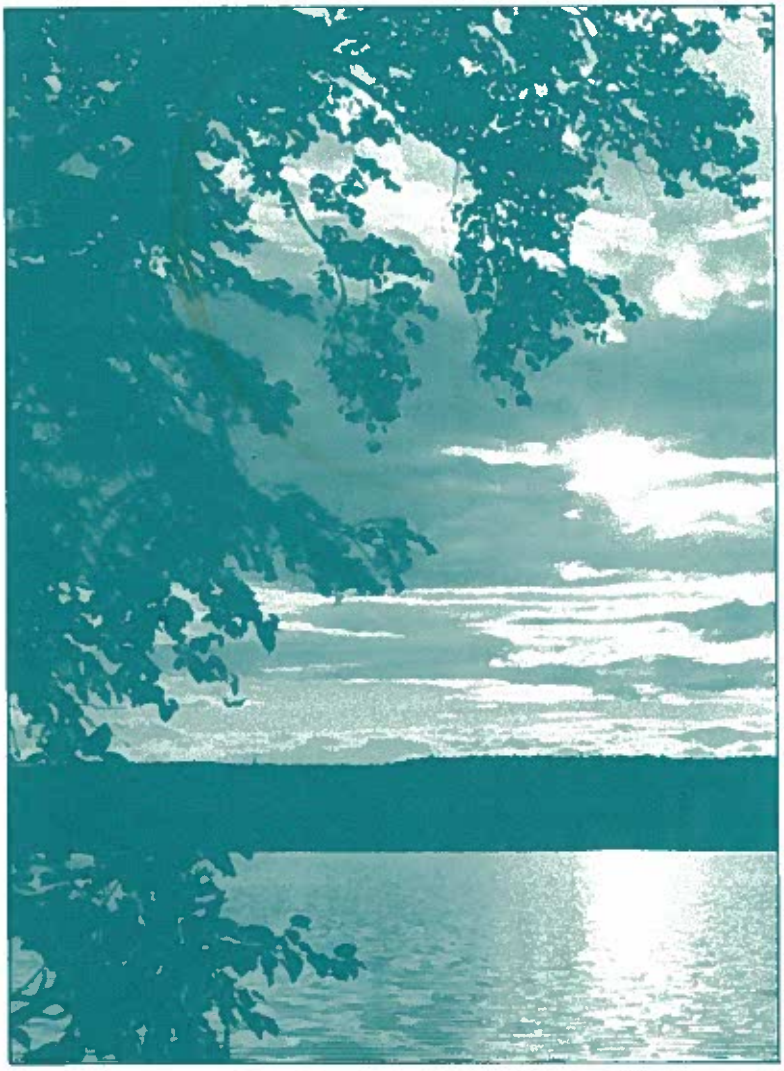
20th Annual

Water Resources Conference



November 19-20, 1987
Earle Brown Continuing Education Center

Presented by:
Department of Professional Development
Continuing Education and Extension
University of Minnesota

Co-sponsored by:
Minnesota Section, A.S.C.E.

20TH ANNUAL WATER RESOURCES CONFERENCE

PROGRAM-AT-A-GLANCE

NOVEMBER 19, 1987

8:30 a.m.	Welcome and Introductions
8:45	Keynote Address
9:15	Nonpoint Source Pollution Programs Contained in the Clean Water Act and Minnesota's Clean Water Partnership
10:30	Erosion Control in Minnesota
11:15	Options for the Financing of Improvements to Existing and Proposed Stormwater Management Systems
12:00	Lunch
1:00 p.m.	A. Design and Performance of Stormwater Detention Ponds for Water Quality Control and Case Study of a Combined Detention-Wetland System, McCarrons Lake, Roseville
	B. Corrugated Polyethylene Pipe: Structural Design and Installation in Storm Water Applications
	C. Hydraulic Characteristics of Storm Water Inlet Grates and Head Losses at Sewer Pipe Junctions
3:00	Repeat Workshops A and C plus State of Development of the Lake Water Quality Simulation Model Minlake
4:40	Social Hour
5:30	Banquet

NOVEMBER 20, 1987

A. MODELING SESSION

8:30 a.m.	Estimation Techniques for the Magnitude and Frequency of Floods
9:05	The Barr Hydrograph Method: A Practical Hydrologic Model for Urban Watersheds
9:40	Determination of Recurrence Interval Based on Risk, Exposure Duration and Season for Design of Temporary Erosion Control
10:45	Stormwater Management Using DR3M and SWMM: It Doesn't Take Time, It Takes Attunement
11:20	Stormwater Management Approaches for Rural Watersheds in Scott County, Minnesota

B. CASE STUDIES

8:30 a.m.	Design and Financing of the First Major 509 Project
9:05	Painter Creek—Upper Watershed Improvement Project
9:40	Lake Pulaski: Problem, Solution, and Status
10:45	Chisago County Lakes Outlet Control Project
11:20	Bassett Creek Tunnel

OPTIONAL AFTERNOON WORKSHOP

1:00 p.m.	Microcomputers in Roadway Drainage Design

20TH ANNUAL WATER RESOURCES CONFERENCE

The University of Minnesota and the American Society of Civil Engineers, Minnesota Section, have collaborated for 20 years to offer the annual Water Resources Conference, which provides the opportunity to examine current water resources ideas and issues. This 20th Anniversary conference will focus on Stormwater Management: Policy and Practice. The conference combines educational formats of general sessions and workshops. Concurrent workshops, scheduled on Thursday afternoon, provide classroom-style, in-depth presentations of six selected state-of-the-art topics. Friday afternoon's optional workshop, "Microcomputers in Roadway Drainage Design," utilizes large-screen video projection to provide a unique learning experience.

This year's conference is again offered at a moderate fee, which includes meals and refreshments. Conference attendees will be awarded one CEU (Continuing Education Unit).

PROGRAM SCHEDULE

THURSDAY, NOVEMBER 19, 1987

7:45 a.m. Final Registration

8:30 **Welcome and Introductions**
Bud Johnson, Conference Chair

8:45 **Keynote Address**
The Honorable Gene Merriam, U.S. Senate

9:15 **Nonpoint Source Pollution Programs Contained in the Clean Water Act and Minnesota's Clean Water Partnership**

In 1987, Congress reauthorized the Clean Water Act, and the Minnesota Legislature passed the Clean Water Partnership. Both address programs to solve nonpoint source (NPS) water quality problems. Minnesota will be providing financial and technical assistance to local units of government to initiate NPS management programs. This presentation will provide an introduction to Minnesota's most dominant water pollution problem, nonpoint source pollution.

Curtis J. Sparks, P.E., Chief, Program Development Section, Division of Water Quality, Minnesota Pollution Control Agency

10:00 Refreshment Break

10:30 a.m. **Erosion Control in Minnesota**

Historically, government-sponsored soil erosion control programs were designed to protect, restore, or enhance soil productivity. In recent years, off-site impacts of soil erosion such as sediment and nutrient damage to resources and public and private facilities have attracted increased attention and funding. This presentation will discuss recent erosion control programs, which show an increasing sophistication in blending federal, state, and local government.

Jim Birkholz, Acting Director, Soil and Water Conservation Board, Department of Agriculture

11:15 **Options for the Financing of Improvements to Existing and Proposed Stormwater Management Systems**

Current laws allow a variety of financing options for the construction of stormwater management systems. These options are dependent on whether the local unit of government or agency is a municipality, county, or watershed management organization. The financing options available to each governmental entity will be briefly reviewed and discussed.

Fred Richards, Popham, Haik, Schnobrich, Kaufman & Doty, Ltd.

12:00 noon Lunch

Afternoon Concurrent Workshops

1:00 p.m. **A. Design and Performance of Stormwater Detention Ponds for Water Quality Control**

With appropriate adjustments in design, detention ponds commonly used for control of peak discharge from urban developments can provide significant water quality control benefits. Performance data, modeling techniques, and design recommendations developed under the EPA's Nationwide Urban Runoff Program and other studies will be discussed. Applications to urban developments in Massachusetts and Minnesota, including the St. Paul water supply watersheds, will be described. Computer software for use in design calculations will be demonstrated.

William W. Walker, Jr., Ph.D., Environmental Engineer

AND

Case Study of a Combined Detention-Wetland System, McCarrons Lake, Roseville

As part of the McCarrons Lake Clean Lake project, the city of Roseville altered an existing 28-acre flow-through wetland to include a three-acre wet detention pond followed by six small, bermed wetland enclosures. Water quality and quantity data have been collected since the treatment system became stabilized in September 1986. Data will be presented showing the effectiveness of this system and recommendations will be made on how the system could be improved to better protect the quality of the lake.

Gary L. Oberts, Environmental Planner, Metropolitan Council

1:00 p.m. **B. Corrugated Polyethylene Pipe: Structural Design and Installation in Storm Water Applications**

This workshop addresses structural design and installation of corrugated polyethylene pipe for seer and culvert applications based on the current state of the art. The concepts presented can also be applied to smooth- and ribbed-wall configurations. The content will be drawn from current and proposed standards and research of the lecturer, which includes the ASCE Structural Plastics Design Manual and the NHRCP Report #225– Plastic Pipe for the Subsurface Drainage of Transportation Facilities. Design examples will be used to illustrate key elements of the design approach.

Richard E. Chambers, Principal, Simpson Gumpertz & Heger, Inc.

C. Hydraulic Characteristics of Storm Water Inlet Grates

Hydraulic testing of various inlet grates at Neenah Foundry Company has resulted in accurate performance "K" charts. With the use of the modified manning equation and hydraulic charts, determination of inlet grate capacities for longitudinal and transverse slopes up to 6% are accomplished. This presentation discusses placement of inlet grates based on design criteria and also selection and sizing of grates in ponding situations. Hydraulic manuals, a slide rule calculator and a video tape of different tests will be utilized.

Steven Akkala, P.E., Product Engineer, Construction Division, Neenah Foundry Company

AND

Head Losses at Sewer Pipe Junctions

Sewer surcharging and the resulting overflows and flooding are often caused by excessive head losses at sewer junction manholes. Such losses and the means of their reduction have been studied in the laboratory for manholes with a 90-degree bend, junctions of a main with a lateral, and junctions of two opposing laterals. Among the junction parameters studied, the benching inside the manhole has been found particularly important for reducing head losses. New benching designs leading to lower head losses have been proposed.

Jiri Marsalek, Rivers Research Branch, National Water Research Institute

2:40 Break

3:00 **A. *REPEAT:* Design and Performance of Stormwater Detention Ponds for Water Quality Control**

AND

Case Study of a Combined Detention—Wetland System

B. State of Development of the Lake Water Quality Simulation Model Minlake

A computer model which simulates several water quality parameters in a stratified lake during the main growth season is under development. Simulation subroutines are being developed for several typical lake water quality management

techniques such as aeration, destratification, inflow treatment or diversion, sediment nutrient inactivation, and others. This presentation will involve the principles for process oriented dynamic lake water quality modeling, history of the Minlake model development, and applications of earlier forms of the model, the current model status, and two demonstrations for its application.

Heinz G. Stefan and Michael J. Riley, St. Anthony Falls Hydraulic Laboratory, Department of Civil and Mineral Engineering, University of Minnesota

C. *REPEAT:* Hydraulic Characteristics of Stormwater Inlet Grates

AND

Head Losses at Sewer Pipe Junctions

4:40 p.m. **Social Hour**

5:30 **Banquet**

Presentation of Outstanding Water Achievement Award

"Water and Your Possible Futures"
Earl Joseph, President and Futurist, Anticipatory Sciences, Inc.

Friday, November 20, 1987

A. Modeling

8:30 a.m. **Estimation Techniques for the Magnitude and Frequency of Floods**

The estimation of the magnitude and frequency of flooding has long been a controversial topic among engineers. Several techniques are commonly used to estimate peak flood discharges at ungaged sites. This presentation compares the common rational formula, Adolf Meyers' original regression equations, and a new regression analysis by Jacques and Lorenz of the USGS. In the Jacques/Lorenz study, Log-Pearson type III flood-frequency analyses were made of annual series peak-flow records from 246 gaging stations on unregulated streams in Minnesota with watersheds ranging in area from 0.08 to 2,520 square miles.

Jim Jacques, United States Geological Survey

9:05 **The Barr Hydrograph Method: A Practical Hydrologic Model for Urban Watersheds**

A typical problem in water management is determining runoff volume and rate. A hydrological model was developed by Barr Engineering Company as a practical solution to this problem. The model was established 30 years ago and has been modified to include updated hydrologic methods and computerization. The model has been used extensively on urban watersheds for the design of storm water management facilities.

Joel W. Toso, Ph.D., Barr Engineering Company

9:40 a.m. **Determination of Recurrence Interval Based on Risk, Exposure Duration and Season for Design of Temporary Erosion Control**

Temporary erosion control facilities can be designed using the hydrologic/hydraulic design methodology traditionally used for permanent stormwater facilities. The prudent designer, however, must make preceding judgements and computations before using the traditional approach. This presentation examines the areas of level of risk, duration of exposure, and time of year of exposure in order to develop a more rational approach to design of these temporary facilities.

Roger A. Baumann, P.E., Globetrotters Engineering Corporation

10:15 Break

10:45 **Stormwater Management Using DR3M and SWMM: It Doesn't Take Time, It Takes Attunement**

Complex urban watersheds can be effectively described in a model and changed or optimized as inexpensive acquisition systems are established, providing large amounts of good data. This presentation describes such a modeling effort with two excellent computer models for urban stormwater management: DR3M (USGS) and PC-SWMM (EPA). A comparison is made between the two models and an extensive literature review is provided. Some sensitivity analysis is performed for DR3M. Suggestions are made (based on Dr. William James' work, University of Alabama) as to the future direction of this design practice.

Jeffrey McNabb, Water Resource Management, University of Minnesota

11:20 **Stormwater Management Approaches for Rural Watersheds in Scott County, Minnesota**

Water quality improvement of agricultural runoff is one objective of watershed management planning for four rural watersheds in Scott County. Priority subwater-sheds within the major watershed are being established based on nutrient and sediment yields. Erosion control of clay soils will be strongly emphasized in priority subwatersheds. Throughout the watershed, a phosphorus adsorption index, based on extractable aluminum in soils, is to be used as one of the criteria for siting sedimentation ponds and wetland storage locations.

Steve McComas, President, Blue Water Science, Inc.

B. Case Studies

8:30 a.m. **Design and Financing of the First Major 509 Project**

Valley Branch Watershed District is now completing the first project carried out under the Metropolitan Water Management Planning Act of 1982 (Chapter 509). The resulting project utilized unique solutions to solve hydraulic, water quality, and financing problems. These solutions included low flow bypasses past two major lakes and financing the project with a combination of district-wide and subwatershed advalorem levies, special assessments based on benefit, and grants.

Nels P. Nelson, Barr Engineering Company

9:05 a.m. **Painter Creek—Upper Watershed Improvement Project**

As the first phase of the Upper Watershed Improvement Project, the Minnehaha Creek District analyzed, determined the feasibility of, and implemented comprehensive stormwater management and detention facilities for a 13.6 square mile subwatershed tributary to Lake Minnetonka. Project tasks included a computer simulation analysis to predict necessary detention storage requirements for anticipated ultimate development conditions, flowage easement negotiation and acquisition, and construction of four sheet pile flow control structures, two in-channel sedimentation basins, and 1.4 miles of channel improvements.

Michael Panzer or Jim Mahady, E. A. Hickok and Associates

9:40 **Lake Pulaski: Problem, Solution, and Status**

Lake Pulaski is a terminal lake that experiences large lake level fluctuations. A long-term trend in increasing lake levels, especially during the last six years, has led to significant damage to public and private property on Lake Pulaski. Lakeshore residents have sought relief through the Corps of Engineers Section 205 Flood Control Program. This presentation will provide an overview of the problem and describe the planning, engineering, construction, and operation of the project.

Dan Reinartz, Hydraulic Engineer, and Mary Schommer, Project Manager, St. Paul District, U.S. Army Corps of Engineers

10:15 Break

10:45 **Chisago County Lakes Outlet Control Project**

A major lake system located in Chisago County has experienced extremely high water levels over the past several years. A high percentage of lakeshore properties have been damaged by the excessive levels. Six major lakes are involved, covering more than 5,000 acres of water surface. Due to the combination of various lake levels and regulated levels for the lake, a complex system of hydraulic structures, together with a complex management plan, is required to provide relief to property owners. The selected system has a hydraulic capacity which will lower all of the lakes an average of two inches per week. The final plans were delivered to the County after approximately five months of public investigation, public information, and design efforts. Part of this 1.9 million dollar project was completed before fall freeze-up, thus averting further property damage.

John B. Erdmann, P.E., and Norman C. Wenck, P.E., Wenck Associates, Inc.

11:20 a.m. **Bassett Creek Tunnel**

The existing Bassett Creek outlet to the Mississippi River is a tunnel under Minneapolis that is deteriorating badly. The authorized flood control project recommends a new tunnel system to carry both Bassett Creek flows and drainage from Interstate 94. Portions of the system have been built and the remainder is scheduled for construction over the next several years. This presentation will discuss the hydraulic design of the Bassett Creek portion of the system, with emphasis on the more unique aspects of the design, especially air management.

Patrick Foley, Chief, Hydraulics Section, St. Paul District, U.S. Army Corps of Engineers

12:00 noon **Conference Adjourns**

OPTIONAL AFTERNOON WORKSHOP

1:00–4:00 p.m. **Microcomputers in Roadway Drainage Design**

Roadway inlets are generally required to collect storm runoff from urban roadways. The inlets may be grate inlets, curb-opening inlets or a combination of the two. The design includes determining the type, proper location and capacity of the inlet so that runoff is effectively and efficiently intercepted.

After the runoff has been intercepted by the inlets, hydraulic calculations are required to determine pipe sizes and gradients necessary to convey the flow to an outfall. Although the calculations can be completed by hand computations and the aid of design charts, use of such charts is time consuming and subject to errors. Microcomputer programs have been developed for storm drainage system design which permits performing calculations rapidly and with increased accuracy. These programs also permit the designer to analyze a number of alternatives in a relatively short time.

A microcomputer program for calculating the interception of grate inlets, curb-opening inlets and slotted drain inlets employs the design methods presented in Hydraulic Engineering Circular No. 12 (HEC #12), "Drainage of Highway Pavements," of the Federal Highway Administration. A microcomputer program being developed for storm sewer design is PFP-HYDRA. This program can be used either to model an existing system or to design a new system. PFP-HYDRA is not an optimization program, thus alternatives need to be run and analyzed by the engineer.

The workshop will present design information from HEC #12 along with sample calculations for determining inlet type and capacities. Use of the microcomputer in roadway drainage design will be demonstrated and program capabilities discussed.

Dennis L. Richards, Simons, Li & Associates, Inc.

REGISTRATION AND FEES

The fee for the 20th Annual Water Resources Conference is $100, which includes one luncheon, refreshment breaks, the banquet, and instructional handouts. A refund, minus a $15 cancellation fee, will be made if the registration is cancelled five working days prior to the conference. Full refund will be made if the conference is cancelled by the University of Minnesota.

The fee for the optional workshop, **Microcomputers in Roadway Drainage Design**, is an additional $30.

LOCATION

The conference will be held at the Earle Brown Continuing Education Center on the St. Paul Campus of the University of Minnesota. A map and directions will be sent with registration confirmations. Parking is available adjacent to the Center for 80¢ per day and across the street in the Fairgrounds Lot for 55¢ per day.

Convenient lodging for out-of-town participants is available at the Holiday Inn-Roseville (612/636-4567) and the Super 8 Motel (612/636-8888).

FOR FURTHER INFORMATION, CONTACT:

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1987 WATER RESOURCES CONFERENCE PLANNING COMMITTEE

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REGISTRATION FORM

20th Annual Water Resources Conference
November 19-20, 1987

50-05 JV
Earle Brown Center

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TITLE/POSITION

☐ Registration for the Conference only ($100).

☐ Registration for the Conference and the Microcomputers in Roadway Drainage Design Workshop ($130).

☐ A check or money order payable to the University of Minnesota is enclosed.

☐ The fee will be paid by my employer. Enclosed is a purchase order or a letter of authorization.

SIGNATURE DATE

MAIL TO: Registrar
Professional Development and Conference Services
University of Minnesota
338 Nolte Center
315 Pillsbury Drive S.E.
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Other Professional Development Programs Of Interest To Engineers & Scientists

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October 15-16, 1987

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9th Annual Midwest Conference on Environmental Laboratory Technology
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January 19, 1988

34th Annual Wastes Engineering Conference
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