indiana, by the Allied Chemical Corporation, has shown relatively low costs to meet the Indiana standard of 80 percent removal of phosphates.

The only new facilities required were chemical storage and feeding equipment totaling about \$100,000. Chemical costs amounted to \$1.25 per resident annually. The full-scale plant tests showed that the addition of aluminum sulfate at the end of the regular secondary treatment process could eliminate the need for more costly tertiary treatment facilities under present effluent standards.

HEPATITIS AND WATER

Many readers of the News will recall the epidemic of infectious hepatitis that incapacitated the Holy Cross football team in 1969. According to the New York Times of February 13, 1972, the long-standing mystery has finally been unraveled. A group of doctors, reporting in the current issue of the Journal of the American Medical Association, has concluded that 90 of the 97 men on the Holy Cross football team got hepatitis by drinking contaminated water. The doctors said knowledge gained from investigating the epidemic not only focused attention on "the potential magnitude of water borne viral hepatitis," but also revealed unappreciated hazards of drinking water systems that are commonly used by participants in other sports, such as golf, soccer, and baseball.

When the Holy Cross team practiced, the players quenched their thirst by drinking water obtained from a faucet connected to a municipal system. The drinking water line also had six underground faucets used to irrigate the football field. Tests showed that surface water would siphon back into the line when a vacuum developed. It was also found that children infected with hepatitis and living nearby played with

the underground faucets. Frequently, the children would neglect to turn the water off creating large puddles of water which were presumably contaminated with hepatitis virus excreted by the children. The final clue was a two-alarm fire that could have created sufficient pumping demand on the water system to create the vacuum and back siphonage of contaminated water.

HEALTH STANDARDS FOR WATER SUPPLIES ENFORCED

On February 17, 1972, the Sanitary Engineering Division of the North Carolina State Board of Health obtained conviction of a sub-division developer who failed to have sub-division water system plans approved by the Board of Health prior to construction. This is the first conviction for this offense and the second relating to maintaining strict health standards for sub-division water systems.

Bobby Combs, Box 242, Stoney Point, was found guilty in Iredell County District Court for failing to submit plans for the water supply system which he owns and operates in the Clearview Acres Development, a potential 72-home community. Combs received various notices of non-compliance dating back to June 1970. He was sentenced to twelve months in the Iredell County jail (suspended for three years) and fined \$500 and court costs. According to State Board of Health officials he must comply with Board rules and regulations or close the water system.

GREAT INTEREST IN SEDIMENT CONTROL

Despite a deliberate effort to limit attendance of the February 10 Sediment Control Workshop so as to preserve an atmosphere compatible with small group discussion, interest in participation swelled registration to the capacity of meeting rooms at the College Inn. From the opening Welcome by Extension Service Director George Hyatt to the closing summaries of discussion group reporters, a high level of concern for sediment problems was in evidence.

Sediment Control Specialist Marshall Augustine shared the Maryland experience with Tar Heels in a staccato luncheon address which left little doubt that state and local government can effectively cope with sediment control if they choose to do so.

Sponsors were the North Carolina Agricultural Extension Service, Soil Conservation Service, Department of Natural and Economic Resources, Land Use Congress, and the Water Resources Research Institute. Extension Specialist Jim Stewart was the program coordinator.

PROFESSIONALS SOUGHT FOR OFFENSIVE AGAINST WATER POLLUTION

This coming year, staffers of Ralph Nader are going to be organizing public interest firms specializing in combatting water pollution. Support for these firms will come primarily from commercial and sports fishermen who suffer damage to their jobs and incomes and to their favorite recreational activities from pollution. If expectations are met, there will eventually be professional action teams located in each of approximately ten regions around the country and one in Washington. These teams will include scientists, engineers, economists, lawyers, etc. The professionals will work for clean water before the courts and the administrative agencies and push for stronger legislation at the state and national levels.

Positions will be available for experienced professionals, recent graduates, and, in some cases, graduate students. There will be opportunities for research in the various professional areas and also for a broader range of activities, including appearing as expert witness in court and regulatory proceedings; analyzing industrial and governmental technical and economic reports; monitoring water quality, analyzing and documenting damage to property and aquatic life, and tracing violations of pollution laws; helping to formulate and push for the enactment of model legislation; and providing guidance and information for grass roots citizen action. In all cases, both a standard of excellence in one's professional discipline and also an ability to relate that discipline to the political and legal and social framework within which pollution regulation takes place are important prerequisites. The work will require individual innovation and aggressiveness in staking out new approaches. Professionals will exercise broad autonomy in making tactical decisions designed to achieve the clean water objective.

Ralph Nader will not control these groups, but he and his staffers will be recruiting their initial professional personnel. It is estimated that by February of 1972 there will be positions available with at least one and possibly two regional firms as well as the Washington-based group. By the spring of 1972, it is expected that there will be several more regional firms commencing operation. Salaries are still to be determined for the various positions available.

Send resumes to: FISHERMEN'S CLEAN WATER ACTION PROJECT
P. O. BOX 19052
WASHINGTON, D. C. 20036

ESTUARINE MODELING

A recent study sponsored by EPA, Estuarine Modeling: An Assessment, EPA-WPC Research Series, 16070 DZU 02/71, cited the following research needs in the field of estuarine modeling:

Hydrodynamic Models

- (1) Methods for predicting dispersion coefficients or eddy diffusivities from hydrographic and environmental factors.
- (2) Representation of vertical dimension, viz. laterally averaged two-dimensional models and three-dimensional models to represent hydrodynamic effects of density gradients.
- (3) Methodology for incorporation of pressure gradient due to density.

Water Quality Models

- (1) Mathematical delineation of reactions to which estuarine constituents are subjected--clarification of processes affecting dissolved oxygen as well as modeling of other parameters (sulfates, sulfites, heavy metals, carbon dioxide, and particulate matter.
- (2) Behavior and modeling of coupled reactions--in particular, problem of general non-linear coupled reactions with feed forward and feedback dependencies.
- (3) Modeling of biota and their interaction with constituents of estuarine water.
- (4) Modeling of local effects of a discharge in the nearshore environment.

IMPACT OF TECHNOLOGY ON WATER REQUIREMENTS

The National Water Commission has announced the release of a study of potential technological advances and their impact on anticipated water requirements. The study was made by the Committee on Technology and Water established for this purpose by the National Academy of Sciences.

The report, which provides technical background for the Commission's deliberations on national water policy, is published and distributed for the Commission by the National Technical Information Service (NTIS). This report has not been approved by the Commission, but is being made immediately available to the public through NTIS to stimulate general discussion of national water policy issues. The Commission invites the comments and suggestions of interested parties.

The report is entitled "Potential Technological Advances and Their Impact on Anticipated Water Requirements" and is part of a larger Commission effort to explore technological developments which might substantially modify future needs for water. A broad range of technological changes, many of a speculative and unproven nature, are considered. The report sets forth an inventory of possible

concepts to increase or decrease future water demand, to increase usable supplies, and to extend usefulness of impure water. Research priorities are suggested.

The report may be ordered from National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia, 22151. The Accession Number is PB 204-053, and the price is \$3.

SEMINAR ON COASTAL ZONE

The Coastal Plains Center for Marine Development Services is sponsoring a Seminar on Planning and Engineering in the Coastal Zone at the Mills Hyatt House in Charleston, South Carolina, on June 8 and 9, 1972. North Carolina State University is one of the sponsoring organizations. Inquiries should be addressed to the Center Director, Box 3643, Azalea Station, Wilmington, North Carolina 28401.

AMERICAN WATER RESOURCES CONFERENCE - CALL FOR PAPERS

The American Water Resources Association has scheduled its Eighth Annual Water Resources Conference at the Sheraton Jefferson Hotel, St. Louis, on October 30 to November 3, 1972. The theme is concerned with engineering, social, environmental, and political interactions associated with large-scale water resource projects. Papers are invited. Inquiries should be directed to Dr. D. L. Warner, Technical Program Chairman, Geological Engineering Department, University of Missouri-Rolla, Rolla, Missouri 65401. Telephone: 314-341-4616.

POST-GRADUATE COURSE IN GROUND WATER MANAGEMENT

UNESCO has announced that the Groundwater Research Center of the Hebrew University of Jerusalem, Israel, has scheduled an International Post-Graduate Course in the Exploration and Development of Ground Water Resources.

Duration: October 1972 - April 1973
Application deadline: August 1, 1972
Tuition: \$300 US

Further information can be obtained from the Institute upon request.

DATES FOR NORTH CAROLINIANS TO REMEMBER

March 28-29	Conference on Seafood Harvesting, Processing, and Marketing - New Bern, North Carolina
April 6-7	National Symposium on Costs of Water Pollution Control - Raleigh, North Carolina
May 6	Referendum on <u>Clean Water Bond Act</u> - Statewide election

June 8 and 9 Seminar on Planning and Engineering in the Coastal
Zone - Charleston, South Carolina

STATUS OF STREAMS AND GROUND WATER IN NORTH CAROLINA - JANUARY

Stream flow was well above normal in the mountains, western Piedmont, and Coastal Plain, and was near or below normal in the eastern Piedmont. There were no significant rises during the month and streams generally remained within their banks.

Ground water levels rose in most areas of the state and remained above average except in the Coastal Plains. Artesian levels continued to decline in heavily pumped areas in the northeastern part of the State. Depressed artesian levels remained below mean sea level in other heavily pumped areas in eastern North Carolina.

— U. S. Geological Survey

WATER RESOURCES LEGISLATION IN THE CONGRESS

Bills Introduced:

Senate:

S. 3078 To create River Basin Waste Treatment Authorities for the purpose of assuming control over, planning, constructing, and operating waste treatment facilities throughout the U. S. in order to eliminate water pollution in our nation's rivers and streams.

House

H.R. 12443 To provide for the restoration of all lands located in the U. S. upon which strip mining operations are being or have been carried out, and for other purposes.

H.R. 12577 To amend section 5(f) of the Land and Water Conservation Fund Act of 1965.

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 from the organizations issuing the publication. The addresses are provided by the News for this purpose.)

Water Resources Planning

"Additional Alternative Arrangements for River Basins and Other Regions: The Federal-State Regional Government Corporation," by R. A. Solomon, NWC (PB 202-997) avail. from NTIS, Springfield, Va. 22151, Price \$3, July 1971.

"Development and Evaluation of Citizen Participation Techniques for Inland Lake and Shoreland Management," by J. K. Fulton for OWRR, Huron River Watershed Council, 415 W. Wash. St., Ann Arbor, Mich. 48103, Dec. 1971.

"Environmental Guidelines for Road Construction in Alaska," by F. B. Lotspeich for EPA (1610 GOI), Alaska Water Lab., College, Alaska, Aug. 1971.

"The Design of Data Programs for Aquatic Ecosystems," by S. F. Moore, Preprint 1574, ASCE Atlanta Conference, Feb. 1972.

"Environmental Response of Salt Marshes to Deposition of Dredged Materials," by H. L. Windom, Preprint 1612, ASCE Atlanta Conference, Feb. 1972.

"Evaluation of Recreational and Cultural Benefits of Estuarine Use in an Urban Setting," by A. M. Levenson, et al, Center for Bus. & Urban Res., Hofstra Univ., Hempstead, N. Y. 11550, Aug. 1971.

The following reports are authored by L. D. James, et al, Env. Res. Center, Ga. Inst. of Tech., Atlanta, Ga. 30332:

"The Peachtree Creek Watershed as a Case History in Urban Flood Plain Development"

"Remedial Flood Plain Management as the Focus for an Interdisciplinary Team Research"

"The Flood Plain as a Residential Choice--Resident Attitudes and Perceptions and Their Implications to Flood Plain Management Policy"

"Flood Plain Information--Neuse River and Buffalo Creek--Smithfield, N. C.," by US Army Corps of Engrs., Wilmington, N. C. Aug. 1971.

"The Mill River and Its Floodplain in Northampton and Williamsburg, Massachusetts: A Study of the Vascular Plant Flora, the Bacterial Family Pseudomonadaceae in Relation to Patterns of Land Use," (Report No. 72-4) by E. D. Robinton, et al, WRRR, Univ. of Mass., Amherst, Mass. 01002.

"Selected Digital Computer Techniques for Groundwater Resource Evaluation," by T. A. Prickett, et al, (Bul. 55) Ill. St. Water Survey, Urbana, Ill. 61801, 1971.

"Inland Lakes Analysis and Action," by J. K. Fulton, et al (Ext. Bul. E-718-NR Ser.) Huron River Watershed Council, Mich., State Univ., Ann Arbor, Mich. 48106, Nov. 1971.

"Foreign Deep Well Port Developments, A Selective Overview of Economics, Engineering, and Environmental Factors," (Vols. I, II & III - IWR Rpt. 71-11) by A. D. Little, Inc., for US Army Corps of Engrs. IWR, avail. from NTIS, Springfield, Va. 22151, Sept. 1971.

"Legal Aspects of Drainage in New England, A Bibliography," WRSIC (71-212), OWRR, USDI, Wash., D.C. 20240, Oct. 1971.

"Feasibility of the Metropolitan Water Intelligence System Concept (Integrated Automatic Operational Control)," (Tech. Memo No. 15), by M. B. McPherson, ASCE, 345 East 47th St., N. Y., N. Y. 10017, Dec. 1971.

"Monitoring for Effective Environmental Management," by N. L. Drobny, Preprint 1626, ASCE Atlanta Conference, Feb. 1972.

"Remote Sensing for Water Resources," by G. F. Sowers, Preprint 1604, ASCE Atlanta Conference, Feb. 1972.

"Water Resource Observatory Solar Radiation Data Water Years 1970 and 1971," by V. E. Smith, et al, (WR Ser. No. 26), Univ. of Wyoming WRRR, Laramie, Wyoming 82070, Nov. 1971.

"Honey Hill: A Systems Analysis for Planning the Multiple Use of Controlled Water Areas," (Vols. I & II - IWR Rpt. 71-9) by Harvard Univ. for US Army Corps of Engrs. IWR, avail. from NTIS, Springfield, Va. 22151, Sept. 1971.

"Identification of Management and Planning Problems of Urban Water Resources in the Metropolitan Area of Greater San Antonio," (Rpt. 39) by J. K. Garner, et al, Texas WRI, Texas A&M Univ., College Station, Texas 77843, Sept. 1971.

- "Treatise on Urban Water Systems," by M. L. Albertson, et al, (based on Inst. on Urban Water Systems presented at CSU June 1970), CSU, Fort Collins, Colorado 80521, July 1971.
- "Federal-State Relations in Water Law," by F. J. Trelease, NWC (PB-203 600) avail. from NTIS, Springfield, Va. 22151, Price \$6, Sept. 1971.
- "A Computerized Educational Program for the Application of the Management Sciences to Water Resource Management," (Rpt. 7), by E. E. Kaczka, et al, WRRC, Univ. of Mass. Amherst, Mass. 01002, June 1971.
- "Water-Supply Development by Water Resources Region," by C. H. Hardison, Preprint 1576, ASCE Atlanta Conference, Feb. 1972.

Water Quality Management

- "Foam Separation of Acid Mine Drainage," by Horizons, Inc., EPA, WPC Res. Ser. 14010 FUI, USGPO, Wash., DC, 20402, Price \$.65, Oct. 1971.
- "Closed Systems for Animal Sewage Treatment," (Rpt. FY 72-7) by J. T. Clayton, WRRC, Univ. of Mass., Amherst, Mass. 01002, 1971.
- "Role of Animal Wastes in Agricultural Land Runoff," by Dept. Bio & Ag Engr., NCSU. EPA, WPC Res. Ser. 13020 DGX, USGPO, Wash., DC 20402, Price \$1.25, Aug. 1971.
- "Characteristics of Wastes from Southwestern Cattle Feedlots," by Texas Tech. Univ. WRC, EPA, WPC Res. Ser. 13040 DEM, USGPO, Wash., DC 20402, Price \$1, Jan. 1971.
- "Pilot Plant Installation for Fungal Treatment of Vegetable Canning Wastes," by The Green Giant Co., EPA, WPC Res. Ser. 12060, EDZ, Wash., DC 20402, Price \$1, Aug. 1971.
- "Dry Caustic Peeling of Tree Fruit for Liquid Waste Reductions," by Nat'l. Canners Assoc., EPA, WPC Res. Ser. 12060 FQE, USGPO, Wash, DC 20402, Price \$.60, Dec. 1970.
- "Proceedings Second National Symposium on Food Processing Wastes," by Pacific NW Water Lab. & Nat'l. Canners Assoc. for EPA, WPC Res. Ser. 16020, USGPO, Wash., DC 20402, Price \$4.50, Mar. 23-26, 1971.
- "Characterization and Separation of Secondary Effluent Components by Molecular Weight," by A. D. Little, Inc. for EPA, WPC Res. Ser. 1620 FEN, USGPO, Wash., DC 20402, Price \$.55, Mar. 1971.
- "A Computer-Directed System for Regulation of Combined Sewage Flows," by C. V. Gibbs, et al, Unpublished paper, ASCE Atlanta Conference, Feb. 1972.
- "Technology Improvements Related to Storm and Combined Sewer Pollution Control," by W. A. Rosenkranz, et al, Unpublished paper, ASCE Atlanta Conference, Feb. 1972.
- "Urban Storm Runoff and Combined Sewer Overflow Pollution," by Envirogenics Co. for EPA, WPC Res. Ser. 11024 FKM, USGPO, Wash., DC 20402, Price \$1.75, Dec. 1971.
- "An Engineering-Economic Study of Cooling Pond Performance," by Littleton Res. & Engr. Corp. for EPA, WPC Res. Ser 16130 DFX, USGPO, Wash., DC 20402, Price \$1.50, May 1970.
- "Demineralization of Wastewater by the Transport-Depletion Process," by Sou. Res. Inst. for EPA (17040 EUN), USGPO, Wash., DC 20402, Price \$.65, Feb. 1971.
- "Detergents in Water, A Bibliography," (WRSIC 71-214), USDI, OWRR, avail. from NTIS, Springfield, Va. 22151, Price \$3 paper, \$.95 micro., Dec. 1971.

- "Evaluation of Conditioning and Dewatering Sewage Sludge by Freezing," by Sewerage Comm. of City of Milwaukee for EPA, WPC Res. Ser. 11010 EVE, avail. from Head, Pub. Branch, Res. Inf. Div., Res. & Mon., Wash., DC 20460, Jan. 1971.
- "Pollution Abatement by Fiber Modification," by EPA, WPC Res. Ser. 12040 EFC, avail. from Head, Proj. Rpts. Sys., Off. of Res. & Mon., Wash., DC 20242, Jan. 1971.
- "Treatment of Selected Internal Kraft Mill Wastes in a Cooling Tower," by Ga. Kraft Co. R&D Center, EPA, WPC Res. Ser. 12040 EEK, USGPO, Wash., DC 20402, Price \$1.25, Aug. 1971.
- "Combined Treatment of Municipal Kraft Linerboard and Fiberboard Manufacturing Wastes," by Macon, Ga., Bd. of Water Comm., et al, EPA, WPC Res. Ser. 11060 DPD, USGPO, Wash., DC 20402.
- "Aerated Lagoon Treatment of Sulfite Pulping Effluents," (WPC Res. Ser. 12040 ELW 12/70) by Crown Zellerbach Corp. for EPA, USGPO, Wash., DC 20402, Price \$1.25, Dec. 1970.
- "Problem Lakes in the United States," (TR 16010 EHR) by M. J. Ketelle, et al, Univ. of Wisc. WRC, Hydraulic & San. Lab., Madison, Wisc. 53706, Dec. 1971.
- "Mercury in Water, A Bibliography," (WRSIC 72-207) USDI, OWRR, avail. from NTIS, Springfield, Va. 22151, Price - \$3 paper, \$.95 micro. Jan 1972.
- "A Microbiotic Ecoassay for Environmental Pollutants," (Rpt. 72-5), by H. G. Gunner, et al, WRRRC, Univ. of Mass., Amherst, Mass. 01002.
- "Control of Mine Drainage from Coal Mine Mineral Wastes," by Truax-Traer Coal Co. for EPA, WPC Res. Ser. 14010 DDH, USGPO, Wash., DC 20402, Price \$1.25, Aug. 1971.
- "Water Pollution Potential of Spent Oil Shale Residues," by Colorado State Univ., EPA, WPC Res. Ser. 14030 EDB, USGPO, Wash., DC 20402, Price \$1.25, Dec. 1971.
- "PCB in Water, A Bibliography," (WRSIC 72-201) USDI, OWRR, Avail. from NTIS, Springfield, Va. 22151, Price \$3 paper, micro. \$.95, Jan. 1972.
- "Inorganic Fertilizer and Phosphate Mining Industries--Water Pollution and Control," by Battelle Mem. Inst. for EPA, WPC Res. Ser. 12020 FPD, USGPO, Wash., DC 20402, Price \$1.75, Sept. 1971.
- "Phosphorus Removal with Pickle Liquor in an Activated Sludge Plant," by Sewerage Comm. of City of Milwaukee for EPA, WPC Res. Ser. 11010 FLQ, USGPO, Wash., DC 20402, Price \$1.25, Mar. 1971.
- "Application of Operations Research Methods for USBR Pipe Distribution Systems," by R. A. Simonds, et al, Engr. & Res. Center, Bur. of Reclamation, USDI, Denver, Colo., Jan. 1972.
- The following process design manuals have been prepared for the Environmental Protection Agency and are available from Technology Transfer, Wash., DC 20242, Oct. 1971:
- "Process Design Manual for Phosphorus Removal," by Black & Veatch (No. 17010 GNP).
 - "Process Design Manual for Suspended Solids Removal," by Burns and Roe, Inc. (No. 17030 GNO).
 - "Process Design Manual for Carbon Adsorption," by Swindell-Dressler Co. (No. 17020 GNR).
 - "Process Design Manual for Upgrading Existing Wastewater Treatment Plants," by R. F. Weston, Inc. (No. 17090 GNQ).
- "Reverse Osmosis Renovation of Primary Sewage," by Envirogenics Co. for EPA, WPC Res. Ser. 17040 EFQ, USGPO, Wash., DC 20402, Price \$.65, Feb. 1971.
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