



# FLOOD HAZARD NEWS

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## EVALUATING AND IMPLEMENTING URBAN DRAINAGE AND FLOOD CONTROL PROJECTS

by NEIL S. GRIGG

*The article following is based on a report prepared for the Urban Drainage and Flood Control District and the U. S. Office of Water Resources Research entitled, "Evaluation and Implementation of Urban Drainage and Flood Control Projects," by the writer together with Leonard Rice, Les Botham and Joe Shoemaker. This report is available from the District or at Colorado State University. It is the result of the first phase of a two phase project and a final report will be issued in June, 1975. Comments, questions or any other correspondence relating to the study can be directed to the writer at the CSU Engineering Research Center, Ft. Collins, Colorado 80523, (303) 491-8578.*

Evaluation and implementation of urban drainage and flood control (UDFC) projects are problems which confront public works officials constantly. Urban Drainage and Flood Control must compete with other urban programs for funding from the limited public purse. It is important to be able to describe and enunciate all of the benefits that these projects provide so that they can compete for funding. This is only one of the evaluation-related problems that confront the public works manager responsible for urban drainage and flood control. Other types of evaluation problems are: the determination of the merit of individual projects, the determination of optimal investment timing and the determination of the incidence of costs and benefits on different population sectors so that project costs can be equitably apportioned.

The evaluation and implementation questions should not be viewed as problems for the policymaking level, but for the analyst and engineer. Who should respond to the guidance provided in the form of goals, objectives, strategy or criteria. The evaluation can best be performed *in terms of the criteria provided.*

Evaluation methodologies are often couched in economic terms—such as Benefit-Cost Analysis. This does

not mean that projects should be selected or implemented solely on the basis of the familiar flood control benefit found from UDFC projects. On the contrary, methodologies must be found which can measure the extent to which alternative projects help meet economic, social and environmental goals.

Drainage and flood control problems in an urban region are a direct result of human interference with normal drainage patterns. In a growing metropolitan area, the thrust of drainage solutions should be in two basic directions, prevention and remedial works.

Preventive activities take the form of flood plain management together with good planning. As rural areas urbanize, flood plains can be developed in such a manner so as to preclude or minimize future damages and problems from flooding. Also, as urbanization proceeds, adequate local drainage should be provided along with streets, roads, schools, parks and other public facilities, consistent with wise levels of public investment.

Situations that require remedial action are those where flood plains have been improperly occupied and developed and where local drainage problems have not been adequately considered and handled. In these cases, positive steps are needed, usually by a public agency, to remove the hazard or alleviate the inconvenience caused by flooding.

Drainage and flood control activities can be placed into structural and non-structural categories. Structural activities incorporate both preventive and remedial categories and include installation of storm sewers, culverts, inlets, adequate curb and gutter, channelization and detention facilities. Non-structural activities also overlap both preventive and remedial functions and include flood plain management (preventive), flood plain warning (remedial), and flood insurance (remedial).

Structural activities relating to urban drainage and

(Continued on Page Eight)

### ABOUT THE AUTHOR . . .

**DR. NEIL S. GRIGG**, a native of Montgomery, Alabama, graduated in 1961 from the U. S. Military Academy. He was commissioned in and served active duty with the U. S. Army Corps of Engineers. Following his discharge from the Army in 1964 he attended graduate school receiving a M. S. degree at Auburn University. He moved to Denver, joining the Ken R. White Company, Architects-Engineers-Planners, and later was co-founder of Sellards & Grigg, Inc., a Lakewood civil engineering consulting firm. After receiving his Ph.D. degree at Colorado State University, he joined the faculty at the University of Denver where he held the jobs of Civil Engineering Chairman and Assistant Dean of Engineering. He is currently a member of the Civil Engineering faculty at Colorado State University where his specialties are water resources and urban engineering. His current research projects concern automatic control of urban water systems, economic evaluation of urban water projects and dynamic modeling for urban public works planning.



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## Effects of Storm Water Detention In Urban Areas

by BILL ALLEY

### WHAT IS STORM WATER DETENTION?

Detention of storm runoff has emerged in recent years as a promising alternative to conventional methods of urban stormwater runoff management. It basically involves the collection of excess storm runoff prior to its entrance into the main drainage system. Stormwater detention can be used to attenuate peak runoff flow rates for the purpose of ameliorating or eliminating such problems as flooding, soil erosion, siltation, sewer overflows, and sewer surcharging. Detained stormwater may also be beneficially used for recreation, ground water recharge, irrigation, industrial cooling, and augmentation of water supplies for potable or sub-potable uses. Stormwater is highly polluted and generally will require treatment prior to its beneficial use.

A proposal for a research study, "The Effects of Stormwater Detention in Urban Areas," is currently being drafted for the American Public Works Association (APWA) by the Urban Drainage and Flood Control District and the Colorado-Wyoming chapter of the APWA. The proposal will use as a springboard Herbert Poertner's recently released "state of the art" report, "Practices in Detention of Urban Stormwater Runoff" (APWA Special Report No. 43). The proposed research program will be divided into four phases.

### WHAT ARE THEY?

Phase I will consist of two studies, a "runoff flow rates" study and a "water quality" study.

The "runoff flow rates" study will involve investigation of the use of stormwater detention for attenuation of peak runoff rates of both minor and major drainages and for reduction or elimination of sewer surcharging.

The "water quality" study will involve investigation of the use of stormwater detention for improving the water quality of an area via either of two mechanisms: (1) through stormwater treatment and (2) through beneficial side effects. The investigation of stormwater treatment will include studies of the costs and benefits of various methods and degrees of treatment, runoff control strategies, practical control criteria for the handling of stormwater, and investigation of using detained stormwater for beneficial uses. The investigation of the beneficial side effects of stormwater detention will center on its effect on sewer overflows and soil erosion problems.

Phase I will involve the use of computer simulation. Through computer simulation many detention alternatives can be investigated relatively inexpensively, rapidly, and safely for many variations in time and space.

An evaluation of current computer models applicable to the problem has been conducted. The EPA Storm Water Management Model has been found to be the best available model for evaluation of water quality and minor drainage runoff flow rates. The MIT Catchment Model is felt to be the most economically realistic model for simulation of major drainage runoff, though the Stanford Watershed Model is more accurate.

The test areas will be selected from catchment basins for which verification-calibration data has been collected. This will allow more accurate results and substantially reduce the modeling costs.

In Phase II an attempt will be made to solve three of the problems of primary concern to public works administrators. First, the legal aspects of stormwater detention will be investigated, including the legal authority of jurisdictions to require detention storage, the allowable strin-

(Continued on Page Four)

# Tucker-Talk

by L. SCOTT TUCKER

*Timely Comment from the District's Executive Director*



**FLOOD HAZARD NEWS EDITOR, HENRY HOUGH, DIES AT 67**

Henry Hough, editor of *Flood Hazard News*, died in May at Rose Memorial Hospital. He was 67. Hough, of Denver, Colorado, had been editor of *Flood Hazard News* since its beginning in January of 1971. Twelve issues of the Newsletter were published under his direction.

He was born October 12, 1906 at Bridger, Montana, and attended the University of Montana at Missoula after graduating from High School at Billings, Montana. Hough moved to Denver and worked as a cub reporter on the old *Denver Express* and was editor of the United Press Bureau in Denver from 1928 to 1929. He then moved to New York City as associate editor of *Scientific American* magazine and returned to Denver in 1932.

He became Chief of the Denver News Bureau for the *Time* and *Life* magazines until 1946 when he worked for Petroleum Publishers, Inc., Denver, as editor of its magazines and Secretary-Treasurer of the Corporation. Most recently he was poetry editor for the *Denver Post*. He will be missed.

The responsibility for editing the *Flood Hazard News* has been assumed by Bill DeGroot of the District's staff. Bill brings to us his experiences as sports editor with the *South Dakota Tech* newspaper of the South Dakota School of Mines. I am confident that with Bill's enthusiasm and experience, the quality of *Flood Hazard News* will not be diminished.

## **NEW BOARD ROOM COMPLETED**

Remodeling of District Offices to provide a Board of Director's meeting room was completed in June 1974. The first board meeting in the new facility was held in June. The new facility will also provide a badly needed location for the many meetings and conferences that are held at District offices.

## **ASCE CONFERENCE ON "URBAN RUNOFF-QUANTITY & QUALITY"**

I will attend the research conference entitled "Urban Runoff-Quantity and Quality" at Franklin Pierce College in Rindge, New Hampshire, from August 11 through August 16, 1974. The objectives of the conference are 1) to effect a technology transfer; 2) consider the availability of data/information; 3) consider a technology of data collection in the Urban Water Resources field; and 4) highlight remaining urban water problems requiring solution and consideration of research priorities.

I will give a talk on "Intra-and Inter-Organizational Arrangements for Management". A post-mortem of the affair will be provided in the next issue of *Flood Hazard News*.

## **SUMMARY OF DISTRICT ACTIVITIES**

The model flood plain regulation adopted by the District in 1970 is being re-evaluated. Present plans are to amend the existing regulation by resolution at the August or September board meeting. The present regulation is basically sound and changes will be relatively minor.

Arrangements have been completed with the Soil Conservation Service to conduct a Flood Plain Informa-

tion Study on Rock and Coal Creeks in Boulder County. Participating in the project are Boulder County, Weld County, Coal Creek Water Users Association, Colorado Water Conservation Board and the District. The project will be completed in July, 1975.

Preparations are underway to initiate a \$130,000 flood plain delineation program. The funds for the program will consist of \$100,000 from the Colorado Water Conservation Board and \$30,000 from the District. The drainageways to be defined are being chosen in cooperation with the six counties comprising the District.

Requests for reviews of plans of developers that affect major drainageways continue to come from the local entities. Requests have been received from all six District counties. Guidelines were developed for use by developers in planning and preparing plans for major drainageways. Copies of the guidelines have been distributed to all local entities for their use, and additional copies can be obtained upon request to the District.

Maps showing 100-year flood plains are being prepared at a scale of 1" = 1000 ft. The purpose of the 1" = 1000 ft. maps will be to provide a medium by which the public can readily determine whether or not they are located in the 100-year flood plain. Existing District, Corps or other information will be transferred to the 1" = 1000 ft. mapping.

The District is continuing its efforts to help coordinate the HUD flood insurance program. The Flood Insurance Act passed in December, 1973 has substantially increased the interest in flood insurance. It has also provided a substantial incentive for local entities to adopt flood plain regulations.

Thus far, six drainage master planning projects have been completed by the District. These include Weir/Sanderson Gulches, Little Dry Creek in Arapahoe County, South Boulder Creek, Big Dry Creek in Adams County, Niver Creek, and the Brighton Drainage. There are presently nine master planning projects underway including those on Goldsmith Gulch, Lena Gulch, Big Dry Creek (Arapahoe County), First Creek, Lakewood/McIntyre Gulches, Westerly Creek, Basin 6100 in Arapahoe and Jefferson Counties, Sand Creek and the Highline Canal. The flood hazard delineation study is on Coal and Rock Creeks in Boulder County.

Negotiations are now underway for master planning efforts with local entities on five drainage ways. These include Ralston/Leyden Creeks, Grange Hall Creek, Mayham Lake, Cherry Creek, and South Boulder Creek. It is hoped to initiate these projects in the near future. Negotiations are also underway for a second flood hazard delineation project on Dry Creek and Boulder Creek in Boulder County.

In addition to master planning and flood plain delineation studies, several construction projects are in various stages of activity. The final design for Sanderson Gulch has been completed and is now being reviewed by the District, Denver, and Lakewood. The project will cost  
(Continued on Page Nine)

## Storm Water Detention

(Continued from Page Two)

gency of local controls, the relationship of detention storage and drainage laws, and enforcement policies necessary to force compliance with any legislation that should be enacted. Second, an equitable cost allocation system will be determined. Third, operation and maintenance problems associated with stormwater detention will be investigated.

Phase III will consist of establishing a cost/effectiveness analysis procedure and implementation of selected stormwater detention facilities into the land use and urban drainage and flood control plans of test areas.

Phase IV will involve the construction of a stormwater detention criteria manual. This will involve synthesis of Phase I through III into *transferable* criteria and procedures for cost/effective implementation of stormwater detention into the land use and urban drainage and flood control plans of an area. The needs of engineers, architects and planners for straightforward, uncomplicated procedures and criteria will be stressed.

### SO WHAT?

It is hoped that through an investigation of this sort stormwater detention will take its proper place among conventional methods of stormwater runoff management. The possible future requirements for stormwater treatment accentuate the need for further investigation of stormwater detention.



William M. Alley is a student-intern of the Resources Development Internship Program working on the above project for the District. The Resources Development Program is administered by the Western Interstate Commission for Higher Education (WICHE) of Boulder, Colorado.

Bill is one of 200 Resources Development student-interns who are working throughout 13 western states this summer in community service projects in economic development, health services, environmental problems, the humanities, and several other areas. He will be working on drafting the above proposal until August 21.

Bill received his Bachelor of Science degree in Geological Engineering this past May at the Colorado School of Mines and will be beginning work on his Master of Science degree in Hydrology at Stanford University this fall.

Bill's interests include backpacking, bicycling, tennis, and music.

## Status of Flood Insurance Within the District

Federally subsidized flood insurance is now available to a substantial majority of the citizens living and working within the boundaries of the Urban Drainage and Flood Control District. Exact eligibility figures are difficult to obtain because the District boundaries do not coincide with county boundaries. However, it is estimated that approximately 90% of the District's population is eligible for at least the first level of insurance coverage.

The District's activities in the area of flood insurance consist primarily of encouraging those communities not yet eligible to become eligible, assisting communities in formulating required land use regulations and providing other assistance as requested.

The following table shows the current flood insurance status of local entities within the District.

ENTITY	FIA HAZARD MAP PUBLISHED	REGULAR PROGRAM	EMERGENCY PROGRAM
Adams County			X
Arapahoe County			X
Arvada	X	X	
Aurora	X		X
Boulder	X		X
Boulder County			X
Brighton	X		X
Broomfield	X	X	
Cherry Hills Village	X		X
Columbine Valley	X		X
Commerce City			X
Denver			X
Douglas County			•
Edgewater			X
Englewood	X	X	
Federal Heights			•
Glendale			•
Golden	X		
Greenwood Village			•
Jefferson County			X
Lafayette			•
Lakeside			
Lakewood	X	X	
Littleton	X		X
Louisville	X	X	
Mountain View			
Morrison			
Northglenn			
Sheridan	X		X
Thornton			
Westminster	X		X
Wheat Ridge	X	X	

\*Application Pending

MARK YOUR CALENDAR NOW

## SEMINAR ON FLOOD PLAIN MANAGEMENT

NOV. 14-15, 1974

## FLOOD PLAIN MANAGEMENT Developing a Program

by BILL DeGROOT

ADMINISTRATOR FLOOD PLAIN MANAGEMENT PROGRAM

### FLOOD PLAIN MANAGEMENT CONFERENCE

I attended the National Conference on Flood Plain Management, which was held on July 23-25 in Washington, D. C. The conference topics included uses of the flood plain, experiences in flood plain management, avenues to improved flood plain management, and recommended initiatives. Several speakers mentioned that although there are new federal programs, such as the recently amended National Flood Insurance Program and the Water Resources Development Act of 1974, which will be a great help in furthering flood plain management, the ultimate success or failure of such programs still rests with local and state governments.

The National Flood Insurance Program is undoubtedly the strongest federal land use legislation yet passed. Entry into the program is almost mandatory for approximately 15,000 communities in the United States. Admission to the program will ultimately require the local governments to adopt land use controls, sub-division regulations, and building codes designed to minimize flood damage. The Federal Insurance Administration will eventually provide flood plain and floodway definitions for all identified flood prone communities. However, this will take several years.

The Water Resources Development Act of 1974 requires federal agencies to look at non-structural alternatives to flood damage mitigation. Quoting from section 73(a): "In the surveying, planning, or design by any federal agency of any project involving flood protection, consideration shall be given to non-structural alternatives to prevent flood damages including, but not limited to, flood proofing of structures; flood plain regulation; acquisition of flood plain lands for recreational, fish, and wildlife, and other public purposes; and relocation with a view toward formulating the most economically, socially, and environmentally acceptable means of reducing or preventing flood damage."

In addition to these new programs, additional federal aid is available from the Corps of Engineers, the U. S. Geological Survey, and the Soil Conservation Service. In the end, it is still the local governments which must carry the ball.

### HUD APPOINTS FLOOD INSURANCE SPECIALISTS

The Federal Insurance Administration has recently appointed Mr. Joe Brown and Mr. Jerry Olson as Flood Insurance Specialists for Region VIII. They will be the Flood Insurance Administration contacts for all governments located in Region VIII. They will also be responsible for coordinating flood insurance studies within each community, to insure that the locally elected officials have an input into the insurance studies.

Mr. Brown and Mr. Olson have been attending training sessions in Washington. By the time you read this, they should be on the job and ready to assist local officials with any problems they may have. I look forward to working with Joe and Jerry, and am confident that they will be a great deal of help in sorting out some of the confusion that now exists with regard to the insurance program.

One of the first things I hope to do is to coordinate our flood plain delineation program with the FIA Flood In-

surance Studies. By coordinating our efforts, we should be able to avoid duplication and have flood plains delineated for the entire district much sooner than we ever felt would be possible before.

### FLOOD PLAIN MANAGEMENT SEMINAR

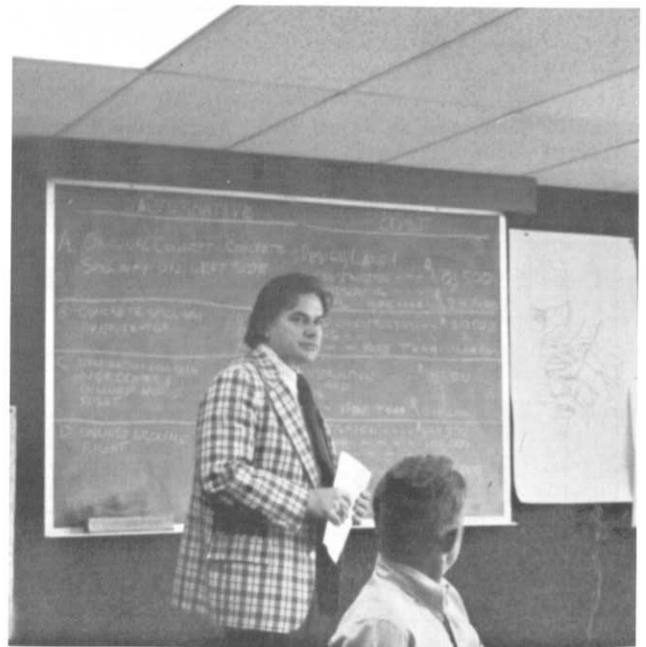
We are in the process of putting together a two day Seminar on Flood Plain Management. We have tentatively scheduled the seminar for November 14 and 15, 1974. Our goal will be to present a complete range of flood plain management alternatives as well as implementation strategies. One of our featured speakers will be Don Barnett, Mayor of Rapid City, South Dakota. I had the opportunity to observe Mayor Barnett in action while I was attending graduate school in Rapid City. He is a very articulate man with some very strong views on flood plain management.

We will be sending out a brochure on the seminar as soon as we have the program shaped up. Please set aside November 14 and 15 on your calendar now.

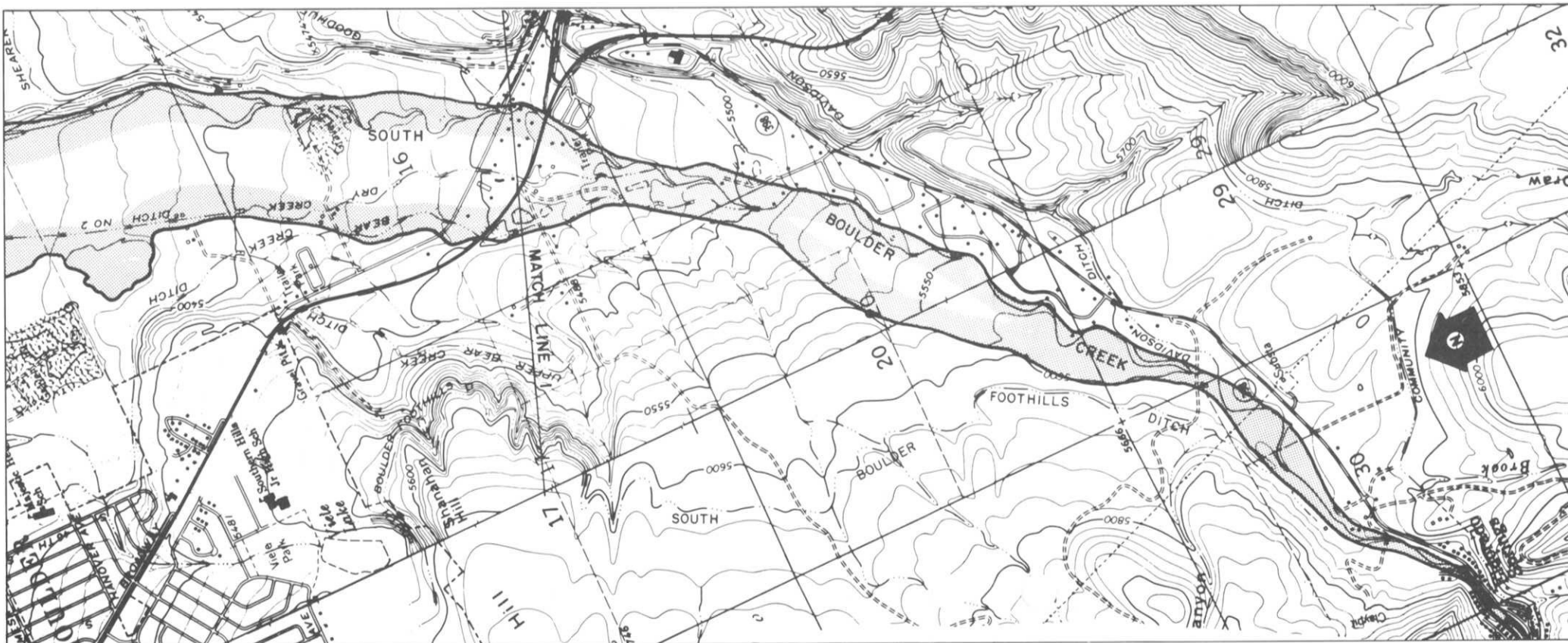
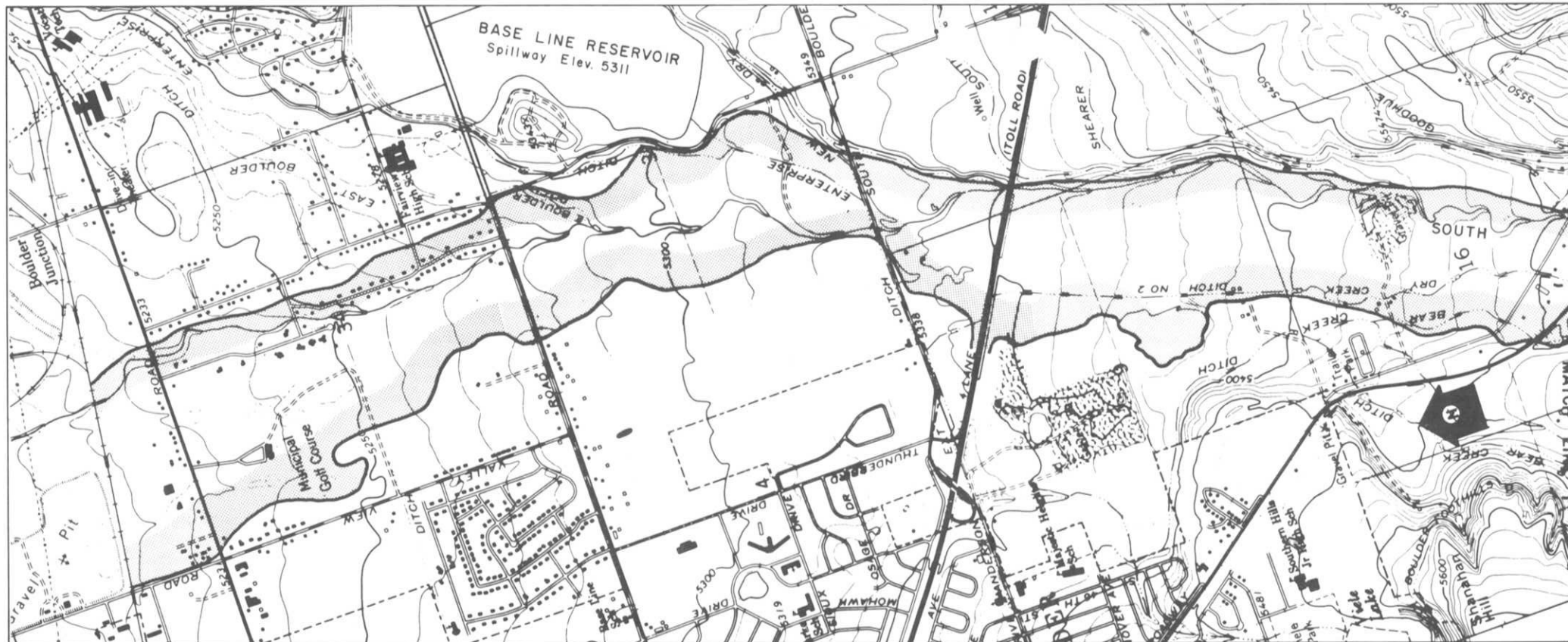
### PUBLIC INFORMATION

One of the difficulties the District has had since its founding has been the problem of getting flood hazard information to the general public. Although we have a great deal of information on flooding hazards, both from our master plans and from the Corps of Engineers Flood Plain Information Reports, the cost and limited quantities of the reports has made it very difficult to get this information to the general public at a reasonable cost. In an effort to solve this problem, we are preparing a series of Flood Plain Information Maps. We are transferring the latest available flood plain delineations from the detailed studies to strip maps obtained from U.S.G.S. photo revised quads. The maps are prepared on 22" x 34" mylar at a scale of 1" = 1,000 feet. They can be reproduced in quantity and are available to the public at a cost of \$1 per sheet. An example is shown on pages 6 and 7.

## District's New Board Room



Herb McCall, from McCall, Ellingson and Morrill, Inc., answers questions concerning design alternatives for Englewood Dam at first meeting in the District's new board room. New facilities include a cork wall, chalk board, movie screen and coffee machine.



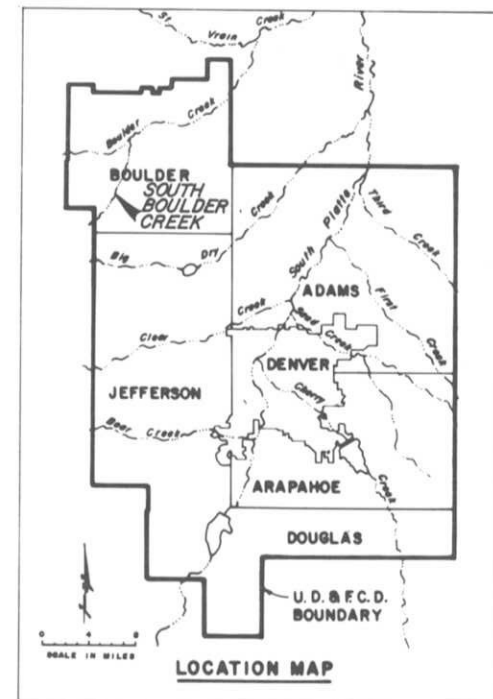
**NOTES**

100-Year flood plain boundaries obtained from MAJOR DRAINAGE WAY PLANNING SOUTH BOULDER CREEK, Volume II by R.W. Beck and Associates, December, 1973

Flood plain boundaries adopted by Colorado Water Conservation Board on June 21, 1974.

This map is intended for use as a guide to show approximate 100-year flood plain boundaries. More detailed information can be found in report noted above. This report is available for review at the office of The Urban Drainage and Flood Control District.

This map delineates the 100-year flood hazard area. Larger floods can and do occur.




**LEGEND**

100 - Year Flood Plain

Base Map from U.S.G.S. Mapping Aerial Photography 1971



 <b>URBAN DRAINAGE AND FLOOD CONTROL DISTRICT</b>	
<b>FLOOD PLAIN INFORMATION MAP</b>	
<b>SOUTH BOULDER CREEK</b>	
ENGINEER <b>R. W. BECK AND ASSOCIATES</b>	
DRAWN LRC/INC/GD.	DISTRICT DRAINAGEWAY NO. 3021
CHECKED U D & FCD/BD	
DATE AUGUST, 1974	SHEET 1 OF 1

## Flood Control Projects

(Continued from Page One)

flood control (UDFC) provide a *service* for the improvement of living conditions in urban areas. As a service, they provide for three types of needs: (1) the need for flood damage mitigation and protection; (2) the need for rapid drainage of public facilities for the basic purpose of convenience; and (3) the need for environmental management such as cleansing of streets and washing away collected dust and pollutants.

The above needs may at first glance appear to be at odds with the trends toward on-site detention and preservation of natural drainage-ways. This is not intended to be the case; in fact, the best drainage system available should provide the services described *and* be consistent with sound environmental planning. As an example of this, consider the service described as *rapid drainage of public facilities*. This does not necessarily mean rapid drainage from the *site* but rapid removal of the storm water from the *facilities* that need the drainage; e.g., buildings and streets.

Urban drainage and flood control activities require an assessment of the benefits derived by those being relieved of potential flood damages. In many situations, urban storm drainage needs become urgent because of the advancing urbanization of an area. Sometimes the direct project beneficiaries are those who are relieved of potential flood damages while, at the same time, advancing urbanization is the culprit. In this case it makes sense that he cost for the project should not necessarily be borne 100% by the beneficiaries. The service concept recognizes the fact that a drainage system accommodates additional stormwater generated by urbanization. The service concept is important in the identification of the full range of drainage and flood control benefits and beneficiaries.

Benefit-cost analyses of UDFC projects can be useful for public works applications. The design of such studies must, however, be specified according to the ultimate use of the output of the study. The term "Benefit-Cost Analysis" (BCA) as applied to UDFC projects, must be viewed as wider than the traditional BCA which recognized only economic efficiency as a viable benefit. Benefits and costs should be normally considered in the four categories recommended recently by the U. S. Water Resources Council: economic efficiency, regional development, environmental impact, and social benefits. In the case of UDFC projects, the latter may well be the most significant, particularly in the case of the so-called *minor* type of project. UDFC systems must be distinguished into minor or major systems, both for implementation purposes and for benefit-cost studies because public benefits differ considerably between the two types of systems.

The state-of-the-art of conducting benefit-cost studies for urban drainage and flood control projects is not far advanced. The distinction between minor and major projects has only recently received wide acceptance. The evaluation problem is plagued by our inability to quantify indirect, secondary and intangible benefits associated with UDFC projects. In the case of the major flood control project, attention has mostly been focused on the potential reduction in flood damages associated with such projects. This attention is probably due to the visibility of flood damages after severe floods as well as the availability of data for quantifying such benefits. It has been found, however, that the state-of-the-art of estimating damage benefits is rather primitive and there currently exists a wide latitude in the practices of agencies in making such estimates. At the local level, little estimating data is available to conduct this type of study.

For minor urban drainage and flood control projects, it is normally not feasible to carry out a detailed Benefit-Cost Analysis because of the intangible nature of the predominant benefits. An analysis such as the type recommended by the Water Resources Council (displaying benefits and costs in a set of *accounts*) may be feasible. This has not yet been demonstrated for local drainage, however. This does not mean that drainage engineers are behind the times because such analyses have not yet been demonstrated for many public programs at the local level. This is primarily because of the difficulty in quantifying and even identifying benefits.

In all types of Benefit-Cost Analyses, it is important to identify the recipients of benefits by population sector so that project costs can be equitably apportioned. This type of *incidence analysis* must be included as part of a viable BCA.

A methodology for the analysis of benefits and costs of UDFC projects is presented in the report upon which this article is based. The purpose of presenting this methodology is to identify the state-of-the-art of performing such analyses, to present the necessary data to complete the analysis and to present the methodology before the profession to solicit comments on its usefulness. The initial methodology is basically limited to a consideration of direct benefits resulting from flood damage reduction although plans are to extend the methodology considerably in the future. Estimating curves for flood damage reduction are presented for certain classes of residential structures as an aid to the analyst.

This methodology is not presented as a complete solution to the problem but rather a tool for the analyst, something that he can display before the decisionmaker to increase the amount of information available. In order to present a complete or comprehensive benefit-cost methodology, all types of costs and benefits as well as incidence analyses should be presented.

The state-of-the-art of quantifying intangible benefits is not advanced to the point yet where these benefits can be considerably quantified for UDFC projects but numerous experimental techniques exist.

The important questions of finance, politics and the legal aspects of implementation must not be neglected. Although the report does not address specifically techniques for funding UDFC projects, this is recognized as a problem area closely associated with Benefit-Cost Analysis. The report describes the traditional methods of financing UDFC projects and comments on the usability of BCA to assist in the financing process. Concerning legal aspects of implementation, there are a number of problems associated with defining and identifying benefits so that assessments can be made for financing projects. This problem has not been solved but the report identifies the state-of-the-art of establishing benefits so that additional investigation can be conducted.

All public programs such as public safety, water supply, library services, urban drainage and flood control and others should be subjected to the type of analysis presented here to identify precisely the benefits from expenditures of public funds and the recipients of the benefits. Only when this type of information is displayed for the decisionmakers can the political process of public participation insure the most acceptable allocation of public dollars. By advancing the state-of-the-art of Benefit-Cost Analysis for UDFC projects, we also are advancing toward unveiling benefits from other public programs. In that sense, the work in the report is intended to be a contribution to the field of public sector productivity and a usable management tool for public works and urban administrators concerned with making the best use of public funds.

## Tucker Talk

(Continued from Page Three)

about \$850,000 more than expected and efforts are now underway to see if additional monies can be raised. Hopefully construction on Sanderson Gulch will be initiated before the end of 1974.

The design of Englewood dam has been completed. Bids for construction will be advertised in August 1974 and bids will be opened and awarded in September 1974. All improvements on Englewood dam will be completed by May 1975.

Channel improvements on Lower Niver Creek in Adams County were initiated in July 1974. Construction is scheduled to be completed in October 1974.

Negotiations between Denver, Lakewood, and the District for drainage improvements on Weir Gulch are well underway. A basic agreement has been signed by Lakewood and it is now being reviewed by Denver for their approval. An agreement for final design on Weir Gulch has been reached with Frasier and Gingery Consulting Engineers. Actual final design will probably be initiated in October 1974.

Negotiations are also underway with Boulder and Boulder County regarding improvements on the Viele Lake Channel. Negotiations should be completed and all agreements signed by October 1974.

### CONFERENCES ATTENDED

Brian Kolstad, District's Civil Engineer, attended a two week course on Urban Hydrology presented by the U. S. Army Corps of Engineers. The course was on procedures for developing stormwater runoff quantity and quality estimates. We are looking forward to applying Brian's newly developed expertise on District projects.

Bill DeGroot, Administrator of the District's Flood Plain Management Program, attended a conference in Washington, D.C. in July on flood plain management. Bill's comments on the conference are located elsewhere in this issue.

### INFLATION AND ITS EFFECTS ON FLOOD CONTROL

The cost of drainage and flood control improvements has risen dramatically in the past years. The rapidly increasing costs will reduce the number of improvement projects that can be undertaken for the rather fixed amount of tax income. These rapidly increasing costs puts even more emphasis on activities that prevent problems from occurring. Flood plain development must be aggressively managed in order to prevent the need for additional structural improvements in the future. Only in this way can we ever hope to make a dent on annual flood damages and suffering.

### STATE LAND USE LEGISLATION PASSED

The State of Colorado passed House Bill No. 1041 in 1974 concerning land use for the State of Colorado. The emphasis of the act is to encourage local governments to adopt land use practices. Specifically, local governments must identify and designate areas and activities of State interest, issue guidelines for the regulation of those areas, and provide for their regulation. Flood plains are included as an area of State interest and therefore, pressure is also being applied at the State level for local entities to regulate and manage flood plains.

The ball is now with local governments with regard to land use management in the State of Colorado. It is tacitly assumed in House Bill 1041 that if local governments do

not run with the ball, that eventually the State will have to assume the responsibility for land use control.

### BRIGHTON DRAINAGE PLAN COMPLETED

A Master Plan for major drainage in the Brighton area was recently completed. The project was a cooperative effort between Adams County, the City of Brighton, and the District. The engineer for the project was the Denver office of Nelson, Haley, Patterson & Quirk. Copies of the final report are available from the District at \$10 per set.

## District Plans to Investigate Water Quality on Lena Gulch

by BRIAN KOLSTAD  
*District Civil Engineer*

In recent years concerns have shifted towards the pollution of main rivers and the quality of the water of tributary channels and streams. It has been found in some areas that the pollution in a tributary stream is sometimes greater in certain pollutant characteristics than a sanitary sewer. One can realize this if you can imagine a parking lot for a large shopping center where hundreds of cars are parked daily. Grease, oil, antifreeze, rusty water and dirt fall from these vehicles onto the parking lot where they collect until a storm washes them off to the tributary channel.

In residential areas, other types of pollutants exist. People spray their lawns with insecticides, weed killers and fertilizers. The polluted residue from the sprays is washed off by irrigation or rain waters to the gutters where they are collected and transferred to the tributary channels.

The Lena Gulch Master Drainage Plan is about to proceed into Phase B - Preliminary Design. The District is going to investigate the water quality of Lena Gulch using a computer program developed by Water Resources Engineers, Inc. for the U.S. Army Corps of Engineers in January, 1974, called STORM. This program has certain limitations and as such, can be used as a planning tool to estimate the quantity and quality of runoff from small, primarily urban watersheds.

STORM uses a rational approach for determining the quantity of runoff. The program is designed for use with many years of continuous hourly precipitation records. However, it can be used for selected single events. This program looks at a selected number of pollutant characteristics that are known to exist in urban runoff. If quality or pollutant records are available, the program has the capability of using them in the computations. If not, and generally this is the case, especially with quality records, the program has certain "default values" that are used to evaluate the basin.

Lena Gulch was selected for this study for the following reasons. During the Phase A portion of the Master Drainage Plan, representatives of the consulting engineering firm doing the study observed pollution in a portion of the gulch. Also, the U.S. Geological Survey has installed two rainfall-runoff measuring stations on Lena Gulch and plans to install a third. It is anticipated that we can add quality measuring instruments to these stations.

The District is planning to acquire the STORM model from the U.S. Army Corps of Engineers and adapt it here in the Denver Metro area where it would be available to the local cities and counties and consulting engineering firms working for the various cities and counties and the District. The District's staff will implement the STORM model with the assistance of the consulting engineer working on Lena Gulch, Wright-McLaughlin Engineers.



# A BEAUTIFUL PLATTE RIVER VALLEY?

Implementation Effort is the Key...

by RICK LAMOREAUX

Suppose the people of Denver could ride their bicycles, maybe even their horses, down a grass- and tree-lined path following the South Platte River through Denver. Suppose they could stop along the way and have a quiet picnic at the river's edge, while watching canoes glide by in the water. What if they were able to attend a symphony concert, camp in their tents, or simply meander in a captive natural environment.

Denver's Mayor, William H. McNichols, is determined that citizens and visitors alike will soon enjoy these kinds of urban amenities along the Platte River. To accomplish his goal, he has organized a committee of civic-minded individuals responsible for overseeing the redevelopment efforts.

It is the feeling of the committee, including Senator Joseph Shoemaker, Chairman, and its staff, that long-range planning is a valuable aspect of the planning process; however, it is felt that unless the people of the community have a chance to physically view and evaluate improvements to the river, there may be little impetus for involvement in future long-range planning and implementation.

Thus, the Platte River Development Committee (PRDC) has directed that four demonstration projects in critical areas of the city be designed and built within the next nine months; the citizens of Denver will then have a chance to "pass judgment". The committee is working with a budget of \$2 million from City funds, approximately half of which is being used to finance design and construction of the pilot projects.

Each of the consulting firms which have been retained for design work on the four demonstration areas has a varied set of problems and assets to deal with. One section includes the stretch of the River between two major open space areas — Ruby Hill Park and Overland Golf Course — and stretches from Jewell to Mississippi. Design consultants for this portion, Frasier & Gingery, have an advantage as the City has control of most of the area. But in other reaches there are complications regarding ownership.

For example, in the stretch running from 38th Street to the north city limits, ownership along the river is divided among many private concerns. In cases like this, the committee, staff, and Oblinger-Smith Corporation, design

consultants for this section, are attempting to enlist the cooperation and assistance of adjacent land owners to participate in the river development.

In the Central Platte Valley project, Wright-McLaughlin, the designers, have a different set of circumstances with which to contend. Although a width of 400 feet has been officially designated as the design focus area in all the projects, Wright-McLaughlin must take into consideration such things as the 15th Street Bridge, redevelopment plans for the Central Valley, and the many proposals put forth for relocation of the main-line railroad tracks through this area.

Weir and Lakewood Gulches enter the Platte River in the remaining demonstration project, which stretches from 8th Avenue to Colfax. A primary goal of the designers - McCall, Ellingson, and Morrill - is to provide good public access to the river redevelopment by utilizing these gulches; again, however, it is necessary to enlist the cooperation of various interests in the area, most notably Public Service Company of Colorado and the City's Public Works Department.

A million dollars does not sound like a great deal of money with which to undertake these projects. However, the committee is hoping to enlist the efforts of volunteer labor to help actually implement the designs; and, it has a specific person in charge of volunteer coordination for each section. In addition, the staff is currently looking into the possibility of matching grant funds from outside the City's budget to help ease the financial burden.

These factors notwithstanding, it is planned that construction of the four pilot projects will be completed by the end of May next year. In the meantime, the committee's staff — Jay Geiger and Rick Lamoreaux from the Denver Planning Office — will be concentrating on coordinating these demonstration projects into a comprehensive plan and design for the entire Platte River Valley as it traverses the City. It is hoped that, given the necessary funding, the committee can continue to implement additional river improvements until the entire valley is a coherent and unified urban asset.

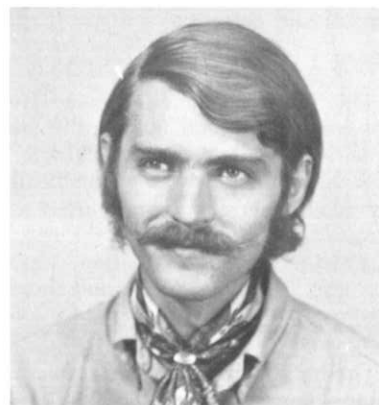
(Continued on Page Eleven)

## ABOUT THE AUTHOR . . .

**RICK LAMOREAUX** is presently the Platte Valley Planner in the Denver Planning Office, and is serving as one of the two DPO liaisons providing staff support to the Platte River Development Committee.

In his undergraduate work at the University of Utah, Rick focused primarily on environmental psychology and design. While completing his Masters in planning at Stanford University, he produced an elaborate slide presentation on environmental awareness, at the same time teaching a graduate-level course in environmental and urban design. His experience has been varied, ranging from professional skiing and jazz performance, to engineering, construction, design, and planning.

A relatively new resident to Denver, Rick, his wife, and dog live in Capitol Hill experiencing the city firsthand. They spend time exploring the mountains - hiking and skiing - and enjoy photography, gardening, and music. Rick is an Associate Member of AIP.



## A Beautiful Platte River Valley?

(Continued from Page Ten)

An obvious key factor in the design process is that of flood plain management. Each of the design consultants is considering the 100-year flood plain and is attempting to minimize the effects of such a flood on adjacent buildings and property. Thus, while the primary focus is on improving the river environment, a major element of the redevelopment concept is to provide for a flood plain corridor which would double as a recreation resource. Each consultant is evaluating structural improvements that will minimize major flood damage and provide additional recreational amenities, such as pools for fishing and boating, walkways at the river's edge—and possibly even an amphitheater.

Cooperation thus far has been excellent from every public agency which has been called into the design process. The Urban Drainage and Flood Control District and the Corps of Engineers are providing the necessary hydrologic information and guidance. The City's departments of Public Works and Parks and Recreation are contributing valuable input and have agreed to be responsible for the maintenance of the finished river projects. The Land Office is looking into property acquisition; the City Attorney's Office is researching any possible legal ramifications of the proposed improvements; and the Planning Office is responsible for overall planning and coordination. Other agencies and individuals, too numerous to mention, are all helping to insure that these and future projects will get started and continue in a smooth fashion.

Of course without the expert guidance of the committee, the idea of a unified Platte River Valley would be just "pie in the sky", as it has been in the past. In order to take effective responsibility, the committee has divided itself into four subgroups, each in charge of guiding the design for one of the initial projects.

H. R. Berglund of Denver Wood Products, and Phil Milstein, Planning Board Chairman and Executive Director of Downtown Denver, are insuring proper treatment of the Ruby Hill/Overland Park Section. Dan Trujillo of the Platte Valley Action Center and Hiawatha Davis of the East Side Action Movement, are spearheading efforts in the stretch adjacent to the Las Casitas — Sun Valley housing area.

Working in the central section are State Representative Ted Bendelow, affiliated with the PARC citizen's committee, and Ms. Dana Crawford, a moving force behind Larimer Square. The Globeville residents in the north are represented by John Zapien of their resident's association, along with Ms. Marjarie Hornbein, long involved in Denver urban affairs. Coordinating the entire work program is the committee's Chairman, Senator Joe Shoemaker, whose strong leadership should insure early implementation.

As everyone familiar with the river is aware, the South Platte has been studied and restudied for almost a century. It has come time to put some ideas into action.

The moment of truth will come next summer as you are enjoying a picnic lunch on "the banks of the Platte". You might be one to say "Look! I planted that tree", or "Why didn't they plant that tree over there?" or even "Why did they bother to plant it in the first place!" — the point being that citizens will ultimately decide whether the committee has succeeded or failed.

If we have failed, it will be back to the drawing boards for more input and a new approach; if success is the answer, new projects will be initiated and these four will be expanded. Either way, the "Queen City of the Plains" is on its way to acquiring another ribbon of jewels in its already elegant crown.

## Meet the New Board Members

TOM CARRILLO

Mayor of Thornton

Mayor Carrillo is a graduate of the University of Colorado with a degree in Architectural Engineering. He is a partner in General Business Services. He has been a representative to the DRCOG and has been a registered Boy Scout counsellor for ten years. He is a member of Thornton Kiwanis, Holy Cross School board and the Thornton JC's.

Mayor Carrillo served on a Thornton budget committee. He is a member of the General Advisory Committee for Community College. He and his wife, Carmen have seven children. They live at 9883 Pearl Street and have been Thornton residents for twenty years.



**TIMELY AND AVAILABLE**

### **GUIDELINES**

for

**DRAINAGE REPORTS FOR DEVELOPMENTS  
LOCATED ON MAJOR DRAINAGEWAYS**

These "Guidelines" were prepared by the District to assist developers in preparing drainage reports for proposed developments. Copies are available on request. Please include a stamped self-addressed envelope with your request.

## DISTRICT SPONSORS COST BENEFIT SEMINAR

A seminar entitled "Benefits and Costs of Urban Drainage and Flood Control Projects" was held in Denver on April 25, 1974. The seminar was sponsored by The Urban Drainage and Flood Control District and the Environmental Resources Center of Colorado State University. The purpose of the seminar was to present tentative results of the first phase of a two-phase research effort, and to receive feedback from those in attendance to guide the research to a practical and useful conclusion.

Approximately ninety people were in attendance at the day-long seminar. Papers were presented by Dr. Neil Grigg, Associate Professor, Colorado State University; Leonard Rice, Leonard Rice Consulting Water Engineers; and Jim Downey, attorney (substituting for W. Joseph Shoemaker). The luncheon speaker was Dr. Norman Evans, Director, Environmental Resources Center, Colorado State University.

The papers presented at the seminar, as well as comments received from the attendees, were incorporated into a report entitled "Evaluation and Implementation of Urban Drainage and Flood Control Projects". A summary of this report begins on page 1.



L. Scott Tucker, Executive Director, checks registrations with Barb Cleghorn (left) and Kathy Vesley.

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