City ENGINEER Check-out Copy

FEASIBILITY STUDY AND MASTER PLAN

FOUNTAIN CREEK CHANNELIZATION

MANITOU SPRINGS TO MONUMENT CREEK

AND

HYDROLOGIC ENGINEERING STUDY

THE WEST SIDE DRAINAGE BASINS

COLORADO SPRINGS - EL PASO COUNTY

OCTOBER , 1975

UNITED WESTERN ENGINEERS

FOR

THE CITY OF COLORADO SPRINGS

COLORADO

MINUTES

MIDLAND EXPRESSWAY/FOUNTAIN CREEK CORRIDOR

JANUARY 31, 1986

Present: Ronald E. Richards, Colorado Department of Highways
Albert Robino, Colorado Department of Highways
Steve Carlson, Colorado Department of Highways
Gene Fuhlroat, Colorado Springs Park and Recreation Department
Mike Ament, Southridge Corporation
Lewis Lambert, Concerned Westside Neighbors
Connie Schmitz, Concerned Westside Neighbors
Gilbert DiVelez, Concerned Westside Neighbors

Mr. Richards, Maintenance Superintendent, started the meeting by discussing the Colorado Department of Highways funding standpoint and where our dollars are directed. Mr. John Herzog, State Representative, had contacted Mr. Richards for Colorado Department of Highways assistance and we will participate as we can.

The following problem areas were addressed by the Concerned Westside Neighbors:

Mr. Lewis Lambert asked for right-of-way boundaries.
Ms. Connie Schmitz asked if we owned the interchanges.
Mr. Gilbert DiVelez discussed his knowledge of funding from the City Park and Recreation Department which could possibly come from lottery funds.

Mr. DiVelez shared an aerial photo of the corridor and discussed City planning thoughts on landscaping:

A. Bike paths
B. Widening of the medians
C. Adding a westbound lane to the north to incorporate median widening
D. Rest areas (2 each)
E. Adjoining existing parks between 21st and 31st

Mr. Richards discussed the 2001 plan and stated that no work has been planned in this time span for the interchange of I-25 and SH 24, or widening.

Mr. Gilbert DiVelez requested assistance in finding persons who they can lobby with to get action or help in this proposal.

Mr. Richards explained that monies are budgeted and directed in different ways and maintenance monies are not adequate or budgeted for construction. He also explained the safety requirements which would eliminate any proposal for landscaping in median areas, and addressed the control access using Academy Boulevard with no control as an example.

Mr. Richards closed the meeting by explaining that we need to involve other people in this project to include City, County and the group that is present. He advised everyone that we are interested in participating, but to what extent is yet to be determined.

Mr. Richards will send copies of the following to Mr. DiVelez:
- 2001 Plan
- Roadside Advertising Rules and Regulations
- President Johnson's wife came through Colorado Springs in 1964 to the best of our recollection.

Mr. Bill Vidal and Mr. Ray Brown will be requested to attend the next meeting.

RER/sc

CONCERNED WESTSIDE NEIGHBORS

January 24, 1986

RE: Meeting of January 6, 1986, Midland Expressway/Fountain Creek Corridor Clean Up and Improvement Campaign

Enclosed please find Mr. DiVelez' opening statement from the above meeting, a summary of the significant discussion, as well as the list of those attending.

We are working on the formation of numerous committees and will be in touch. If you have any questions or comments, please do not hesitate to call. A transcript of the meeting is available from Inge Barth, West Side Transcription Service, 633-TYPE, for $15.00.

Sincerely,

CONCERNED WESTSIDE NEIGHBORS

Lewis R. Lambert
1115 West Kiowa Street, 471-1904

Gilbert DiVelez
117 South 10th, 630-1738

Connie Schmitz
1224 West Pikes Peak, 632-2316

ijb

Enclosures

Ladies and Gentlemen:

We have all gathered here tonight to support "The Midland Expressway/Fountain Creek Corridor Clean-up and Improvement Campaign." We have invited representatives from neighborhood organizations, and governing bodies from state, county, and local levels. Everyone here I am sure is interested in both environmental and economic impacts on the Westside. While we may come from various sources representing individual objectives and interests we are here as a coalition with a common goal: To clean-up and improve the Midland Expressway/Fountain Creek Corridor by implementing a study and comprehensive plan that was conducted and approved by Community Development via a planning process that involved a high level of participation by various organizations and city representatives at a substantial cost to the taxpayers ($100,000).

During 1978, citizens and the Planning Department prepared data on existing conditions and citizens' concerns. As a part of the planning process for the Westside Plan, the city staff and consultants consequently developed the most significant concerns of the socio-economic and physical aspects, one of which is the Midland Expressway/Fountain Creek Corridor, which is our key issue. This support document provides a framework for the implementation of this plan with general and specific recommendations which could arouse renewed interests in urban revitalization. We have facts and options due to the extensive time that was devoted to the preparation of this plan. The consulting team which was composed of businessmen, planners, residents, and city staff introduced this plan which has the potential of serving the Westside residents, the greater Colorado Springs area, conventions and meetings visitors, and tourists. The objectives are to upgrade commercial activity on the Westside and to improve the appearance of this corridor while preserving natural and historical features and allowing modern convenience and encouraging new growth. This plan provides a combination of open space and bike trails linked with tourist service areas and/or carefully planned commercial/industrial areas with special attention given to the visual impact along the Midland Expressway, such as avoiding the need for a cement drainage ditch. It also calls for developing a usable linear park along Fountain Creek and where possible, to provide access to adjacent neighborhoods, parks, and trail systems. This would eliminate blighting and unsightly uses of the land such as are now in evidence along the Midland Expressway and to instead provide economic incentives with long-term stability, without destroying the old historical heritage. The Pikes Peak Area Council of Governments predicts the population of El Paso County at 550,000 by the year 2000. This corridor is the most under-served in all these terms while remaining the main access into this area. The tourist market potential would induce a variety of service and retail interests, such as motels, restaurants and service stations, as well as the many Pikes Peak attractions. This corridor is the primary route to Manitou Springs and the mountains

and it also has the potential to generate increasing demands for Historic Old Colorado City. We need to improve the visual appearance of this corridor in order to become compatible to the location based on adopted criteria. The study includes concerns for compatible development relative to surrounding uses and will contribute to the character of the Westside. The visual integrity of the Midland Expressway as a major access to the mountains and its cities causes its appearance to be a very strong consideration while capitalizing on existing public investment. This issue contains three topics: Fountain Creek, Highway 24 which is a major access to the city and to the mountains, and a linear park and open space concept. The combination of these factors makes land use a requirement and would be a highly potential asset to the Westside. It would provide economical and social advantages and would accommodate traffic diversion. Commercial development will have a significant impact. If handled correctly, it will play a key role to Westside flexibility in its part of serving Colorado Springs, Manitou Springs, and points west via Ute Pass. It is also a destination route for a large number of people who reside in the area. There are major crossings within this corridor such as the interchange at I-25 and it is the **ONLY** route in the area to the mountains to the west. The state highway department has spent considerable time investigating alterations and solutions, and both the city and state recognize the problems of this high traffic area. We, the residents, feel that it has been a long enough time with a great deal of consideration taken into account and that the time has come to recommend that efforts be made to get this project under way and that it be instated on the highway department's program for execution.

Thank you very much.

Concerned Westside Neighbors

SUMMARY OF CONCERNED WESTSIDE NEIGHBORS MEETING OF MONDAY, JANUARY 6, 1986

FOR THE MIDLAND EXPRESSWAY/FOUNTAIN CREEK CORRIDOR

CLEAN UP AND IMPROVEMENT CAMPAIGN

This meeting was organized by Concerned Westside Neighbors to generate input, support, and enthusiasm for this large project. Mr. John Herzog, State Representative; Ms. Marcy Morrison, County Commissioner; Mr. Leon Young, Vice-Mayor and Councilman for District #3; and Mr. Dan Stuart, Mayor of Manitou Springs were invited to help with their specialized knowledge of city, county, and state procedures. See the attached list for others who were present at this meeting.

During the meeting the following problems were identified as necessary for the clean up and improvement of the Midland corridor (Highway 24) and Fountain Creek areas:

1. Improvement of the overall shoddy and disappointing appearance of this major avenue to the mountains.

2. Improving the blighted look of junkyards that have no visual screening from the highway (trees or fences).

3. Concern for the preservation of historic Fountain Creek with the establishment of a linear park and the promotion of the public's use of the creek in some areas with bike and pedestrian paths or views from commercial establishments open to the public.

4. The distraction of billboards on this gateway to Pikes Peak.

5. The unkempt appearance of state highway right of ways and the creek-bed because of much trash and junk; some from vehicles going to the dump on 26th street.

6. The erosion of foothill sites , arsenic from Gold Hill Mesa.

7. The danger of flooding in developments in the flood plain along Fountain Creek.

8. The need to upgrade agress and egress at 8th, 21st, and 26th streets.

9. Need for attention to grade separations at major interchanges of Highway 24 within the Westside.

10. The need to enforce zoning regulations along Highway 24.

The following suggestions were made:

Since this project involves city, county, and state land, jurisdictions must be clarified. Committees must be assigned to deal with each jurisdiction and then report to the full committee.

Mr. Lewis Lambert stated that Concerned Westside Neighbors would be forming these committees and is committed to pursuing solutions.

Mr. Herzog explained how the state Highway Department operates and funds projects. The county, Pikes Peak Area Council of Governments (PPACG) and the Highway Advisory Commission need to have our project explained to find out if it qualifies for federal funds. Then, the project has to get on the priority list (this can take up to 15 years!!). Also, the county and city may have funds for clean up along Highway 24. He also explained that all maintenance of state highways comes from the 5-cent gas tax increase of 1985.

A discussion of the possibility of having sound barrier fencing along highway 24 similar to that going up along Interstate 25 from Bijou to Fillmore revealed that it would not be appropriate since the Highway 24 area is commercial and not residential. Sound barrier fencing is a federal requirement for highways put through residential areas. The cost is approximately $1,000,000 per mile. What is wanted is visual screening for unsightly commercial operations.

Mr. Dan Stuart, Mayor of Manitou Springs and past Chairman of the Urban Area Policy Committee stated that the "real problem is funding and the challenge here is to identify what kind of funding we're talking about, and what needs funding and what can be done through cooperative effort." Mr. Stuart also stated that one way to deal with Highway 24 funding is through the annual update process. He suggested that Concerned Westside Neighbors try to get a favorable reception to the project and it might then become part of the five-year plan of the Urban Area Policy Committee.

Mr. Herzog suggested contacting Mr. Joe Shoemaker through the Mayor's office in Denver. He was past Chairman of the Joint Budget Committee, who got approval from the City of Denver to work on improving the junky appearance of Cherry Creek. he used private organizations and had some grant money. This is now a beautiful waterway. it is landscaped almost the entire length of the city. The local and private sectors were the initiative here.

Vice-Mayor Leon Young stated that if any businesses along Highway 24 were operating illegally, the city, through Code Enforcement and Zoning, could take the proper steps to enforce zoning ordinances.

Mr. Herzog suggested a meeting of property owners to try to get cooperation to beautify the area after the costs have been explored. This might lead to the formation of an improvement district.

Ms. Marcy Morrison suggested that the Highway Department might be able to clean up trash along the expressway. Mr. Herzog is carrying a Bill this year to increase fines for trash along highways. The fine has been

$5 since 1963. These low fines possibly are a reason police have not cited offenders in the past.

Mr. Herzog also suggested looking into the use of public work requirements, for DIUs, to have some clean up work done. The courts can put people to work for any agencies that request them. It could be done by Concerned Westside Neighbors getting agency status or possibly through the Park and Recreation Department.

Mr. Jim Bates, Community Development of Colorado Springs, suggested that the 501(c)(3) (non-profit corporation status) will give Concerned Westside Neighbors agency status.

Mr. Terry Allen of Neighborhood Housing Services offered his help with finding grant money and help with the 501(c)(3). He suggested that the Colorado Springs Community Trust and the Springs Beautiful Committee might have money. Foundations, such as El Pomar, could also be approached; however, grant funds would not be sufficient for capital improvements.

Ms. Debra Little of the City Planning Department of Colorado Springs explained much of the procedure for zoning complaints. Usually citizens must make complaints or nothing will happen. The city will not look for violations; however at the direction of the City Council, Planning can go to an area with a team from Code Enforcement. She also suggested that Concerned Westside Neighbors could get maps and note violations. She offered to help the members of this committee educate themselves as to what to look for. This work could be submitted as a package to help speed things through the system. This is similar to the way the Organization of Westside Neighbors Land Use Committee is working with their revision of the Midland Area Plan, south of Highway 24.

Mr. Leon Young stated, "Your office just got busy!!"

Mr. Gene Fuhlroat, landscape architect with the City of Colorado Springs Park and Recreation Department, advised that Concerned Westside Neighbors come up with a physical plan and map it, identifying the problems and come up with solutions and cost estimates (this could be in the millions). Then, if the City departments that have responsibilities in planning these things want to get something going, then certainly the Park Department could contribute in three different ways. One would be the multi-use trails, bikeways, and off-street trails that are planned for the fountain Creek corridor. Another way would be enlarging or expanding both Vermijo and Blunt Parks which would then link them together and from then on, you've already got two parks of this linear park established. Another thing that his department worked on last summer was a review of all of the medians within the streets. This expanded into a study which has not been reviewed yet. It is called street scapes. Park and Rec is now looking at a whole network of streets through the city figuring out what is needed, what we can afford, where should new medians go. In the process, we identified that of the corridors leading into the city, the four major ones, three are pretty bad looking -- and one is Highway 24.

Mr. Gilbert DiVelez suggested the use of state lottery funds for this project. In discussion, it was brought out that Concerned Westside

Neighbors would have to have a detailed plan with numbers. The project would have to be identified as to scope.

Mr. Bob Patoni, the Westside Representative of Community Development, suggested looking into the recent development of 17 miles of hiking and bike trails along the South Platte River funded with state lottery money.

Ms. Morrison impressed that for the county, presentations must be ready by June since the county process starts in July. The Park Department needs to have all material to the Budget Officer by July. She also suggested Concerned Westside Neighbors find out who funds Parks -- the state, county, and (should this be 'or') city -- and establish a different committee for each.

Mr. Herzog suggested having Frank Sele, the District Engineer for this part of the state, come to talk. We could show him what is wanted, see what is feasible. Then, he can make recommendations to his bosses and the Commissioners.. Regarding the mowing, that's the Highway Department. They then go to the legislature and say we need money for this. Mr. Herzog stated that his job is to make sure that our project is heard and eventually funded. "Come up with a plan, put it together and obviously I will help you set up meetings if necessary with the proper people."

Ms. Morrison said that she could be most helpful in setting up meetings. She suggested talking to Grant Johnson of PPACG, who is the head of the transportation area and knows road systems, highway systems, and how to apply for grants. He knows where the funding is coming from and the priority system.

Mr. Bates of Community Development stated some things can be done right away, such as the clean up using Code Enforcement and Zoning. Concerned Westside Neighbors has been involved in certain aspects of this on Eighth Street. Fences have come down and Code Enforcement has been trying to get them back up. Another committee could work with the professionals on the further development of the plans that Park and Rec has -- certainly the median and street scape plans. Perhaps we can get the state excited about that as being the #1 street scape and we'll concentrate on that. Then, there seems to be a need for the government officials to get together city, county, state, and Manitou Springs. We could move on three or four fronts at the same time. I'm happy to see the community get involved with this -- the implementation of the Westside Plan. We have not given much attention to this area since efforts have been focused on other areas, but we are happy that it shifts into this area where there is citizen support and support we hope from the county and state and other agencies. It is important to all of us as we drive up Ute Pass to enjoy a more scenic view -- and a lot of people think of 24 and it doesn't stack up with what we claim the city is.

ATTENDANCE LIST OF JANUARY 6, 1986 MEETING

Bruce Warren
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P.O. Box 316
Colorado Springs, CO 80901
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Bob Patoni
Westside Representative
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Dan Stuart, Mayor
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Manitou Springs, CO 80829
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Debra Little
Planning Department
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Debbie Kovalik
Convention & Visitors Bureau
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William Rasch
Concerned Westside Neighbors
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Colorado Springs, CO 80904
471-0855

NAME (TITLE)	ADDRESS	PHONE.
GILBERT DIVELEZ CW.N.	117 So 10TH ST.	630-1738
Steve Carlson C.D.O.H.	2025 Commercial Blvd.	576-1868
Ron Richards CDOH	905 Erie Pueblo	544-6286
Albert Robino CDOH	2025 Commercial Blvd	576-1868
Connie Schmitz CWN	1224 W Pikes Peak	632-2316
Lewis Lambert CWN	1115 W. Kiowa 80904	471-1904 / 630-1668
MIKE AMENT	3614 W. High St.	633-4779
Gene Bukovak	C.S. P&R Dept 1444 N. Hancock	578-6852

Lewis Lambert CWN

Larry Blick	City Mgr	578-6604
Bob Brockmeier	City Planning	578-6692
Jim Ringe	Comm. Devel.	578-6910
LARRY SCHENK	PARKS + REC.	578-6640
JIM BATES	REDEVELOPMENT	578-6910
Connie Schmitz	CWN	632-2316
Pauline Spragg	City Manager's Office	578-6604
Pat Markley	415 Mesa Vista Ct Park & Rec Advisory	634-5712
MIKE AMENT	3614 W. High St.	635-4480
DEANNA DIVELEZ	117 S. 10TH ST.	630-1738
CAROL LAMBERT CWN	1115 W. KIOWA	471-1904

FEASIBILITY STUDY AND MASTER PLAN

FOUNTAIN CREEK CHANNELIZATION
MANITOU SPRINGS TO MONUMENT CREEK
AND
HYDROLOGIC ENGINEERING STUDY
THE WEST SIDE DRAINAGE BASINS

OCTOBER 1975

PREPARED BY
UNITED WESTERN ENGINEERS
SUITE 104
3709 E. PLATTE AVENUE
COLORADO SPRINGS, COLORADO 80909
OLIVER E. WATTS
PE-LS NO. 9853
PROJECT ENGINEER

FOR
THE CITY OF COLORADO SPRINGS, COLORADO
PUBLIC WORKS DEPARTMENT
MR. DEWITT MILLER, PE-LS
DIRECTOR OF PUBLIC WORKS

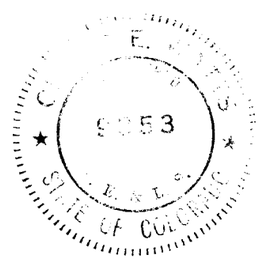
Mr. DeWitt Miller
City Hall
P.O. Box 1575
Colorado Springs, Colorado 80901

Dear Mr. Miller:

Transmitted herewith is the feasibility study and master plan of the channelization of Fountain Creek from the Easterly limits of Manitou Springs to its confluence with Monument Creek and the associated study of the West Side Drainage Basins.

This study is certified to comply with all existing or proposed drainage and flood plain ordinances and criteria of the City of Colorado Springs and all work was performed by me or under my direct supervision.

Please do not hesitate to contact me if we may provide any further assistance or explanation of items covered in the report.



Respectfully submitted,

UNITED WESTERN ENGINEERS

Oliver E. Watts
PE-LS No. 9853
Engineer Director

Enclosure:

INDEX

LIST OF ILLUSTRATIONS

SECTION I

INTRODUCTION

I. INTRODUCTION

A. Purpose and Scope.

The purpose of this investigation is to determine the feasibility of and develope a master plan for the corrective work required along Fountain Creek so as to lower the existing predicted flood plain. The modifications are necessary to prevent the substantial loss of life and damage to property that would result from the floods which have occured in the past in this area and which might reasonably be expected to occur in the future. Associated with this investigation is a hydrologic engineering study of the twenty five drainage basins which discharge into the creek so that the respective inlets may be designed.

The investigation determines the feasibility of certain design concepts, the cost of which are held to a minimum consistent with the purpose. Design work is limited to this, and a detailed final design is not intended, but should be performed in the final phase in the preparation of contract documents. Sufficient information is presented to allow this design and necessary planning by governmental agencies. Rights-of-way drawings are included in the appendix as an aid in this planning.

The project limits are the Manitou Springs City Limits on the West, Monument Creek on the East, and the limits of the drainage basins to the North and South that terminate on Fountain Creek within this reach.

Hydrologic Investigation of the inflowing drainage basins is limited to the outfall conduits if they are sufficiently large. If these conduits are inadequate, the investigations extend upstream until a point is reached where no modification is necessary.

B. Background Information.

The US Army Corps of Engineers prepared a study entitled "Flood Plain Information-Fountain Creek-Colorado Springs*Manitou Springs*Colorado" in August, 1974. The limits of the flood plains resulting from two floods were deliniated in this study: The "intermediate regional flood," having an average recurrence of once in each 100 years, or a 1% probability of occurring in any given year; and the "standard project flood", the most severe that may be considered reasonably characteristic of the drainage basin. The first of these, the 100 year storm, flood plain under the existing conditions is delineated on the channelization plans in the appendix, pages 74to 82. Substantial information is presented in the referenced report.

Two of the 25 drainage areas discharging into the study area, and a part of a third, have been previously studied by private consultants and the master plans for these have been adopted by the City of Colorado Springs. The Camp Creek Basin, including what is shown herein to be the Camp Creek and 28th Street basins, was studied by this firm in October, 1964 and an updated study is now being solicited. The 19th Street Drainage basin, which is the upper half of the 14th Street basin, was studied by this firm in February, 1964, and was re-studied by G. L. Williams and Partners in November, 1972.

The City has adopted a flood plain ordinance and has applied and been accepted for flood plain insurance under a HUD program. This ordinance will become effective as soon as HUD publishes their maps of the flood prone areas within the City. These areas should be the same as deliniated by the Corps of Engineers in their three studies on Monument, Upper and Lower Fountain Creeks and by the Soil Conservation Service on Sand Creek. Studies are also underway in other major areas within the City. The HUD mapping is expected in December.

SECTION II

GENERAL DESCRIPTIVE DATA

II. GENERAL DESCRIPTIVE DATA

Contained in this section is a general description of proposed drainage facilities intended for general information. Technical information including design data and particulars, is included in the next section.

A. Fountain Creek.

1. General Description and Criteria.

The existing channel of Fountain Creek has a relatively poor alignment and is badly congested by vegitation, consisting of various shrubs and brush and numerous cottonwood trees. This congestion creats a much larger flood plain than might normally be expected, and the flood plain area has been encroached by a significant amount of development in the form of motels, campgrounds, and other tourist facilities, as well as single family, mobile homes, and commercial facilities. The existing flood plain probably creates the greatest danger of loss of life and property in Colorado Springs.

As precribed by the City, the 100 year storm was used as a basis in designing a channel to lower the flood plain to limits deemed reasonable and prudent, as allowed by the flood plain ordinance. In general, a channel is provided that will fully contain a storm having an average recurrence interval of once in each ten years, with no structural damage. The 100 year storm may in some cases cause light to moderate structural damage without loss of life.

The intent of the design is not to fully channelize to accomodate the 100 year storm, except where necessary to prevent loss of life, major structural damage, or interruption of traffic flow on major arterial streets. Rather, the channel is intended to lower the flood plain to the point where the flood plain ordinance will be complied with, using relatively minor structural additions to existing facilities.

The major limiting factors along the creek are the existing bridges, which generally prescribe rather detailed designs that will pass the design flows. The designs at these crossings therefore are more detailed than in other areas.

2. Reach Number One (Manitou to Ridge Road, Sta. 0+00 to 15+90)

The existing flood plain at the Manitou Springs City limits is contained in a width of about 420 feet north of Manitou Avenue. The channel at this point is severely conjested by a dense growth of vegetation, live and dead, as shown on photo number one, which may wash downstream and create problems at bridge piers.

A dike is provided to concentrate a flow into a concrete lined channel, which is necessary throughout the reach to avoid flooding of Manitou (Colorado) Avenue and numerous single family dwellings, with resulting loss in life.

The Bridge at Manitou Avenue is the only major bridge in the project area requiring replacement. This bridge was installed by the State in 1934 and will contain only the runoff from a 4 year storm without overtopping. The bridge replacement will entail replacement of the 6-inch gas main and reducing vault feeding Manitou Springs, 16-inch and 20-inch water lines, and an 8-inch sewer line and telephone cable. An existing retaining wall above the bridge is incorporated into the design. Below the bridge the channel occupies a good portion of the Yucca Lane Campground, where the access bridge and several small buildings must be removed. New access from Manitou Avenue is provided. The Ridge Road bridge can easily accomodate the flow by installation of the proposed concrete channel.

Photographs numbers one thru seven and cross section sheets one thru seven in the appendix, as reference on plan sheet number one, show the work in detail.

3. Reach Number Two (Ridge Road to 31st. Street, Sta. 15+90 to 46+00)

A concrete lined channel is required to reduce the flood plain beneath numerous dwellings and the Red Rock Canyon Shopping Center.

The Creek is realigned near the City Water intake across the Red Rock Canyon Mobile Home Village to avoid substantial hydraulic problems. The City Water intake and the USGS stream gaging station will require relocation and modification.

The Channel is badly constricted behind the Red Rock Canyon Shopping Center as shown on cross section sheets 12 and 13. A retaining wall is provided along the access road behind the buildings in this area. The 31st. Street bridge will easily accomodate the runoff with installation of the lined channel under it.

Photo numbers eight thru fourteen and cross section sheets eight thru fourteen show the work in detail, as referenced on plan sheet numbers one and two.

4. Reach Number Three (31st Street to 26th Street, Sta. 46+00 to 76+00)

A riprapped channel is provided to lower the flood plain to a level below highway 24. The lowered flood plain will inundate the Golden Lane Campground to a depth of two feet. Below this area, the depth nears four feet in an area containing a few dwellings and businesses, and in Vermejo Park it will be about one foot deep.

A portion of the channel (sta. 60 to sta. 68) is realigned to avoid hydraulic problems and the CutKomp Brothers access road bridge will be removed and the old channel may be refilled. The 26th Street bridge will easily pass the flow by concreting a channel underneath, however a dike is required upstream on the south bank as shown on the plan to avoid overtopping of highway 24.

An alternative design was considered following the existing channel, sta. 60 to 68, and was abandoned because it created the need for substantial more right of way,condemnation of residences, and was more expensive.

5. Reach Number Four (26th Street to 25th Street, Sta. 76+00 to 81+40)

A concrete channel is proposed to fully contain the design flow in this rather short reach. The meanders in the stream channel are straightened out to provide better flow characteristics. The 25th Street bridge is more than adequate to pass the design flow as proposed.

6. Reach Number Five (25th Street to 21st Street, Sta. 81+40 to 103+88)

The existing creek is badly conjested by vegetation and lays hard against a steep bank on the north. The existing flood plain is therefore directed to the south in a band about 600 to 750 feet wide, inundating the commercial area near Naegele Road, Highway 24 and practically all of El Paso Community College.

A relatively small channel is provided to contain a 10 year runoff, which will lower the flood plain to just below Highway 24. The upper portion may be riprapped, however the lower portion must be concrete lined to accomplish this. Although this will create inundation of the commercial area, including numerous recreational vehicles as shown on plan sheet number four - the depth of water is generally less than one foot. The maximum depth of about four feet is located near a sign fabrication shop and cattle packing facility. No significant property damage and no loss of life is anticipated.

The natural topography will concentrate the runoff into the channel above the 21st Street bridge, which will easily accomodate the design runoff. Cross section sheet numbers 25 thru 29 show the proposed work in detail.

7. Reach Number Six (21st Street to Highway 24, Sta. 103+88 to 111+20)

A riprapped channel is provided that is set hard against the steep south bank of the creek. The flood plain is lowered to an overbank depth of less than two feet that will inundate an auto salvage yard and encroach to about the floor level of one residence. A dike is required against highway 24 as shown on plan sheet number 4 that will prevent the water from following a natural course along the north side of the expressway, dividing the flow.

The two bridges on Highway 24 are of sufficient height to provide adequate room for a concrete channel to pass the runoff beneath them.

8. Reach Number Seven (Highway 24 to Trailer Park, Sta. 111+20 to 148+10)

The channel runs south of Highway 24 along the Gold Hill Mesa area. The natural flood plain is shown as inundating Highway 24, but in fact is split by it and runs down either side for most of the reach. The area is completely undeveloped to the south,

but has two stretches of riprapped channel that were part of the highway construction in relocating the creek.

A riprapped channel is proposed that will eventually contain the entire 100 year flow and is shown as "final" on plan sheets five and six. For the purposes of this project, however, the southerly bank is left low, allowing the flood plain to inundate a small portion of the undeveloped ground. This is shown as "interim" on the plans. It is proposed that future developers be left with the option of completing the channel if they wish to fully develope the flood plain, or using it in the "interim" conition in accordance with the flood plain ordinance, in the form of parks or similar land uses. The primary purpose of the channel is to contain the flood plain below the level of Highway 24.

9. Reach Number Eight (Trailer Park to 8th Street, Sta. 148+10 to 174+70)

The existing channel is badly constricted and creates a flood plain that inundates a Mobile Home Village and commercial area, as well as Highway 24 to the west of Eight Street. The mobile home village allows insufficient room for an improved channel to alleviate this situation.

A concrete channel is therefore provided that will contain the entire 100 year storm flow and must be between four and five feet below the existing grade so as not to create inundation of Highway 24 or the Mobile Home Village. This will remove 22 mobile home spaces as shown on plan sheet number five, however about half of these will be usable under a revised park layout. The remainder of the channel follows the natural alignment of the creek, however the approach to the Eighth Street bridge is badly constricted by facilities of Daniels Chevrolet north of Garner Street. Fortunately, the Eighth Street bridge is of more than sufficient size to accomodate the proposed design. Cross section sheets 37 thru 42 and photograph numbers 28 thru 31 show the area in detail.

10. Reach Number Nine (8th Street to Monument Creek, Sta. 174+70 to 195+70)

The existing flood plain fans out in this reach to a total width of about 2200 feet, not all of which may be shown on plan sheet number seven. The flood exits thru the I-25 railroad underpass north of Highway 24, and is forced south along the west side of I-25 to Bear Creek, as well as across the intended channel north of the Midland Expressway underpass.

A concrete lined channel is provided to contain the complete runoff so as to avoid inundation of the Holiday Inn facilities and the expressway. The existing creek bed and bridge openings in this areaare sufficiently large to allow this, and were improved as part of the highway construction. The present riprap lining, however is insufficient to contain the design runoff.

The channel is terminated underneath the Cimarron Street bridge at Monument Creek so as to provide scour protection at the west abutment and pier. The existing flood plain elevations on Monument Creek and Lower Fountain Creek, as shown on plan sheet number Seven, will not be substantially affected by the proposed design.

B. The West Side Drainage Basins.

1. General Description and Criteria

The limits of the various drainage basins that terminate on the creek within the project area are shown on plate number one included at the end of this section on page

Generally the natural drainage area terminates along Mesa Road to the north, bounding the Mesa basin, which is now being studied by a private consulting firm. The southerly limit is a natural divide along the route of the proposed Fountain Creek Boulevard which separates the west side basins from the Bear Creek Basin.

The existing City criteria requires that drainage facilities be provided to accomodate the runoff from a 50 year storm in minor basins, or a 100 year storm in basins where the flow becomes a major quantity (500 CFS). This criteria has been developed since the first major drainage investigations were performed for the City in the late 1950's. Recently, advances in technology have indicated that in small areas what was formerly expected to be a 50 year storm may be expected to be exceeded every 10 years. For this reason the newest procedures are utilized in this investigation and the following criteria was used to analyse existing and proposed storm sewers. This criteria is in close agreement with that used by other cities nationwide, and exceeds common

practice in most cities, particularly Denver and Los Angeles.

a. For general storm sewer work in streets in minor basins a 10 year storm was used.

b. For open channel storm sewers in basins of moderate size a 50 year storm was used.

c. For major drainage ways, where the runoff exceeds 500 CFS, a 100 year storm was used.

The basins were individually analysed in what is expected to be their future ultimately developed state, as explained in the next section.

2. Columbia Road

This basin extends well into Palmer Park and exits into Fountain Creek just above Colorado Avenue, occupying 376 acres. The basin will probable never be developed in more than 23% of its total size due to restructions of Palmer Park and steep terrain. The remainder should remain in natural, but hydrologically poor condition.

Most of the channel is in a natural, unimproved state which appears more than sufficient to accomodate the runoff. A concrete lined inlet to the Fountain Creek channel is proposed at station 5+02, with a RCB culvert where access is maintained to existing equestrian stables.

3. Ridge Road

This 106 acre basin drains down 36th Street and Ridge Road to Colorado Street and is about 60% developed. A storm sewer is provided from Colorado Avenue to the channel at station 14+30.

4. 33rd Street

This 134 acre basin should develope in about 80% of its total area, with the area along Colorado Avenue developing into commercial uses similar to the Red Rock Canyon Shopping Center. The existing runoff is overland to 33rd Street and Colorado Avenue, where a 54-inch RCP storm sewer is provided to the main channel at station 31. Due to the realignment of the creek, this storm sewer will have to traverse the mobile home park.

5. Camp Creek

The Camp Creek basin is by far the largest of those which drain into Fountain Creek in the project area, with 7060 acres outfalling just above 31st Street. A concrete lined channel with a riprapped bottom occupies the median of 31st Street from the northerly terminus to Bijou Street, where an arch plate structure with a concrete paved invert runs to the creek at channel station 45.

These facilities were designed to accommodate a 50 year storm, and will accomodate those flows with minor inlet revisions as shown on the drainage plan (plate 10). New City criteria requires these structures to be designed for a 100 year storm, which would require their removal and replacement with larger facilities. These facilities are not specified herein, in anticipation of the re-analysis of this basin in the near future. Inlet conditions to the channel are less than ideal, however these plans show only the connection between the channel and the existing structure.

6. 28th Street

This 106 acre basin is a part of the designated Camp Creek basin and is considered fully developed at this time. Some undeveloped ground exists along the northerly boundary below King Street, however its use will be severely limited by the very steep nature of the terrain.

A storm sewer network of corrugated metal pipe exists as shown on the drainage plan, and should be replaced by concrete pipe for additional capacity to Bijou Street in order to accomodate the slightly larger anticipated runoff. The storm sewer will

require an extension because of the relocated channel to terminate at station 63+40.

7. 26th Street

This is a very small (26 acre) basin that contain a very old storm sewer system which is adequate for the anticipated run off. The storm sewer will require extending from Vermejo Avenue to the channel above the 26th Street bridge.

8. Basin "C"

This is a minor, 13 acre basin that will require only consideration of minor inlets at the time of final design of the channel.

9. 24th Street

This is a very complex drainage basin that involves numerous serious consideration. The basin is divided into two portions. The upper portion is fully platted and nearly fully developed, and its 150 acres drain into a reservoir located just south of King Street at 25th Street. This reservoir provides substantial flood control benefits and should remain, however it is in violation of State Law, in that it has no spillway to accomodate storms of a reasonably large magnitude. For this reason it represents a serious danger to numerous residences downstream. A spillway is proposed to alleviate this situation.

The lower, 154 acre, portion of the basin has a relatively new storm sewer along 24th Street as shown on the drainage plan, which intercepts a considerable quantity of runoff that would otherwise overload an old storm sewer down 23rd Street. Despite the beneficial effects of the upstream reservoir, however, very little of this storm sewer is large enough to contain the full design flows. From Monument to St. Vrain, it must be increased one size to prevent exceeding street capacity. Below St Vrain, however, the excess runoff will drain to 23rd Street, so that only one modification in size is required to Fountain Creek. The storm sewer will outfall into the channel at station 86+95.

10. 23rd Street

Because of the new 24th Street storm sewer, this basin now consists of only 48 acres, lying either side of 23rd Street as far north as Monument Street. It contains a very old storm sewer, consisting of a series of reinforced concrete box structures, that is considerably oversized. For this reason it is used as a supplement to the 24th Street storm sewer, and needs only the addition of several inlets to cause these two systems to fully contain the runoff of both basins. This may be accomplished without exceeding any street capacity along the way.

The 23rd Street storm sewer terminates just north of station 91+90 on the main channel, where a riprap ditch is provided as an inlet.

11. 21 Street

This 59 acre basin extends from the Creek north to Uintah Street and drains to 21st Street. It contains two old, small storm sewer systems, the easterly of which requires replacement from Colorado Avenue to the creek at the 21st Street bridge.

12. 20th Street

This is a long, slender, 58 acre basin that extends to past Henderson Street on the north, and contains an existing storm sewer system along 20th Street. This system must be extended from the D & RG railroad tracks to the channel at station 107 +40 to provide adequate drainage of some low-lying ground in that vicinity.

13. 14th Street

This is another complex basin, similar to the 24th Street basin, that consists of two major portions.

The upper portion is the 19th Street basin, containing 272 acres, which has been investigated twice for the City and

terminates at a 40 acre below ground reservoir at 19th Street and Dale Street. The storm sewer system and the reservoir size are more than sufficient and will require no modification, however previous analysis of the outlet works to the reservoir did not consider several factors. Certain types of storms that might occur as often as each 10 years on the average will overtop the reservoir and allow severe flooding of streets below that point. Fortunately, this reservoir is entirely below ground and no danger exists related to the washing out of dikes and sudden release of stored water.

The lower portion of the basin, 361 acres in size, contains the oldest portion of Colorado Springs, including an old storm sewer system consisting of a series of reinforced concrete box structures of various sizes. Despite the beneficial effects provided by the upper reservoir, none of this storm sewer is large enough to accomodate the runoff from a storm that should occur each 10 years, and must be replaced as shown on the drainage plan. The system outfalls to the channel at station 139+70, where an 8' x 7' RCB is provided across Highway 24.

14. 12th Street

This 63 acre basin is essentially fully developed and contains a series of existing storm sewers that are sufficient to accomodate the design runoff. An extension of a 48" RCP culvert at station 147+46 will provide an inlet to the main channel.

15. 11th Street

This minor, 6 acre basin, drains through two-24-inch culverts on Highway 24 which will require extending to the main channel.

16. 10th Street

This 56 acre basin has only an old, small storm sewer from Colorado to Cucharras Streets. A new storm sewer system is proposed from Kiowa Street to an existing 36-inch RCP across Highway 24, which will have to be extended slightly to the main channel at station 159+28.

17. 8th Street

This is a very long, slender, 54 acre basin that extends to 12th Street and Manitou Boulevard, draining down limit and 8th Streets. The storm sewers are enlarged along Limit Street and extended down 8th Street to the bridge on the main channel at station 173+70.

18. Chestnut Street

This 83 acre basin extends to Bijou Street and contains an old, minor storm sewer network that requires replacement from Pikes Peak to the main channel at station 187+10.

19. Red Canyon

This 353 acre basin lies against Crystal Hills and extends two miles in length into the Forest at elevation 7600. The drainage channel is natural along practically its entire length, except the bottom portion where considerably fill has been placed. The only significant structures along its length are two 8' x 4' box structures placed in series by the highway department across Highway 24. These culverts are adequate to pass a 100 year storm runoff, and a concrete channel is provided from the end to the channel at station 19+15.

20. Palmer Trail

This is a rugged, 910 acre basin that extends 14,400 feet south of the creek into the forest at elevation 8130. Only the lower 47 acres appears to have the capacity for any significant development. A few minor stockwater ponds exist along the creek but the only significant drainage structure is the 9' x 6' box culvert across Highway 24.

This culvert cannot pass the 100 year storm, having a capacity to pass a storm of about a 60 year recurrence; more than adequate for highway purposes, but insufficient per the City's criteria. No modification is proposed, and an open topped extension

is shown to the channel at station 27+65.

21. Basin "A"

This is a minor, 57 acre basin that outfalls through an existing 36" concrete culvert just above the 31st Street interchange on Highway 24. An extension of this culvert to the channel at station 43+70 is proposed.

22. Basin "B"

This is an odd-shaped, 101 acre basin that originates between the sandstone "hog-backs" south of Highway 24 and terminates at an insufficient 24" culvert. The culvert must be replaced by a 54" RCP, or equal, to terminate on the channel at station 58 +55.

23. Fairview

This 247 acre basin has a total length of 8800 feet to a point on the major sandstone "hog-back" west of Gold Camp Road where it intersects the Bear Creek Road. The drainage channel consists of an inadequate unlined ditch parallelling Smelter Street, terminating at an insufficient 36 inch culvert just west of 26th Street on Highway 24. This culvert must be replaced with a 78-inch RCP, or equal, to terminate on the channel at station 75-30.

24. Basin "D"

This 103 acre basin consists of the previously developed ground between 21st and 26th Streets as far south as Howbert Street. It drains to a 27" x 43" culvert near the Ghost Town which is insufficient. The routing is revised to cross 21st. Street through a series of lined ditches and a 4'x4' box culvert to the channel at station 111+80.

25. South 21st Street

This is a 422 acre basin that lies south and west of 21st Street against the Bear Creek Basin. It is largely undeveloped and interior drainage is provided by a series of unlined ditches with improved road crossings installed by El Paso County. The unimproved main channel terminates at 2-84" metal culverts which tie into an old 8' x 10' box structure on 21st Street. Although these are sufficient to pass the design flow, the inlet is very susceptible to being plugged by trash as shown on photograph number 25.

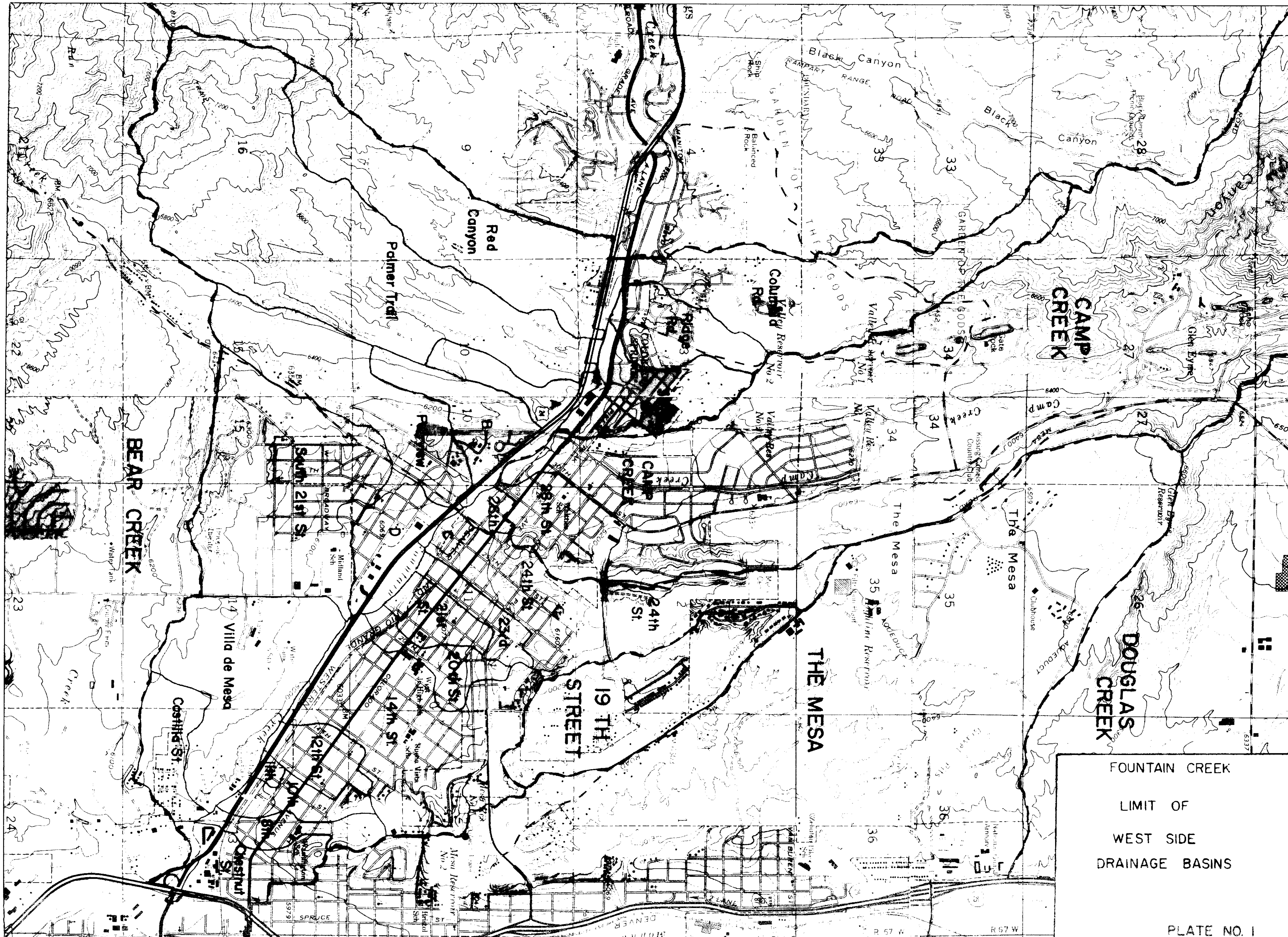
A riprapped channel is proposed to extend from the culvert on 21st Street to the main channel at station 113+93.

26. Villa DeMesa

This 284 acre basin includes the Gold Hill Mesa area and the existing Villa DeMesa subdivision. Various development plans are being contemplated by the owners, however the area is essentially undeveloped. Until such time as a firm development plan is approved by the City no detailed drainage work is possible in this area. Inlets should be provided to accomodate relatively minor runoff from the undeveloped ground at the time of final design, with the developer being required to provide detailed drainage work as prescribed by existing ordinances and regulations.

27 Costilla Street

This 83 acre basin encompases a small area of residences that contains existing culverts on roadways that are sufficient to accomodate future design flows. The existing 4' x 5' box culvert at the outfall is sufficient and discharges into the channel immediately above 8th Street.



FOUNTAIN CREEK

LIMIT OF

WEST SIDE

DRAINAGE BASINS

PLATE NO. 1

SECTION III

TECHNICAL DATA

III TECHNICAL DATA

A. Surveying Information

All horizontal control is based on the U.S.C. & G. S. Colorado Coordinate System, central zone, Lambert projection, 1927 North American Datum.

All vertical control is based on the U.S.G.S. mean sea level datum, 1929 adjustment.

Survey information is based upon a control traverse from points "Glen Eyrie", in the Southeast Quarter, Section 20, Township 13 South, Range 67 West of the 6th P.M. and "Palmer" located just to the east of the Palmer Park Overlook. Field closures were well within acceptable limits.

Topography and photogrammetric work was provided by Bell Mapping of Denver, from 500 scale aerial photography, dated February 3, 1975. All mapping is certified by them to conform to National Map Accuracy Standards, in that 90% of the topography is within one-half contour interval, the remainder being within one contour interval. The topography was placed on a series of photos rectified to true image along the creek bed for clarity.

The centerline shown on the enclosed plan and profile sheets is a preliminary line taken for design purposes, and it may be seen that the channel is not symmetrical about it in all cases. The following is the design configuration of this centerline.

FOUNTAIN CREEK PRELIMINARY CENTERLINE CONTROL

PI NO.	COORDINATE INFORMATION NORTH	EAST	TANGENT LENGTH	BEARING	Δ	R	L	T	PC STA	PT STA
City Limit	373,535	2,175,582								0+00.00
			486.25	S77-39-00E						
1	373,431	2,176,057			17°30'55"	500	152.85	77.03	4+09.22	5+62.07
			295.20	S60-08-05E						
2	373,284	2,176,313			14°37'19"	500	127.60	64.15	7+16.09	8+43.69
			425.99	S74-45-24E						
3	373,172	2,176,724			3°40'40"	2000	128.38	64.21	11+41.32	12+69.70
			1341.49	S71-04-44E						
4	372,737	2,177,993			5°48'17"	2000	202.62	101.40	24+45.58	26+48.20
			634.55	S76-53-01E						
5	372,593	2,178,611			20°11'29"	1000	352.41	178.05	30+03.30	33+55.71
			498.96	S56-41-32E						
6	372,319	2,179,028			5°35'18"	2000	195.07	97.61	35+79.01	37+74.08
			492.11	S51-06-14E						

PI NO.	COORDINATE NORTH	INFORMATION EAST	TANGENT LENGTH	BEARING	Δ	R	L	T	PC STA	PT STA	
7	372,010	2,179,411			2°20'13"	2000	81.58	40.79	41+27.79	42+09.37	
			1069.42	S53-26-27E							
8	371,373	2,180,270			46°08'51"	500	402.71	213.00	50+25.00	54+27.71	
			590.78	S07-17-36E							
9	370,787	2,180,345			34°31'21"	1000	602.53	310.72	54+94.77	60+97.30	
			1191.20	S41-48-57E							
12A	369,899.210	2,181,139.220			14°13'47"	2000	496.71	249.64	67+28.14	72+24.85 BK	=73+49.50 AHD
			473.40	S56-02-45E							
13	369,634.8	2,181,531.9			18°45'46"	500	163.74	82.61	74+90.65	76+54.39	
			693.52	S37-16-59E							
14	369,083	2,181,952			25°16'42"	1000	441.19	224.24	80+41.06	84+82.25	
			967.88	S62-33-41E							
15	368,637	2,182,811			12°20'35"	2000	430.86	216.27	90+09.62	94+40.48	
			1236.20	S50-13-05E							
16	367,846	2,183,761			20°11'51"	700	246.76	124.67	103+35.74	105+82.50	
			489.69	S30-01-14E							
17	367,422	2,184,006			53°19'12"	250	232.65	125.52	108+22.00	110+54.65	
			405.33	S23-17-58W							
18A	367,049.726	2,183,845.678			91°06'37"	200	318.04	203.91	111+30.55	114+48.59	
			645.38	S67-48-39E							
18B	366,805.989	2,184,443.261			9°26'30"	2000	329.58	165.16	117+24.90	120+54.48	
			2720.95	S58-22-09E							
19	365,379	2,186,760			0°40'02"	10000	116.43	58.22	145+52.05	146+68.48	
			1492.72	S59-02-10E							
20	364,611	2,188,040			26°06'11"	2000	911.17	463.63	156+39.35	165+50.52	
			1217.67	S32-55-59E							

PI NO.	COORDINATE INFORMATION NORTH	EAST	TANGENT LENGTH	BEARING	△	R	L	T	PC STA	PT STA
21	363,589	2,188,702			60°09'25"	150	157.49	86.88	172+17.68	173+75.17
			1168.70	N86-54-36E						
22	363,652	2,189,869			48°11'05"	350	294.34	156.51	183+00.48	185+94.82
			427.80	S44-54-19E						
23	363,349	2,190,171			23°18'35"	500	203.42	103.13	187+62.98	189+66.40
			649.38	S68-12-54E						
24	363,108	2,190,774			72°10'00"	300	377.86	218.63	192+94.02	196+71.88
			609.45	S03-57-06W						
25	362,500	2,190,732								200+62.70

The following are the horizontal ties to the various control points located along the channel centerline at the center of the referenced bridges:

POINT NO.	BRIDGE LOCATION	COORDINATES- NORTH	EAST	STATION	OFFSET
FC B1	Colorado Street	373,362.112	2,176,174.428	6+21.17	1.24' RT
FC B2	Ridge Road	373,082.467	2,176,995.596	14+91.44	3.37' LT
FC B3	31st. Street	371,780.985	2,179,719.358	45+52.68	0.28' RT
FC B4	26th Street	Same as PI	#13	75+72.52	6.78' LT
FC B5	25th Street	369,196.459	2,181,868.631	81+24.54	1.09' RT
FC B6	21st Street	367,915.887	2,183,676.651	103+50.88	0.10' RT
FC B7*	Upper Highway 24	367,312.221	2,183,908.595	110+65.88	46.43' RT
FC B8	8th Street	363,594.178	2,188,805.510	173+91.93	0.41' RT
FC B9	Lower Highway 24	363,640.956	2,189,661.940	182+49.64	0.13' LT
FC B10*	I 25 on Ramp	363,196.139	2,190,586.583	193+05.43	12.52' LT

* Offset from Center of Bridge

B. Soils and Geology

Soils mapping was taken from the mapping of the USDA-Soil Conservation Service files in the Colorado Springs Office. Geological Mapping is that of the US Geological Survey and was performed as a part of the ongoing study related to development of the

Front Range Urban Corridor in Colorado. The limit of the various formation exposures are shown at the end of this section on plate number 2 Page 41 as they relate to hydrologic classifications.

The creek lies in a narrow band of the Piney Creek Alluvium, a gray to brown humic-rich, firmly compacted clayey silt and sand up to 20 feet thick, having pebble lenses in the lower part. This is a good construction material, except where humus deposites are found, which will be highly compressible and should be wasted. Generally the water level is below the creek bed. A study of 36 wells in the project area reveal an average depth to water of 30 feet from the terrace level, varying from 20 to 63 feet, with yields averaging 10 GPM, varying from 0-30 GPM. In places, however, the alluvium pinches out against bedrock and an underdrain will be required to protect the channel lining. This occurs where the sandstone hog-backs cross above 31st street and throughout the lower reaches, where the Pierre Shale occasionally exposes in the creek bed. Detailed soils exploration should be required in the final design stage for the purpose of underdrain design and material suitability.

The Fountain formation occupies the basin terraces above the hog-back crossing, except for minor alluvium deposites on ridge-tops. This is a reddish brown arkosic conglomerate, being very difficult to excavate.

The Louviers alluvium occupies the ground near El Paso Community College and a strip from the D & RG railroad to Kiowa Street north of the creek. This is a yellowish-brown material containing pebbles, cobbles and boulders, weakly compacted, poorly sorted and well stratified. Permiability is quite high and the material is excellent for the channel construction.

The Terrain either side of the alluvium deposites along the creek is comprises of Pierre shale exposures below 31st Street. This is a clayey shale containing irregular grey limestone masses that has high swelling and erosion potential, with low permeability.

The ridge tops along the basin limits are comprised of alluvial gravel deposites, the Verdos alluvium along Mesa Road and the Rocky Flats alluvium near Gold Camp Road. The permeability in these units are generally quite high.

The mine tailings in the Villa de Mesa-Gold Hill area are totally worthless as a construction material and should be avoided.

C. Fountain Creek

1. Hydrology

A USGS stream gaging station is located on the channel at station 26+68 and has been operated continuously since April of 1958. The records of this period are good. The natural stream flows are affected by storage reservoirs, power developments, diversions for irrigation and municipal use, and at times, transbasin diversions from the Beaver Creek Drainage and Transmountain diversions from the Colorado River basin. A regression analysis has been performed from these records and the flow in the creek during an "average" year is represented on plate number three at the end of this section. From this plate, it may be seen that stream water diversions for construction of the channel are not a major problem, and that the contractor might expect a peak runoff of 235 CFS during a normal construction period. The period of record is considered too short, however, for prediction of major floods.

As prescribed by the City, the basic 100 year design flows of the Corps of Engineers were used in the design of the channel. The project area was split into three reaches as follows:

REACH	DESIGN FLOW-CFS (Q100)
To Red Rock Canyon	17,100
Red Rock Canyon to Camp Creek	19,600
Camp Creek To Monument Creek	20,500

Hydrographs are presented as plate number four.

These results agree quite closely with those prescribed by the USDA-SCS synthetic hydrograph method as outlined in referenced publications, and described in detail in section III D 1. The 3 primary design reaches have the following hydrologic characteristics.

REACH	AREA-SM	TC-HRS	CURVE NUMBER
To Red Rock Canyon	101	1.275	66
Red Rock Canyon to Camp Creek	111	1.325	67
Camp Creek To Monument Creek	120	1.782	70

From this data, a Theroretical analysis was presented with respect to discharge VS. return period as shown on plate number five. This analysis proves to be more conservative in the lower return periods than the regression analysis previously mentioned, but is used for the design.

The project area was further divided into sub-reaches corresponding to the location of inlets prescribed in the design, and design runoffs for these reaches are as follows.

INLET	STATION	DESIGN FLOWS-CFS	
		10 YEAR STORM	100 YEAR STORM
City Limit	0+00		
		4,720	17,100
Columbia Road	5+02		
		4,780	17,200
Ridge Road	14+30		
		4,800	17,200
Red Canyon	19+15		
		4,860	17,400
Palmer Trail	27+65		
		5,010	17,600
33rd Street	31+00		
		5,030	17,600
Basin "A"	43+70		
		5,040	17,700
Camp Creek	45+00		
		6,230	19,700

INLET	STATION	DESIGN FLOWS-CFS	
		10 YEAR STORM	100 YEAR STORM
Basin "B"	58+55		
		6,240	19,700
28th Street	63+40		
		6,260	19,800
26th Street	75+30		
		6,260	19,800
Fairview	75+30		
		6,300	19,800
Basin "C"	81+24		
		6,310	19,900
24th Street	86+70		
		6,350	19,900
23rd Street	91+90		
		6,360	19,900
Basin "D"	103+20		
		6,380	20,000
21st Street	103+20		
		6,390	20,000
South 21st Street	107+40		
		6,400	20,000
20th Street	113+93		
		6,470	20,100
Villa De Mesa	133+06		
		6,510	20,400
14th Street	139+70		
		6,600	20,400

INLET	STATION	DESIGN FLOWS-CFS 10 YEAR STORM	100 YEAR STORM
12th Street	147+46		
		6,630	20,400
11 th Street	154+37		
		6,640	20,400
10th Street	159+28		
		6,640	20,400
Costilla Street	173+20		
		6,660	20,500
8th Street	173+70		
		6,670	20,500
Chestnut	187+10		
		6,680	20,500
End of Job	195+70		

2. Hydraulics

All hydraulic computations were performed using Mannings formula. "n" valves were taken as 0.015 for concrete channel lining, 0.035 for riprap, 0.013 for formed concrete, and corresponded to valves used by the Corps of Engineers for the flood plains in general. In some cases, independant "n" valves were reassessed due to significant flood plain modicication. Details of flood plain information are shown on the cross section. The following summarizes the basic open channel computations.

STATION	SLOPE	n	b -ft-	d -ft-	z	10 YEAR STORM Q-CFS	10 YEAR STORM depth-ft	10 YEAR STORM V-fps	100 YEAR STORM Q-CFS	100 YEAR STORM depth-ft	100 YEAR STORM V-fps	FB-ft
0+00	0.01303	0.015	24	12	2	4,720	5.0	26.9	17,100	10.0	39.0	2.0
	transition											
1+25												
	0.01303	0.0147	35	12	2 lt Vert rt	4,720	4.4	26.5	17,100	9.6	40.1	2.4
4+09.22												
	Transition											
5+62												
	0.01303	0.013	90	6	Vert	--	---	----	17,200	5.2	36.4	0.8

STATION	SLOPE	n	b	d	z	10 YEAR STORM			100 YEAR STORM			FB-ft
			-ft-	-ft-		Q-CFS	depth-ft	V-fps	Q-CFS	depth-ft	V-fps	
6+73												
	transition											
8+43.69												
	0.01303	0.015	60	9	2	4,780	3.2	22.8	17,200	6.7	35.1	2.3
13+87												
	transition											
14+62												
	0.01303	0.015	40	10	1.5	4,800	4.0	25.5	17,200	8.4	38.5	1.6
15+15												
	transition											
15+90												
	0.01303	0.015	50	9.5	2	4,860	3.6	24.2	17,400	7.4	36.4	2.1
27+70												
	transition											
28+00												
	0.01303	0.015	40	10	2	5,010	4.0	25.2	17,600	8.3	37.7	1.7
30+00												
	0.02767	0.015	40	9	2	5,030	3.2	32.2	17,600	6.7	48.9	2.3
31+65												
	transition											
32+00												
	0.02767	0.0148	44	9	vert 1t	5,030	3.2	32.9	17,600	6.9	51.0	2.1
33+00					1.75 rt.							
	0.01262	0.01475	44	10	do.	5,030	4.2	26.1	17,600	8.7	39.0	1.3
35+79.10												
	transition											
36+00												

STATION	SLOPE	n	b	d	z	10 YEAR STORM			100 YEAR STORM			FB-ft
			-ft-	-ft-		Q-CFS	depth-ft	V-fps	Q-CFS	depth-ft	V-fps	
36+00												
	0.01262	0.0148	53	10	1.75 Rt	5,030	3.6	24.2	17,600	7.8	37.7	2.2
41+27.79												
	transition											
42+09.37												
	0.01884	0.015	30	10	2.5	5,040	4.2	29.7	17,700	8.2	42.8	1.8
44+50												
	0.01084	0.015	30	11	2.5	6,230	4.8	31.3	19,700	8.8	43.5	2.2
46+00												
	0.01086	0.035	40	8	2	6,230	7.8	14.3	19,700	See flood plain		0.2
61+00												
	0.01467	0.035	40	8	2	6,260	7.2	15.9	19,800	See flood plain		0.8
68+30												
	0.01467	0.035	26	10	2	6,260	9.4	15.0	19,800	See flood plain		0.6
74+90.65												
	transition											
75+50												
	0.01092	0.015	30	12	2	6,300	5.6	26.9	19,800	10.4	37.5	1.6
80+14.06												
	transition											
81+15												
	0.01092	0.013	62.7	9	Vert	6,310	3.9	27.4	19,900	7.8	40.5	1.2
81+40												
	0.01092	0.035	50	7	2	6,350	7.0	13.8	19,900	See flood plain		--
89+00												
	transition											

STATION	SLOPE	n	b	d	z	10 YEAR STORM			100 YEAR STORM			
			-ft-	-ft-		Q-CFS	depth-ft	V-fps	Q-CFS	depth-ft	V-fps	FB-ft
90+09.62												
	0.01051	0.015	30	7	2	6,360	5.8	26.9	19,900	See flood plain		1.2
102+50												
	transition											
103+12												
	0.01051	0.015	60	9	2.5	6,390	3.8	25.0	20,000	7.1	35.9	1.9
103+88												
	0.01311	0.035	60	9	2.5	6,400	6.0	14.0	20,000	See flood plain		3.0
109+30												
	transition											
110+30												
	0.01311	0.015	35	13.5	1.5	6,400	5.2	29.2	20,000	10.5	41.8	3.0
111+20												
	transition											
112+00												
	0.01204	0.035	40	16	2	6,470	7.8	15.0	20,000	14.2	20.7	1.8
120+70												
	0.01108	0.035	40	16.5	2	6,470	8.0	14.6	20,000	14.5	20.1	2.0
120+80.32												
	0.00686	0.035	40	18.5	2	6,470	9.2	12.4	20,100	16.5	17.0	2.0
133+60.32												
	0.01099	0.035	40	16.5	2	6,600	8.0	14.6	20,400	14.6	20.1	1.9
144+70.32												
	0.01812	0.035	40	15	2	6,630	7.0	17.4	20,400	12.9	24.2	2.1
148+10.32												
	transition											

STATION	SLOPE	n	b -ft-	d -ft-	z	10 YEAR STORM Q-CFS	depth-ft	V-fps	100 YEAR STORM Q-CFS	depth-ft	V-fps	FB-ft
	transition											
148+70.32												
	0.01812	0.015	60	8	2	6,630	3.4	28.5	20,400	6.7	41.4	1.3
150+70.32												
	0.008671	0.015	60	9	2	6,640	4.4	22.5	20,400	8.3	32.3	0.7
159+20.32												
	0.005209	0.015	60	10.5	2	6,640	5.0	18.8	20,400	9.6	27.1	0.9
170+70.52												
	0.00867	0.015	60	9	2	6,660	4.4	22.5	20,500	8.3	32.3	0.7
173+08.43												
	transition											
173+58.43												
	0.00867	0.013	65	9	vert	6,670	--	--	20,500	8.4	37.7	0.6
174+25.43												
	transition											
174+70.32												
	0.01166	0.015	40	10.5	2.5	6,670	5.0	26.6	20,500	9.0	36.7	1.5
180+87.68												
	transition											
182+16.32												
	0.006879	0.015	40	12	2.5	6,670	5.6	21.8	20,500	10.3	30.3	1.7
187+10.32												
	0.01070	0.015	40	10.5	2.5	6,680	5.0	25.6	20,500	9.1	35.5	1.4
193+70.32												
	transition											

STATION	SLOPE	n	b -ft-	d -ft-	z	10 YEAR STORM Q-CFS	10 YEAR STORM depth-ft	10 YEAR STORM V-fps	100 YEAR STORM Q-CFS	100 YEAR STORM depth-ft	100 YEAR STORM V-fps	FB-ft
	transition											
194+20.32												
	0.01070	0.015	35	11	2	6,680	5.4	26.6	20,500	10.0	37.1	1.0
195+70												

Transition lengths were computed in accordance with USBR Spillway criteria, in that the length required is defined as 1.5 times the product of the change in width and the average Froude number across the transition, and may be summarized as below. Transitions marked with an asterisk were computed by backwater computations.

TRANSITION STATION	CHANGE IN WIDTH -ft-	AVERAGE FR	REG'D LENGTH -ft-	LENGTH
0+00	10.6	2.227	73.48	125.00
4+09.22	45.4	2.547	173.44	152.78
6+73	16.6	2.602	64.79	170.69
13+87	20.8	2.367	73.84	75.00
15+15	12.2	2.350	43.00	75.00
27+70	8.2	2.332	28.68	30.00
31+65	6.6	3.376	33.42	35.00
41+27.79	6.15	2.759	25.45	81.58
44+50	1.5	2.609	5.87	15.00
68+30	12.4	0.931	17.32	20.00
74+90.95	2.4	1.403	5.05	59.35
80+14.06	11.9	2.304	41.12	100.94
89+00	0.80	2.004	2.405	100.00
102+50	9.75	1.842	26.93	60.00
109+30	37.75	1.663	94.15	100.00
111+20	17.65	1.622	42.94	80.00
*120+60			8.6	10.00
*124+50			21.2	30.32

TRANSITION STATION	CHANGE IN WIDTH -ft-	AVERAGE FR	REG'D LENGTH -ft-	LENGTH
*133+00			9.83	60.32
*143+95			75.1	75.32
148+10.32	7.6	2.001	22.81	60.00
150+70.32	3.2	2.396	11.50	55.19
158+70.32	2.6	1.759	6.86	32.00
170+50.32	6.3	1.759	16.62	20.00
173+08.43	11.8	2.134	37.78	50.00
174+25.43	0.45	2.080	1.72	44.89
180+87.66	3.25	1.911	9.31	128.64
193+70.32	7.75	2.072	16.06	50.00

Additional backwater will exist above certain bridge openings or channel constrictions where a wide flood plain is concentrated into a narrow channel opening. These were checked by the Bureau of Public Roads momentum analysis as presented in the Denver Urban Flood Control Manual. A summary of these backwater is as follows:

LOCATION ---	STATION	NORMAL FLOOD PLAIN ELEV.	BACKWATER -FT-	BACKWATER ELEVATION	DIKE ELEV.
Inlet ,	0+00	6172.8	0.56	6173.36	6176.0
26th Street	74+90.65	6078.8	0.49	6079.29	6080.0
21st Street	102+50	6042.3	Constrained by channel banks		
Highway 24	109+30	6033.9	0.69	6034.6	6035.0
Trailer Park	148+10.32	5994.0	0.51	5994.5	5998.00

The bridge pier effects were analysed in accordance with the criteria of the Corps of Engineers and the LA County Flood control district. In all cases the channel slopes were so steep as to require a momentum analysis under class C flow, which may be summarized as follows:

BRIDGE	INCOMING V-fps	INCOMING DEPTH-ft	DEPTH FACTOR	DEPTH THRU PIERS-FT.	ALLOWABLE DEPTH-Ft
Manitou Ave.	36.41	5.2	1.083	5.6	6.0
Ridge Road	38.54	8.4	1.183	9.9	10.6
31st Street	42.78	8.2	1.222	10.0	10.2

BRIDGE	INCOMING V-fps	INCOMING DEPTH-ft	DEPTH FACTOR	DEPTH THRU PIERS-FT.	ALLOWABLE DEPTH-ft.
26th Street	37.54	10.4	1.188	12.4	14.2
25th Street	40.52	7.8	1.126	8.8	11.6
21st Street	35.85	7.1	1.140	8.1	11.2 *
Upper Highway 24	41.82	10.5	1.245	13.1	14.8
8th Street	37.72	8.4	--	8.4	12.5
Lower Highway 24	36.72	9.0	1.262	11.4	12.7
I 25 Overpasses	35.51	9.1	1.118	10.2	Very High
I 25 Ramp	35.51	9.1	1.118	10.2	13.3

* Variable girder, Minimum depth=9.6'

Curve superrelevations were checked by the formula $S = v2\ B/gR$ where S is the total maximum water surface superelevation in the curve. The following is a summary of these computations.

PC STATION	NORMAL d-ft-	B -ft-	V -fps-	R -ft-	MAXIMUM d-ft-	DEPTH Used-ft-	MINIMUM FREEBOARD -ft-
4+09.22	5.2	54.2	40.09	500	7.9	8.0	0.1
7+16.09	6.7	86.8	35.10	500	10.0	10.0	-0-
11+41.32	6.7	86.8	35.10	2000	7.53	9.0	1.47
24+45.58	7.4	79.6	36.38	2000	8.22	9.5	0.94
30+03.30	6.7	50.0	48.91	1000	8.56	9.0	0.44
35+79.01	8.7	59.2	38.98	2000	9.40	10.0	0.60
41+27.79	8.2	71.0	42.78	2000	9.21	10.0	0.79
50+25.00	6.8	67.2	17.07	500	7.41	8.00	0.59
54+94.77	7.8	71.2	14.3	1000	8.0	8.0	-0-
67+28.14	9.0	62.0	17.19	2000	9.14	10.0	0.86
74+90.65	10.4	71.6	37.52	500	13.53	14.2 (girder)	0.67
80+41.06	10.4	71.6	37.52	1000	11.97	12.0	0.03
90+09.62	5.8	53.2	26.90	2000	6.10	7.0	0.90

PC STATION	NORMAL d-ft-	B -ft-	V -fps-	R -ft-	MAXIMUM d-ft-	DEPTH Used-ft-	MINIMUM FREEBOARD -ft-
103+35.74	6.0	90.0	13.97	700	6.39	9.0	2.61
108+22.00	11.4	117.0	20.14	250	14.35	14.8 (girder)	0.45
111+30.55	14.2	96.8	20.73	200	17.43	19.00	1.57
117+24.90	14.5	98.0	20.10	2000	14.81	16.00	1.19
145+52.05	12.9	91.6	24.16	10000	12.98	15.00	3.02
156+39.35	9.6	98.4	27.13	2000	10.16	10.5	0.34
172+17.68	8.4	64.8	37.72	150	17.94	19.7	1.76
183+00.48	9.1	85.5	35.51	350	N/A	Rt side allowed to flood	
187+62.98	9.1	85.5	35.51	500	12.45	12.50	0.05
192+94.02	10.0	75.0	37.14	300	N/A	Lt side conforms to Mon. Creek	

Areas of riprapped channel were sized for thickness of riprap and size of stone in accordance with California bank and shore protection standards. A specific gravity of the rock was assumed to be 2.60. The tangential bank velocity is considered to be two-thirds of the mean, while the outer bank velocity on curves is considered to be four-thirds of the mean. Computations are summarized as follows.

STATIONS	MEAN VELOCITY -fps-	SIDE SLOPE -z-	TANGENTIAL DIAMETER -ft-	TANGENTIAL THICKNESS -ft-	OUTER CURVE BANK DIAMETER -ft-	OUTER CURVE BANK THICKNESS -ft-
46 to 57	17.4	2	1.0	2.0	4.0	6.0
57 to 61	20.0	2	1.5	3.0	6.0	8.0
61 to 68	22.2	2	1.75	3.5	N/A	N/A
68 to 74	15.8	2	1.0	2.0	3.5	6.0
82 to 89	13.8	2	0.75	1.5	2.5	5.0
104 to 109	20.1	2.5	1.5	3.0	3.5	6.0
112 to 125	20.7	2	1.5	3.0	6.0	8.0
125 to 133	17.0	2	1.0	2.0	N/A	N/A
133 to 144	20.1	2	1.5	3.0	N/A	N/A
144 to 148	24.2	2	2.0	4.0	N/A	N/A

D. The West Side Drainage Basins

1. Hydrology

All computations were performed in accordance with the USDA-SCS synthetic hydrograph method, in accordance with the following formula:

qp = K A Q

where:

qp is the peak design runoff

K is a constant, varying with time of concentration.

A is the basin area in square miles.

Q is the runoff corresponding to a given soil-cover complex and rainfall. Type IIa storm distributions were used.

Times of concentration were computed by the overland flow formula to the point of the first inlet, then full barrel velocities were used.

Soil-cover complexes were developed using plate number 2, located in section III B, and plate number 6, included at the end of this section. Plate 6 shows the development categories of the various basins, as they are reasonably expected to be in their ultimate state. Plate number 10, located at the end of this section is a drainage plan of the project area.

The following will summarize the hydrologic computations of the various individual basins along the west side, at the point of discharge into Fountain Creek.

BASIN	CURVE NO.	TC	AREA	PEAK RUNOFF			
		-hrs-	-SM-	10 YEAR	50 YEAR	100 YEAR	DESIGN
Columbia Road	81	0.460	0.588	407	650	799	799
Ridge Road	76	0.251	0.165	96.7	166	209	96.7
33rd Street	84	0.234	0.209	204	314	381	204
Camp Creek	66	1.720	11.035	1260	2200	2860	2200 (1)
Old Camp Creek	88	0.148	0.0239	31	45	54	45
28th Street	87	0.209	0.165	195	290	347	195
26th Street	75	0.137	0.040	23	41	52	23
Upper 24th Street	84	0.379	0.234	206	316	384	206
Lower 24th Street	86	0.077	0.240	278	420	504	N/A (2)
23 rd Street	84	0.136	0.075	78	119	145	78
21st Street	82	0.217	0.092	81	128	156	81

BASIN	CURVE NO.	TC -hrs-	AREA -SM-	PEAK RUNOFF 10 YEAR	50 YEAR	100 YEAR	DESIGN
20th Street	84	0.165	0.090	93	143	173	93
19th Street	85	0.284	0.425	423	646	777	423
Lower 14th Street	82	0.152	0.564	514	815	994	N/A (2)
12th Street	76	0.195	0.099	60	103	129	60
11th Street	76	0.085	0.009	6	10	12	12
10th Street	84	0.379	0.088	77	118	143	77
8th Street	85	0.224	0.085	88	135	162	88
Chestnut	84	0.266	0.130	125	192	233	125
Red Canyon	71	0.341	0.551	211	393	513	513
Palmer Trail	77	0.444	1.42	772	1300	1624	1300 (1)
Basin "A"	75	0.241	0.089	49	86	109	86
Basin "B"	82	0.218	0.158	139	220	269	220
Fairview	79	0.428	0.386	242	396	494	396
Basin "C"	75	0.112	0.020	12	21	26	26
Basin "D"	86	0.285	0.161	169	255	306	255
South 21st Street	84	0.422	0.660	563	866	1050	1050
Villa de Mesa	89	0.562	0.443	443	644	760	N/A (3)
Costilla Street	85	0.231	0.130	134	205	247	205

(1) Ordinarily the higher figure would be used, however an expensive structure is in place under other criteria and no replacement is recommended.

(2) These flows do not apply as composite hydrographs were developed as later explained.

(3) No detailed design is possible until the developer establishes his proposed plans in detail-the figures are shown as a guide only.

Detailed inlet hydrographs were developed for the upper 24th Street and 19th Street reservoirs in accordance with chapter 16 of the SCS engineering manual, which closely approximates the USBR small dams method. The storm was then routed through the reservoirs and the out flow hydrographs were combined with the hydrographs of the lower 24th street and lower 14th Streetbasins, respectively, to develope composite design hydrographs. The details of this design are explained in the next section.

2. Hydraulics

The same hydraulic criteria was applied in the design of basin storm sewers as described for the Fountain Creek Channel. In addition, the following was used.

In storm sewers, the maximum hydraulic gradient to the channel gradient was utilized with the following mannings' "n" valves:

0.013 RCB boxes and RCP

0.024 CMP standard corrugations

0.026 CMP 3" x 1" corrugations

0.030 CMP 6" x 2" corrugations (in arch pipe)

In channels the optimum hydraulic shape was used, where d/b = 1.

In roadway culverts the criteria of the Bureau of Public Roads, as used by the State Highway Department was used, with the full headwater allowed by the crest of the roadway.

Existing "as-built" plans of storm sewers were used where possible for grade. Where these were not available the best topography was used the 2' topography herein, the 5' USACE Topography, or USGS.

The following is a summary of the computations.

a. Columbia Road

Q100 = 799 CFS S= 3.97%

Use concrete channel; b=5', d=5', z=1, Smin=1.74%
with 1' Freeboard

b. Ridge Road

Q10=96.7 CFS HGL S=3.09%

Use 36" RCP, Min S=2.10%

c. Red Canyon

Q100=513 CFS

Capacity 8' x 4' x 148' RCB, H=10.5', 676 CFS

Inlet HGL=2.704%

Use 12' x 4' concrete channel, z=2, Freeboard=2.2'

d. Palmer Trail

Q100=1620 CFS

Capacity 9' x 6' x 151' RCP, H=15', 1430 CFS (62 Year Storm)

Use 9' x 8' box channel to conform to channel

e. 33rd Street

Q10=204 CFS HGLS=1.50%

Use 54" RCP, min S=1.08%

f. Basin "A"

Q50=86 CFS HGLS=4.46%

Use 36" RCP, min S=1.66%

g. Camp Creek

Q100=2860 CFS

25'-0" x 7'-6" Arch Plate with Paved Invert

A=157.59 ft2 R=1.956 n=0.02287 min HGL S=1.258%

Capacity=2246 CFS h;=4.47', add 1'7" to headwall. Will accomadate 50 year flood.

h. Old Camp Creek

Q50=45.2 CFS S=3.08%

Use 2' x 2' riprap channel

i. Basin "B"

Q50=220 CFS Exist 24" x 98' RCP, H=2'; Cap=26 CFS

Use 54" x 128' RCP, H=5', h; =3.25'

j. 28th Street

	Q10	PIPE TYPE	S-%	CAPACITY	USE PIPE
Upper Uintah	36	27" CMP	2.805	31	OK
Uintah-Platte	56	36" CMP	2.52	36	OK
Platte-Bijou	85	48" CMP	1.25	86	OK
Bijou-Kiowa	103	54" CMP	0.60	78	54" RCP
Kiowa	141	54" CMP	1.68	131	54" RCP
Kiowa-Colorado	173	54" CMP	1.29	112	54" RCP
Colorado-Channel	195	54" CMP	1.29	112	54" RCP

k. 26th Street

Q10= 23 CFS Exist 24", S=3.2%-±, Cap=40.3 CFS OK

l. Fairview

Q 50= 396 CFS

Exist 36" x 134' RCP, H=2', Cap=60CFS

Use 78" x 244' RCP, H=4.4', H; = 2.42'

m. Basin C

Q100=26 CFS Use minor inlets at time of final design

n. 24th Street and 23rd Street

See plate number 7 for inflow and outflow (10 year) hydrographs for the reservoir at 25th and King Streets and the composite hydrograph for the 24th Street basin outfall. Plate number 8 shows the details of the reservoir at 25th and King Streets

The existing reservoir is very valuable in staging the 10 year storm so that lower storm sewers will not require replacement. However, as shown on plate number eight, no spillway is available to prevent overtopping the dam in storms of a high magnitude, such as the 100 year storm. The dam is composed of soils derived from the Pierre shales, which are very erosive. Overtopping the dam could create a quick washout of the fill, releasing the impounded water directly above a number of residences located below Cache La Poudre Street. A spillway is proposed in accordance with the State Engineer's criteria for small flood control dams which will easily accomodate a 100 year storm, the maximum water surface being two feet below the dam crest as shown on plate eight. This assumes a plugged outlet works.

As shown on plate 7, the outflow from the reservoir is reduced from 206 CFS to 163 CFS, as controlled by the existing storm sewer system below the reservoir. The hydraulic gradient under this outflow will allow all downstream inlets to function properly.

As described in Section II B 9, the storm sewer system in 24th Street and 23rd Street will jointly accomodate the total runoff in both basins with only 4 minor modifications in the 24th Street system. The following tabulation summarizes the design of the storm sewer systems below the reservoir.

STREET	24TH STREET							23RD STREET							TOTAL SYSTEM	
	Q10 -CFS-	EXIST PIPE SIZE	S %	CAP -CFS-	USE PIPE	PIPE FLOW -CFS-	STREET FLOW -CFS-	Q10 -CFS-	EXIST PIPE SIZE	S %	CAP -CFS-	PIPE FLOW -CFS-	STREET FLOW -CFS-	FLOW FROM 24TH	Q10 -CFS-	STORM S. CAPACITY -CFS-
Dale							18									
	237	48"	4	287	ok	219									237	287
Monument							20									
	239	48"	1.92	199	54"	219									239	199
Alley Grate							29									
	248	48"	1.54	178	54"	219									248	178

STREET	24TH STREET							23RD STREET							TOTAL SYSTEM	
	Q10 -CFS-	EXIST PIPE SIZE	S %	CAP -CFS-	USE PIPE	PIPE FLOW -CFS-	STREET FLOW -CFS-	Q10 -CFS-	EXIST PIPE SIZE	S %	CAP -CFS-	PIPE FLOW -CFS-	STREET FLOW -CFS-	FLOW FROM 24TH	Q10 -CFS-	STORM S. CAPACITY -CFS-
Alley Grate							37									
	256	48"	2.33	219	ok	219									256	219
St Vrain							3									
	264	54"	1.27	222	ok	222			2.3'x4.3'	1	93	42		42	264	315
Uintah							6									
	273	54"	2.26	296	ok	231			3'x3'	2.8	142	42		42	273	438
Alley							9						28			
	281	43'x68"	2.26	286	ok	239		28	3'x3'	2.8	142	70		42	309	428
Platte							20						0			
	281	43"x68"	3.62	362	ok	239		28	3'x3'	2.8	142	70		42	309	504
Alley							40						7			
	321	43"x68"	2.94	326	ok	279		35	3'x3'	2.8	142	77		42	356	468
Bijou							7									
	321	43"x68"	3.28	344	ok	279		35	3'x3'	2.8	142	77		42	356	486
Kiowa							14						7			
	335	43"x68"	2.34	291	ok	291		42	3'x2.5'	2.8	111	86		44	377	668
Pikes Peak							15						6			
	351	48"x76"	1.97	353	ok	307		48	3'x3'	2.8	142	92		44	399	752
Colorado							16						6			
	368	48"x76"	0.81	226	53"x83"	321		54	3'x4'	2.5	196	101		47	422	648
							0						2			
	368	53"x83"	0.81	321	ok	321		54	3'x4'	2.5	196	101		47	422	743
							0						5			
	368	66"	0.81	302	72"	321		54	3'x4'	2.5	196	101		47	422	724

STREET	24TH STREET							23RD STREET							TOTAL SYSTEM	
	Q10 -CFS-	EXIST PIPE SIZE	S %	CAP -CFS-	USE PIPE	PIPE FLOW -CFS-	STREET FLOW -CFS-	Q10 -CFS-	EXIST PIPE SIZE	S %	CAP -CFS-	PIPE FLOW -CFS-	STREET FLOW -CFS-	FLOW FROM 24TH	Q10 -CFS-	STORM S. CAPACITY -CFS-
Cucharras							7						7			
	386	66"	1.32	386	ok	339		61	3'x4'	2.5	196	108		47	447	582
							14						6			
	405	66"	1.32	386	ok	358		67	3'x4'	2.5	196	114		47	472	582
Vermejo							22						9			
	431	66"	1.32	386	ok	384		78	3'x4'	2.5	196	125		47	509	582

Channel

o. 21st Street

LOCATION	Q10-CFS	PIPE SIZE	SLOPE	CAPACITY	USE PIPE
Colorado-Cucharra	32	18" VCP	2%	14.8	21" RCP
Cucharra-Sheldon	57	18" VCP	2%	14.8	30" RCP
Sheldon-Channel	81	---	5.18%	9.3	30" RCP

p. 20th Street

LOCATION	Q10-CFS	PIPE SIZE	SLOPE	CAPACITY	USE PIPE
Platte	46	24" RCP	2.7%	37.5	ok
Platte-Kiowa	67	36" RCP	2.7%	110	ok
Kiowa-Colorado	73	48" RCP	2.7%	166	ok
Colorado-D&RG	85	48" RCP	2.7%	166	ok
D&RG-Channel	93	None	1%Min	101	42" RCP

g. Basin "D"

a50=255 CFS

Highway 24: Cap 27"x43" x 127' RCP, H=2', 50 CFS N.G.

Ditch #1: Use 4'x4', Z=1 Concrete Ditch, S=0.65%

RCB: Use 4'x4', S=2.1%, d=3.3'

g. Basin "D" (con't.)

Ditch #2: Use 4'x3', Z=1 Concrete Ditch S=2.1%

r. South 21st Street

Q100 = 1050 CFS

On 21st St: Hmax=5' L=60' 8' x9' RCB ok

Ditch:

Use 12' x 6', z=1.5 Riprap Ditch

V=8.4 FPS Dia=9", I=18"

Conform top of lining to Main Channel top

s. 19th Street and 14th Street

The topography of the reservoir at 19th and Dale Streets was taken from G.L. Williams and Associates drawings number 1651. This reservoir provides substantial flood control benefits.

As shown on plate number 9, the existing reservoir has a capacity of just over 45 acre feet, while the 10 year, 6 hour storm inflow peaks at 423 CFS and passes a total runoff of 149.01 acre feet. The existing 12-inch VCP outlet will not release the water at a sufficient rate to prevent overtopping of the reservoir. The overtopping will reach a peak of 418 CFS (becoming street flow in the Uintah Gardens Shopping Center) and will last for over eight hours,created substantial downstream flooding. The 12-inch VCP would take over 9 days to drain the reservoir.

A number of modified outlet works were investigated, and it was found that a 54" RCP would be the smallest that would prevent serious reservor overtopping. This outlet works would create street flows peaking at 72 CFS but lasting less than one hour, without overtopping any downstream streets. The hydrograph would be lowered from 423 CFS inflow to 232 CFS outflow. The peak outflow of the basin, as shown on plate 9 is 700 CFS, as compared with 903 CFS under existing conditions.

Even with the substantial benefits afforded by the reservoir, the old series of RCB storm sewers in the 14th Street basin need to be replaced. The following is a tabulation of the design runoff in the 14th Street storm sewer network.

LOCATION	Q10-CFS	TYPE OF PIPE	S %	CAPACITY -CFS-	USE PIPE
Res.-Armstrong	296	48" RCP	1.78	192	60" RCP
Armstrong-Boulder	326	54" RCP	1.06	202	66" RCP
Boulder-Platte	377	54" RCP	1.59	248	66" RCP
Platte-Bijou	380	3.3'x4' RCB	2.0	200	66" RCP
Bijou-Kiowa	385	2.5'x5' RCB	2.0	179	66" RCP

s. 19th Street and 14th Street

LOCATION	Q10-CFS	TYPE OF PIPE	S %	CAPACITY -CFS-	USE PIPE
Kiowa-Pikes Peak	386	2.5'x5' RCB	2.0	179	66" RCP
Pikes Peak-Colorado	394	3'x5.5' RCB	2.0	235	66" RCP
Colorado to 16th Street	524	3'x5.5' RCB	0.845	153	84" RCP
Colorado, 16th to 15th	612	3'x5.5' RCB	0.847	153	84" RCP
Colorado to D&RGRR	641	60" CMP	2.38	156	72" RCP
Highway 24 to Channel	700	2-48" RCP	H=4.5'	336	7'x8' RCB
Colorado, 18th to 17th Street	39	2'x2' RCB	1.3	32.8	ok
15th Street, Kiowa to Pikes Peak	70	None	0.847	--	36" RCP
Pikes Peak to Colorado	79	None	1.06	--	48" RCP

t. 12th Street

LOCATION	Q10-CFS	TYPE OF PIPE	S %	CAPACITY -CFS-	USE PIPE
14th Street, Colorado-Cucharras	6	18" RCP	1.0	10.5	ok
Vermijo, 14th - 13th Street	11	30" RCP	1.0	41	ok
13th, Colorado-Cucharras	10	30" RCP	1.0	41	ok
12th, Colorado-Cucharras	15	18" RCP	1.0	10.5	ok
D&RG Railroad	24	43"x60" RCP	1.0	165	ok
D&RG to Highway	51	2-34"x53" RCP	0.5	168	ok
Highway to Channel	60	48" RCP	H=3'	80	ok

u. 10th Street

LOCATION	Q10-CFS	TYPE OF PIPE	S %	CAPACITY -CFS-	USE PIPE
Kiowa-Pikes Peak	20	None	1.3	--	24" RCP
Pikes Peak-Cucharras	35	16"x25" CMP	1.3	8.5	27" RCP
Cucharras	51	None	1.0	--	36" RCP
Cucharras-Highway 24	74	--	4.1	--	30" RCP
Highway 24- Channel	77	48" RCP	H=2'	120	ok

v. 8th Street

LOCATION	Q10-CFS	TYPE OF PIPE	S %	CAPACITY -CFS-	USE PIPE
Limit Street	48	18" RCP	1.45	12.5	30" RCP
8th Street to Cimarron	12	18" RCP	1.72	13.8	ok
Cimarron to Channel	79	None	1.84	--	36" RCP

w. Chestnut Street

LOCATION	Q10-CFS	TYPE OF PIPE	S %	CAPACITY -CFS-	USE PIPE
Pikes Peak-Colorado	39	18" RCP	1.0	10.5	30" RCP
Colorado - Cucharras	59	13"x22" CMP	0.85	4.4	36" RCP
Cucharras - FRontage	95	None	3.87	--	36" RCP
Frontage - Channel	125	None	0.80	--	48" RCP

x. Costilla Street

Cap exist 44"x72" cap, S=2%, 153.4 CFS ok

Outfall Q50=205 CFS

Cap Exist 4'x5' RCB, S=2%, 347 CFS ok

E. References

1. U.S. Army Corps of Engineers Publications

a. Flood Plain Information, Fountain Creek; Colorado Springs, Manitou Springs, Colorado, August, 1974.

b. Flood Plain Information, Fountain and Jimmy Camp Creeks; Colorado Springs, Fountain, El Paso County, Colorado, March 1973.

c. Flood Plain Information, Monument Creek, Colorado Springs, Colorado, May, 1971.

d. Hydraulic Computation Computer Printouts and Data Sheets for reference "a" above.

e. Hydraulic Design Criteria, September, 1970.

2. USDI-Bureau of Reclamation Publications

a. Design of Small Dams, 1965.

b. Design Standards Number 3, Canals and Related Structures, December, 1967.

c. Hydraulic and Excavation Tables, 11th Ed., 1957.

3. USDA-Soil Conservation Service Publications

a. Procedures for Determining Peak Flows in Colorado, December, 1972 and July, 1975.

b. Engineering Handbook, Section 4, Hydrology

c. Engineering Handbook, Section 5, Hydraulics

d. Soil Mapping for the Project Area, unpublished.

4. USD HUD-Flood Hazard Maps, Colorado Springs Area, 1974.

5. USDI-Geological Survey Publications.

a. WSP #1681, Part 7, Magnitude and Frequency of Floods, Lower Mississippi River Basin.

b. Water Resources Data for Colorado-Part 1, Surface Water Records, 1958-1974.

c. Environmental, Geologic and Hydrologic Studies, Front Range Urban Corridor, Colorado.

6. State of Colorado Publications

a. Rules and Regulations of the State Engineer

b. Roadway Design Manual, May, 1972.

7. References Available through the City of Colorado Springs

a. Ordinances and Criteria related to drainage work.

b. All available plans on existing storm sewer, highway and bridge work in the project area.

c. Camp Creek Drainage Study, United Western Engineers, October, 1964

d. Upper 19th Street Drainage Study, Lovejoy and Williams, November, 1972

e. Bear Creek Drainage Study, R.Keith Hook and Associates, July, 1972.

8. Other Miscellaneous References

a. Bank and Shore Protection in California Highway Practice, November, 1960

b. Denver Urban Drainage and Flood Control District Criteria Manual, Vol's I and II

c. LA County Flood Control District, Hydrology and Hydraulic Design Manual.

d. Handbook of Hydraulics, Kings and Brater, 5th Ed., 1963.

e. Fluid Mechanics for Engineers, Albertson, Barton and Simons, 1960

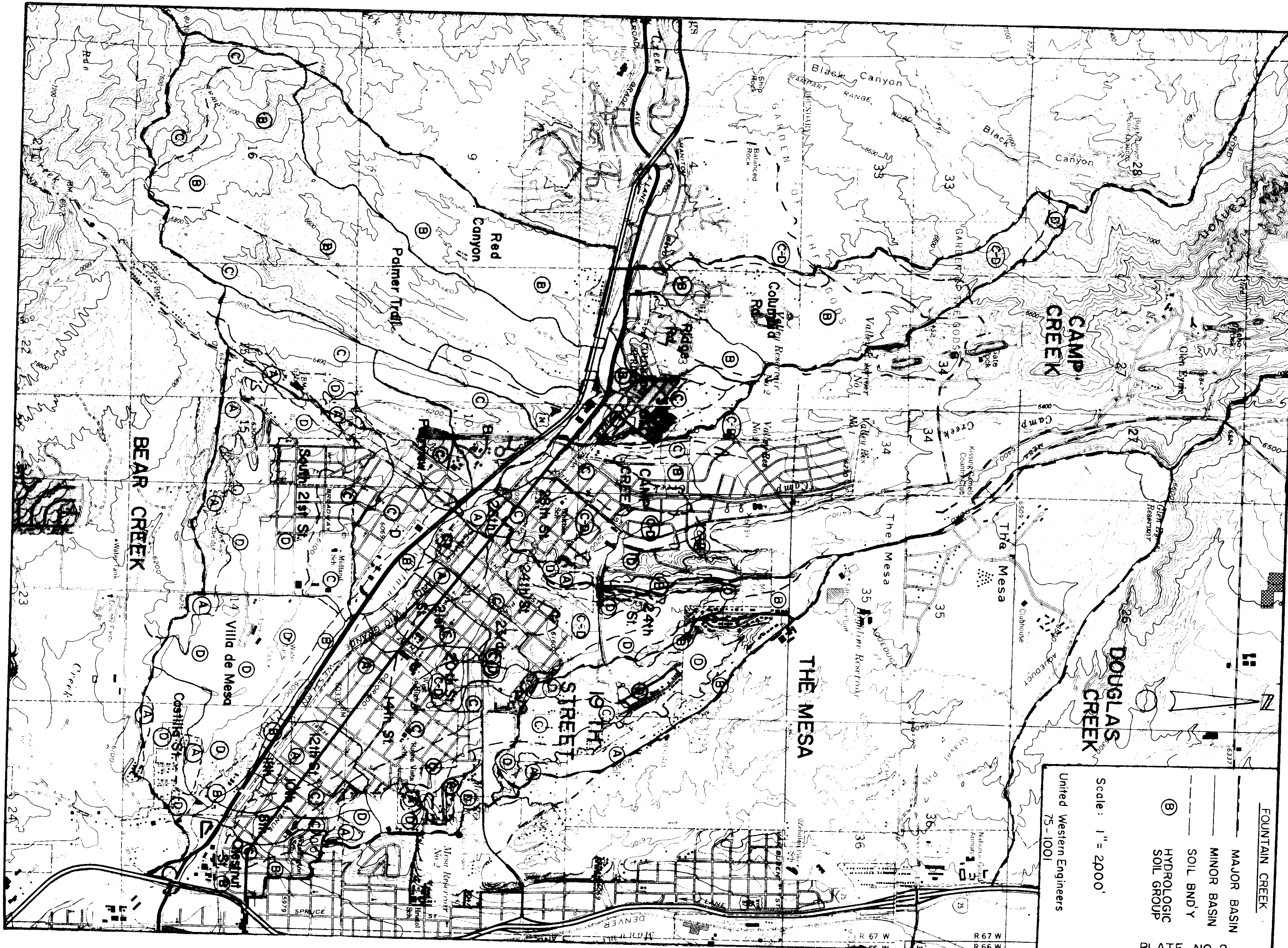
f. Wastewater Engineering, Metcalf and Eddy, 1972

g. Hydrology For Engineers, Linsley, Kohler and Paulus, 1958

h. Water Resources Engineering, Linsley and Franzini, 1964

i. Handbook of Concrete Pipe Hydraulics, PCA, 1964

j. Handbook of Steel Drainage and Highway Construction Products, AISI, 1971.


FOUNTAIN CREEK
MAJOR BASIN
MINOR BASIN
SOIL BND'Y
HYDROLOGIC SOIL GROUP
Scale: 1" = 2000'
United Western Engineers
75-1001
BEAR CREEK
CAMP CREEK
DOUGLAS CREEK
THE MESA
19TH STREET
Red Canyon
Palmer Trail
Villa de Mesa
Black Canyon
GARDEN OF THE GODS
R 67 W
R 66 W
PLATE NO. 2

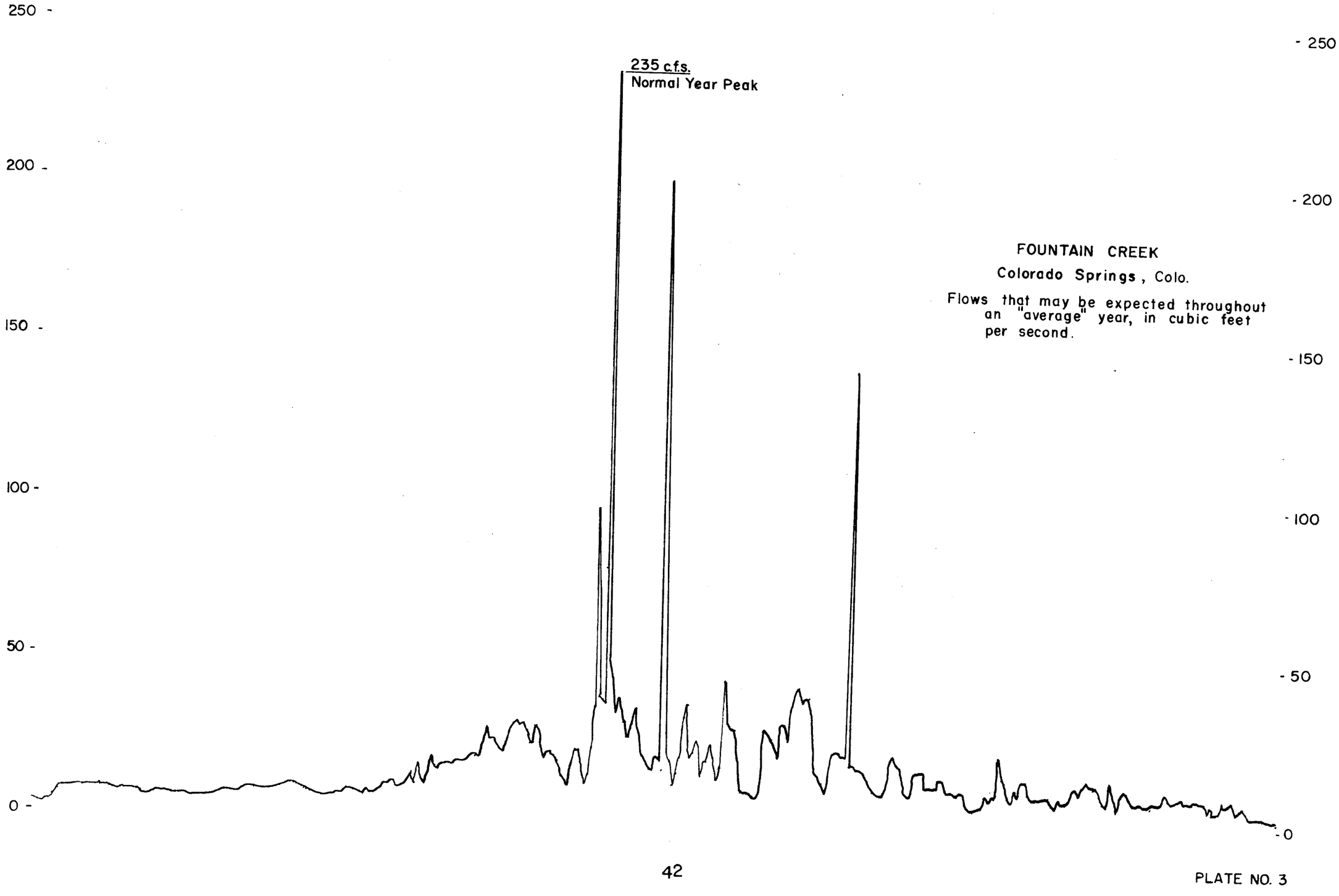
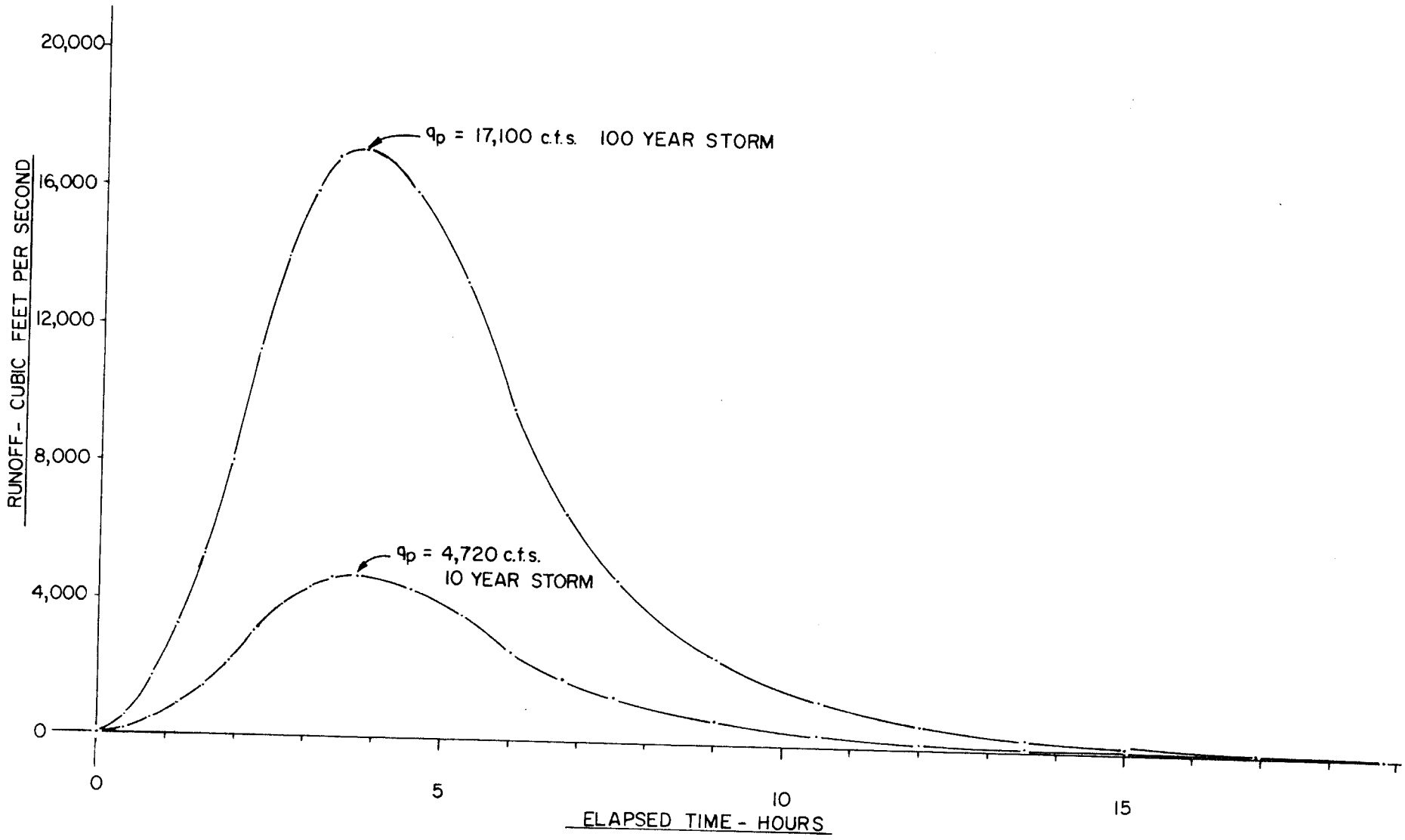

250
200
150
100
50
0
235 c.f.s.
Normal Year Peak
FOUNTAIN CREEK
Colorado Springs, Colo.
Flows that may be expected throughout an "average" year, in cubic feet per second.

PLATE NO. 3

HYDROGRAPH

FOUNTAIN CREEK AT THE EASTERLY MANITOU SPRINGS CITY LIMIT



43

HYDROGRAPH

FOUNTAIN CREEK JUST ABOVE THE MONUMENT CREEK JUNCTURE

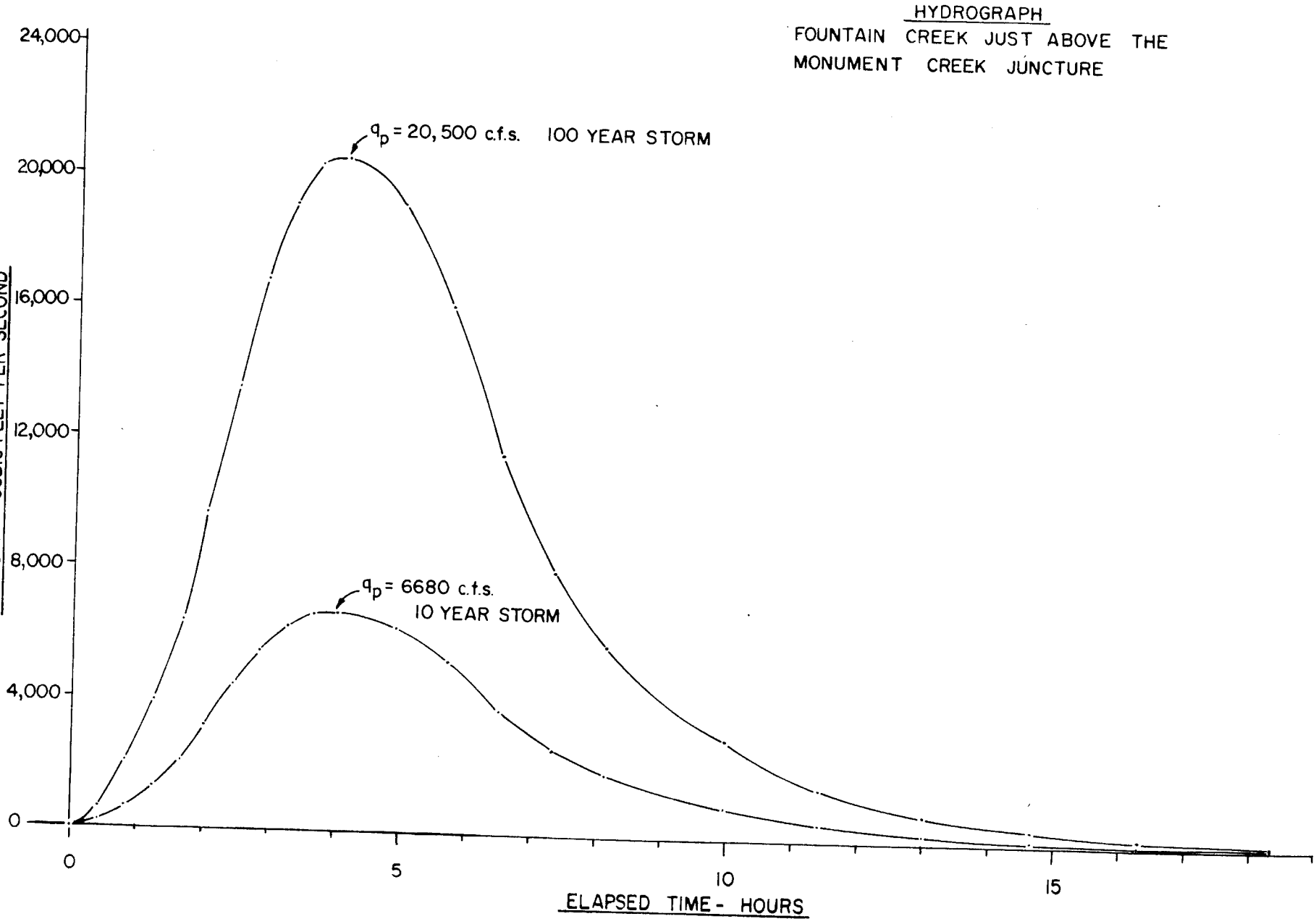
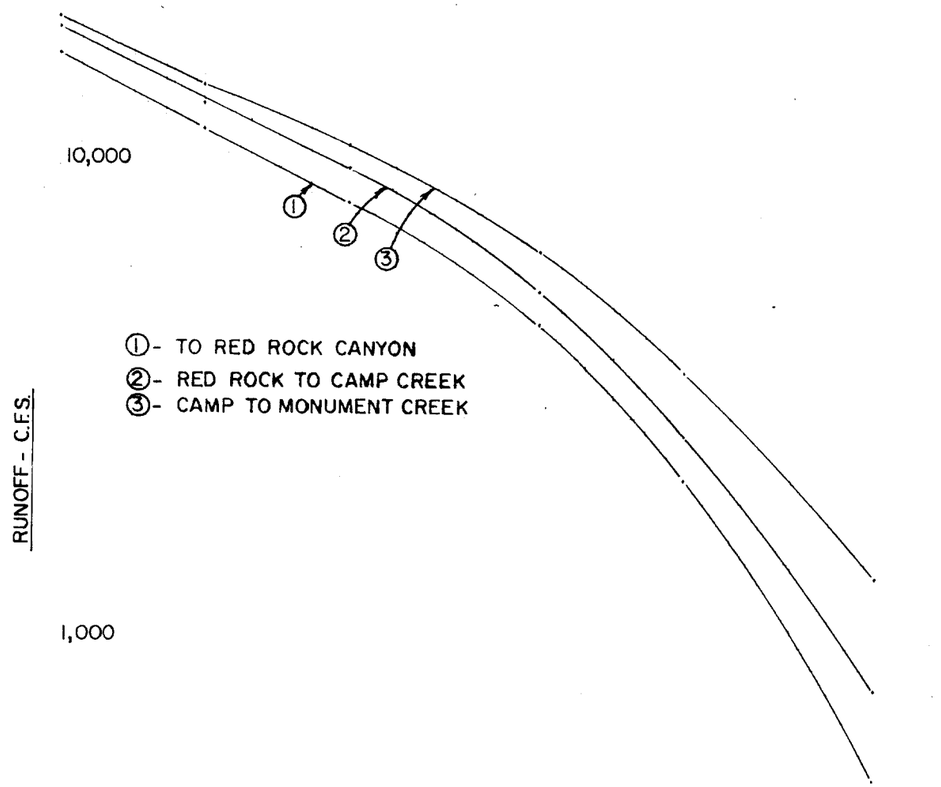


PLATE NO. 4



FOUNTAIN CREEK

PROJECTED RUNOFF IN C.F.S.

PLATE NO. 5

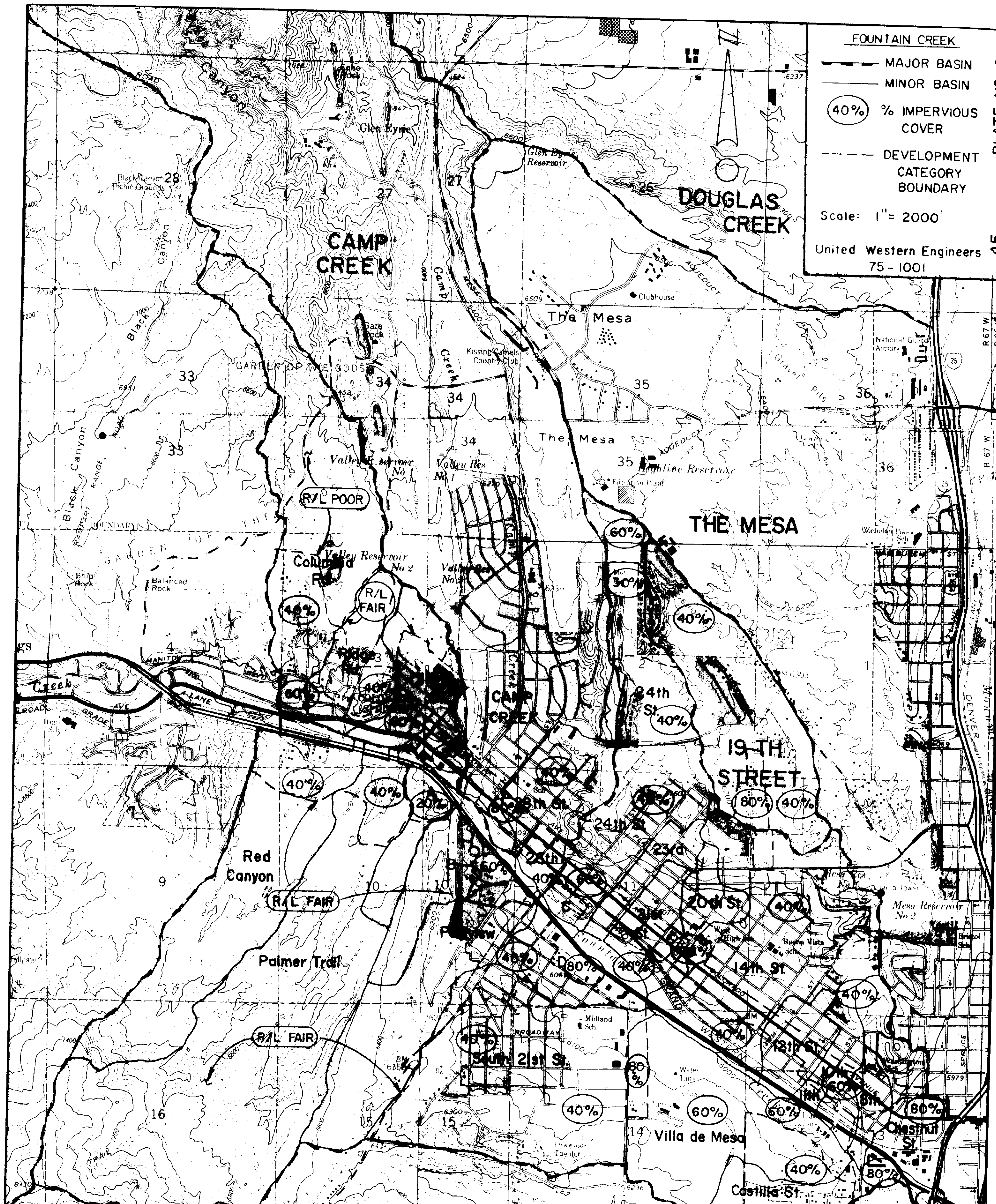
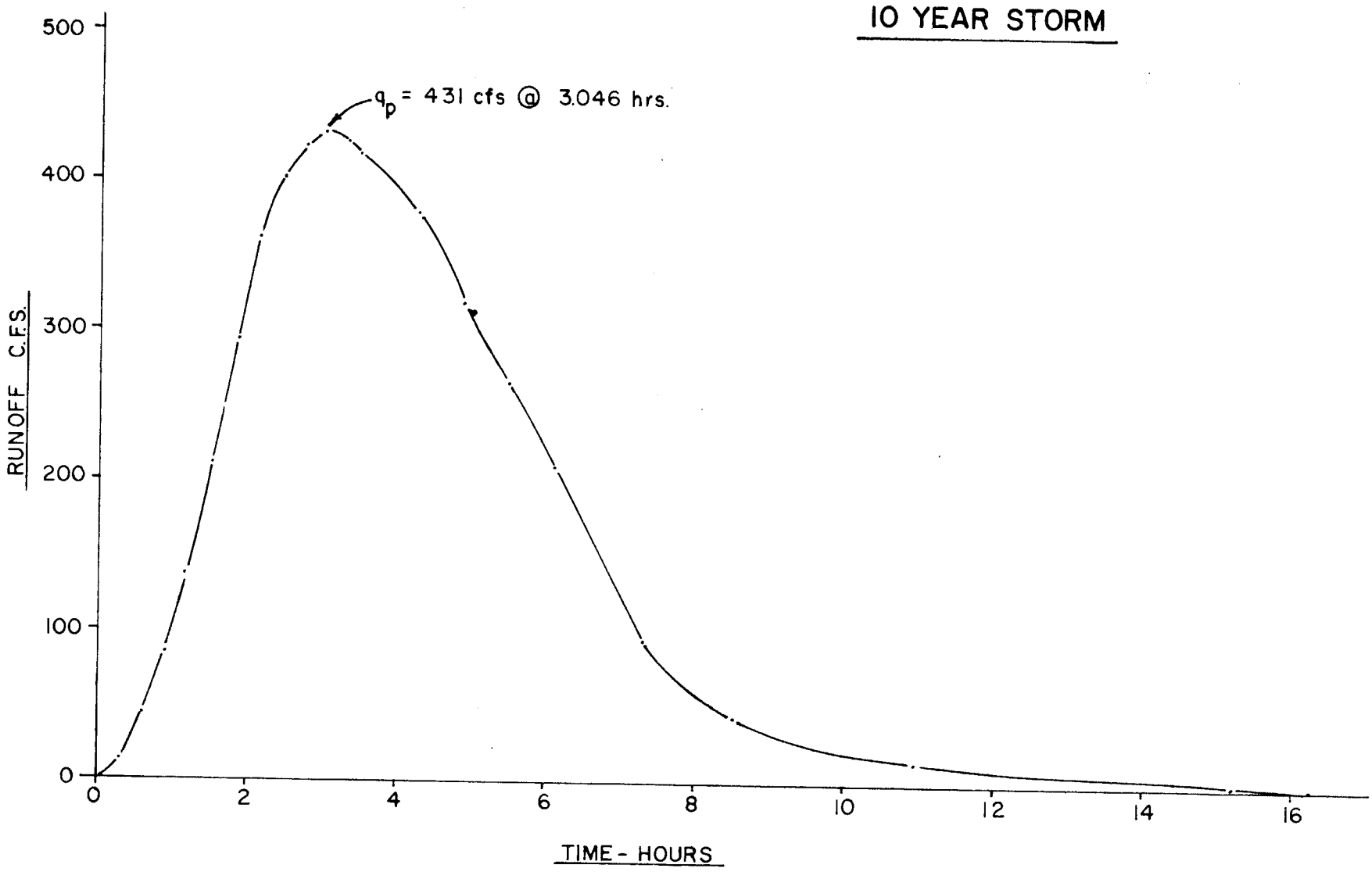

FOUNTAIN CREEK
MAJOR BASIN
MINOR BASIN
40%
% IMPERVIOUS COVER
DEVELOPMENT CATEGORY BOUNDARY
Scale: 1" = 2000'
United Western Engineers
75 - 1001
BEAR CREEK
DOUGLAS CREEK
CAMP CREEK
19 TH STREET
THE MESA
Red Canyon
Palmer Trail
Villa de Mesa
Costilla St.
Chestnut St.
14th St.
20th St.
24th St.
South 21st St.
R/L FAIR
R/L POOR
80%
60%
40%
30%
20%
Garden of the Gods
Kissing Camels Country Club
The Mesa
Glen Eyrie
Black Canyon

PLATE NO. 6

HYDROGRAPH
24 TH STREET BASIN OUTFALL POINT
10 YEAR STORM



HYDROGRAPH
RESERVOIR AT 25TH AND KING STREETS
10 YEAR STORM

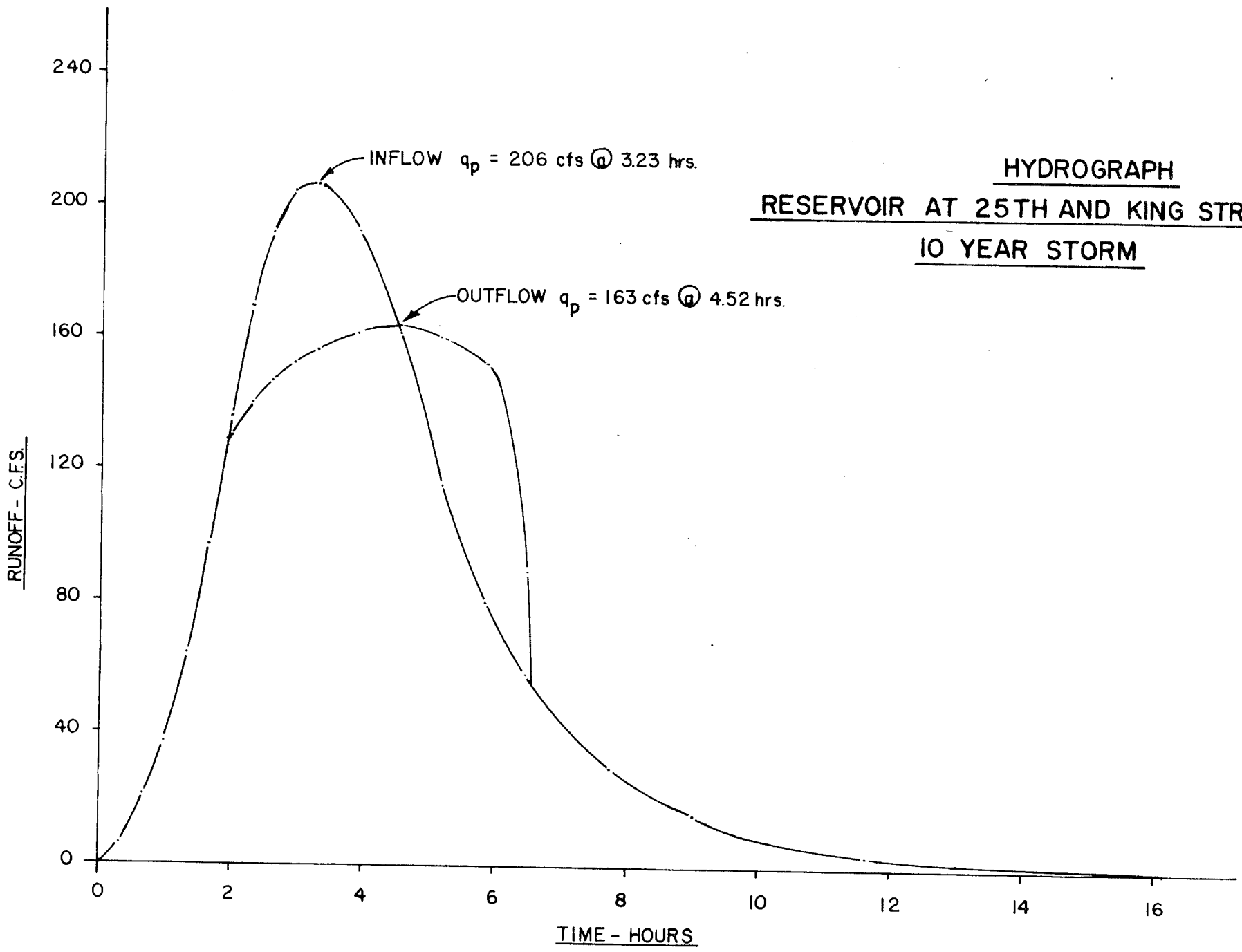


PLATE NO. 7

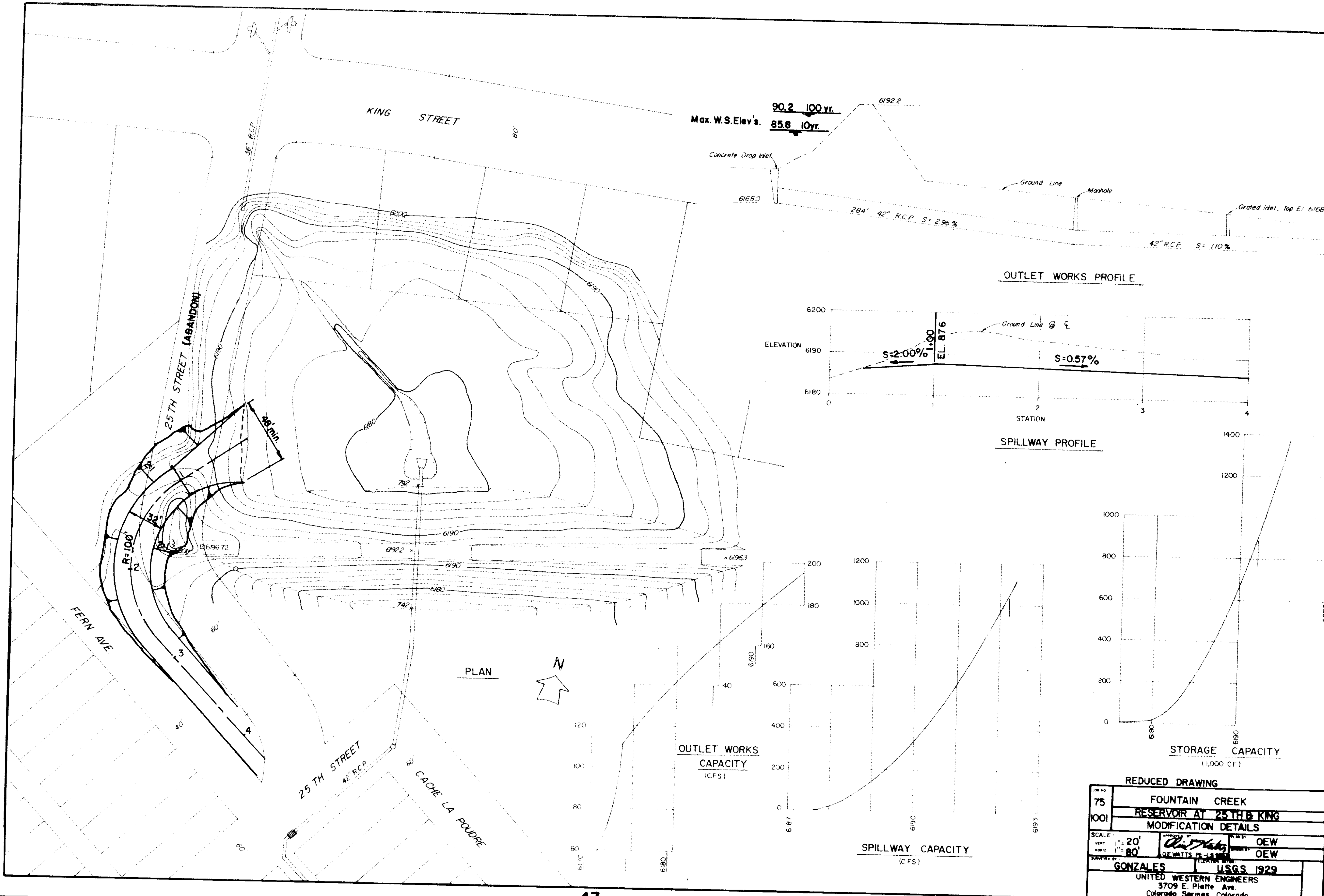
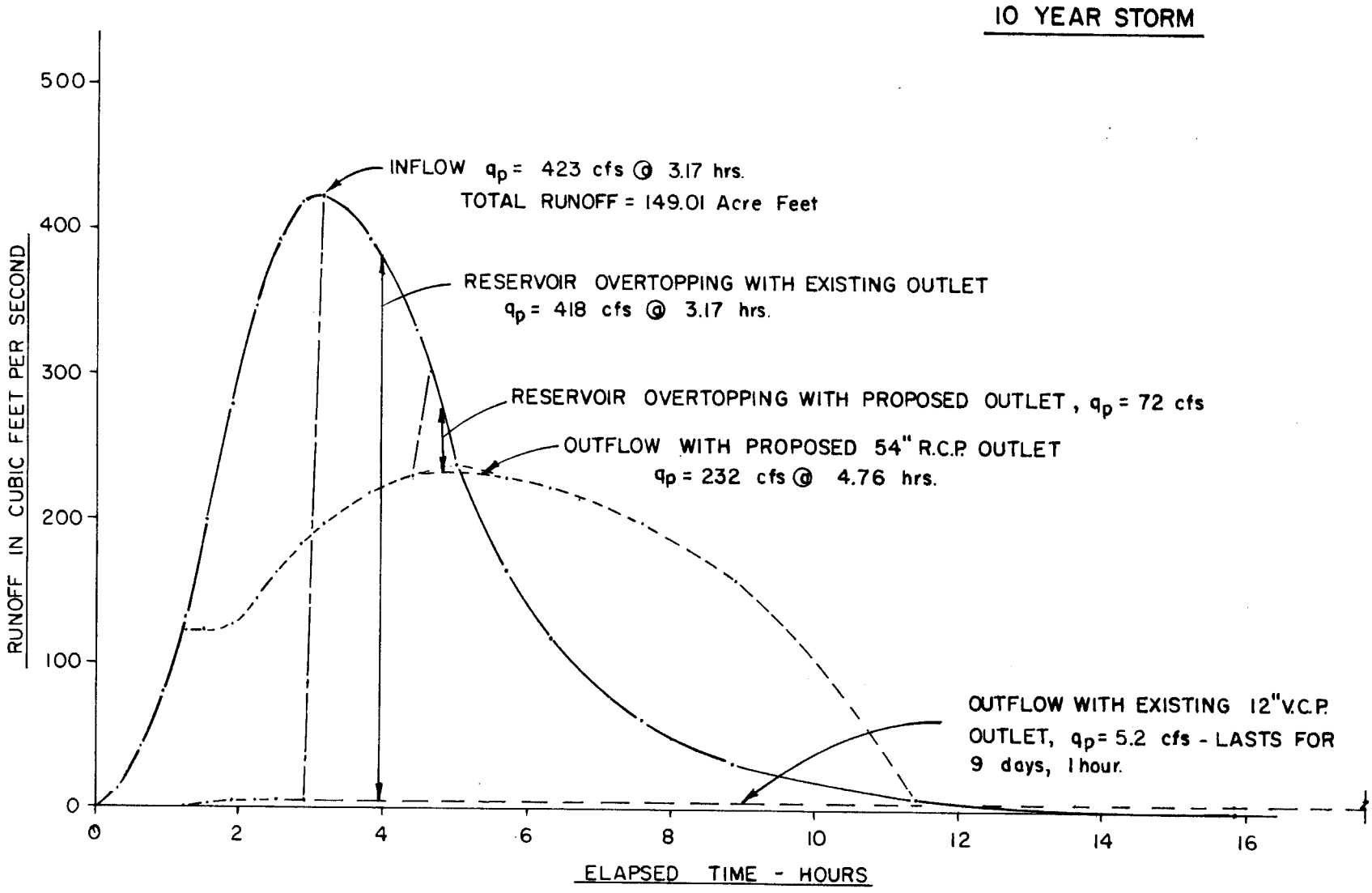
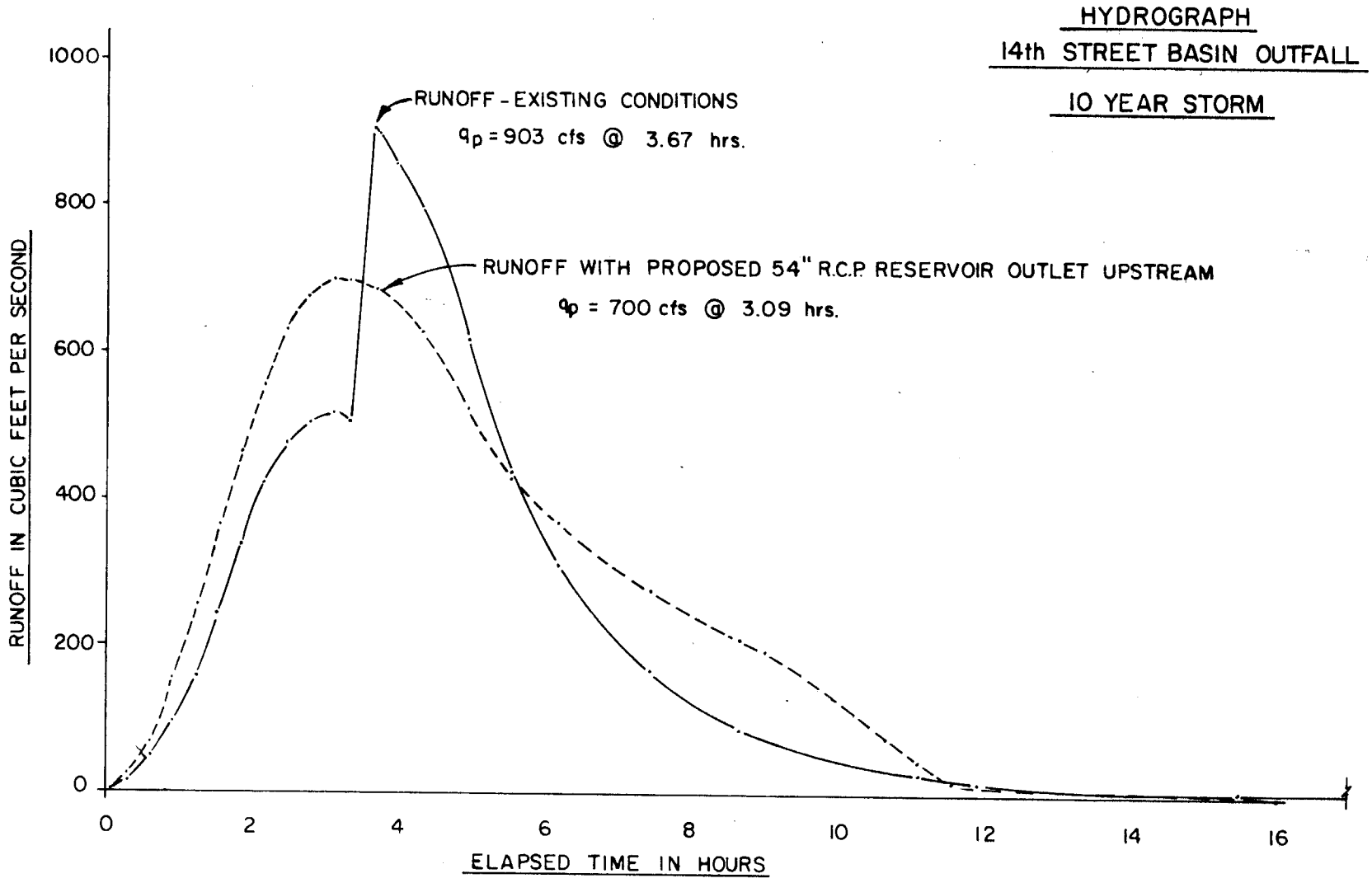

KING STREET
25TH STREET (ABANDON)
FERN AVE
25 TH STREET
42" RCP
CACHE LA POUDRE
36" RCP
PLAN
N
48' min.
32'
R=100'
Max. W.S. Elev's. 90.2 100 yr. 85.8 10yr.
Concrete Drop Inlet
Ground Line
Manhole
Grated Inlet, Top El. 6168.9
284' 42" RCP S=2.96%
42" RCP S=1.10%
OUTLET WORKS PROFILE
ELEVATION
Ground Line @ ℄
S=2.00%
1+00 EL. 87.6
S=0.57%
STATION
SPILLWAY PROFILE
OUTLET WORKS CAPACITY (CFS)
SPILLWAY CAPACITY (CFS)
STORAGE CAPACITY (1,000 CF)
REDUCED DRAWING
75 1001
FOUNTAIN CREEK
RESERVOIR AT 25TH & KING
MODIFICATION DETAILS
SCALE: VERT 1"=20' HORIZ 1"=80'
OEW
OEW
GONZALES
USGS 1929
UNITED WESTERN ENGINEERS
3709 E. Platte Ave.
Colorado Springs, Colorado

PLATE NO. 8

HYDROGRAPH
RESERVOIR AT 19th AND DALE STREETS
19th STREET BASIN OUTFALL
10 YEAR STORM



HYDROGRAPH
14th STREET BASIN OUTFALL
10 YEAR STORM



PLATE

SECTION IV

COST ESTIMATES AND PRIORITIES

IV COST ESTIMATES AND PRIORITIES

A. Data

Priorities for the Fountain Creek Channel construction are assessed on the basis of the existing hazards to property and life that are created by the flood plain. Where the greatest danger exists, the greatest priority is given to construction to alleviate the situation. Many intangibles may not be considered, such as the potential loss in life from the inundation of major Streets, loss of utility service and the like. Therefore, only those facilities of a static, visible nature are assessed.

Construction estimates are based on the unit prices shown in the individual schedules. Required rights-of-way costs are based on the evaluation of the County Assessor, plus 15% for land and 50% for structures. Easements were taken as 25% of their face value. Utility relocations were estimated by the respective utility companies and are shown on the plans.

B. Fountain Creek Priorities

The following table summarizes the nature of the existing 100-year flood plain, as determined by the Corps of Engineers, and the number of structures and people commonly using them, that are under water during the flood in question.

REACH OF CHANNEL	NUMBER OF STRUCTURES INUNDATED			PERSONS INUNDATED	
	DWELLING UNITS	BUSINESSES	MOTEL-CAMPGROUND UNITS	RESIDENTS	SHOPPERS
Manitou to Ridge Road	12	4	48	194	-0-
Ridge Road to 31st Street	25	10	41	314	296
31st Street to 26th Street	5	8	58	214	72
26th Street to 25th Street	10	10	35	69	86
25th Street to 21st Street	-0-	9	-0-	-0-	1275 *
21st Street to Highway 24	8	2	-0-	32	24
Highway 24 to Trailer Park	-0-	3	-0-	-0-	16
Trailer Park to 8th Street	55	10	-0-	174	266
8th Street to Monument Creek	-0-	11	100	322	188
TOTALS	115	67	282	1319	2223

* The great majority are in El Paso Community College

Based upon the above potential structural damage and loss of life, both permanent or temporary residents and possible shoppers, the following priorities are given in construction of the channel. Consideration is also given to intangibles, such as the desire to maintain traffic on major arterial streets during a flood emergency, and the severity of the potential hazard.

PRIORITY NUMBER	REACH OF CHANNEL
1	Ridge Road to 31st Street
2	Trailer Park to 8th Street
3	31st Street to 26th Street

PRIORITY NUMBER	REACH OF CHANNEL
4	Manitou Springs to Ridge Road
5	8th Street to Monument Creek
6	25th Street to 21st Street
7	26th Street to 25th Street
8	21st Street to Highway 24
9	Highway 24 to Trailer Park

If the channel is constructed in the above sequence, serious consideration will have to be given to structures designed to concentrate the flood plain into the channel. These facilities are not shown in this report, but appear to be conceptually feasible.

C. Cost Estimates

1. Fountain Creek

The following are the detailed cost estimates for the channel construction by reach of channel.

a. Reach Number One, Manitou City Limits to Ridge Road

1. Channel Construction

ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
Channel Excavation	7,230 CY	$ 2.00	$ 14,460.00
Structural Excavation	8,300 CY	3.00	24,900.00
Compacted Embankment	5,160 CY	1.00	5,160.00
Compacted Backfill	4,310 CY	3.50	15,085.00
12-inch Concrete Lining	3,540 CY	80.00	283,200.00
4-inch Concrete Lining	3,050 SY	8.00	24,400.00
Structural Concrete	7,570 CY	100.00	757,000.00
Streamwater Diversions	Lump Sum		17,800.00
Clearing and Grubbing	Lump Sum		19,000.00
Underdrain System	700 LF	10.00	7,000.00
Bridge Steel	135,000 LB	.40	54,000.00
Asphalt Pavement	1,552 SY	4.75	7,372.00

1. Channel Construction (cont.)

ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
Pavement Base	605 CY	$ 9.00	$ 5,445.00
Detours and Barricades	Lump Sum		2,000.00
Relocate Gas Line and Regulator	Lump Sum		23,500.00
Relocate 24-inch raw water line	Lump Sum		8,400.00
Relocate 16-inch water line	Lump Sum		12,200.00
Relocate 12-inch water line (2 ea.)	Lump Sum		3,200.00
Telephone Relocation	Lump Sum		39,668.00
Electrical Relocation	Lump Sum		7,743.32
Sub-total			$1,331,533.32
Engineering and Contingencies at ± 15%			199,766.68
Total Estimated Construction Cost			$1,531,300.00

2. Rights-of-Way

PARCEL NUMBER	LAND SIZE-ACRES	LAND UNIT COST	LAND COST	STRUCTURES COST	TOTAL COST
74033-00-011	0.43	$ 7,530	$ 3,237.90	$ -0-	$ 3,237.90
-00-018	0.14	5,260	736.40	-0-	736.40
-24-001	0.15	32,700	4,905.00	-0-	4,905.00
-069	0.05	39,100	1,955.00	-0-	1,955.00
-067	1.30	39,100	50,830.00	12,500.00	63,330.00
Sub-totals			$61,664.30	$12,500.00	74,164.30
Acquisition Fees @ ± 5%					3,735.70
Total right-of-way cost					77,900.00
Total Estimated Cost of Reach Number One					$1,609,200.00

b. Reach Number Two, Ridge Road to 31st Street

1. Construction Costs

ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
Channel Excavation	32,900 CY	$ 1.75	$ 57,575.00
Structural Excavation	9,840 CY	3.50	34,440.00
Compacted Embankment	1,320 CY	0.80	1,056.00
Compacted Backfill	10,585 CY	2.50	26,462.50
12-inch Concrete Lining	7,230 CY	80.00	578,400.00
4-inch Concrete Lining	5,580 SY	8.00	44,640.00
Structural Concrete	198 CY	200.00	39,600.00
Streamwater Diversion	Lump Sum		35,300.00
Clearing and Grubbing	Lump Sum		18,400.00
Underdrain System	1,000 LF	10.00	10,000.00
Relocate USGS Station	Lump Sum		5,000.00
Relocate 12-inch water line (2 ea.)	Lump Sum		3,200.00
Asphalt Paving and Base	1,210 SY	6.00	7,260.00
Telephone Relocations	Lump Sum		4,885.00
Electrical Relocations	Lump Sum		17,809.62
Sub-total			$ 884,028.12
Engineering and Contingencies at ± 15%			132,571.88
Total Estimated Construction Cost			$1,016,600.00

2. Rights-of-Way

PARCEL NUMBER	LAND SIZE ACRES	LAND UNIT COST	LAND COST	STRUCTURES COST	TOTAL COST
74033-24-052	0.27	$ 5,016	$ 1,354.32	-0-	$ 1,354.32
74034-00-028	0.30	(City)	-0-	-0-	-0-
-00-026	0.33	51,000	16,830.00	-0-	16,830.00
-00-033	0.33	38,000	12,540.00	-0-	12,540.00

PARCEL NUMBER	SIZE ACRES	LAND UNIT COST	LAND COST	STRUCTURES COST	TOTAL COST
-00-021	0.16	51,000	$ 8,160.00	-0-	$ 8,160.00
74011-00-024	0.09	45,300	4,077.00	-0-	4,077.00
Sub-totals			$ 42,961.32	-0-	$ 42,961.32
Acquisition Fees @ ± 5%			2,138.68	-0-	2,138.68
Total Rights-of-way cost			$ 45,100.00	-0-	$ 45,100.00

Total Estimated Cost of Reach Number Two $1,061,700.00

c. Reach Number Three, 31st Street to 26th Street

1. Construction Costs

ITEM DESCRIPTION	QUANITY	UNIT COST	COST
Channel Excavation	48,800 CY	$ 1.50	$ 73,200.00
Structural Excavation	140 CY	4.00	560.00
Compacted Embankment	14,570 CY	0.75	10,927.50
12-inch Concrete Lining	242 CY	80.00	19,360.00
4-inch Concrete Lining	291 SY	8.00	2,328.00
Riprap Channel Lining	20,650 CY	18.00	371,700.00
Streamwater Diversion	Lump Sum		35,000.00
Clearing and Grubbing	Lump Sum		12,900.00
Underdrain System	1,000 LF	10.00	10,000.00
Telephone Relocations	Lump Sum		60.00
Electrical Relocations	Lump Sum		9,291.98
Sub-total			$545,327.48
Engineering and Contingencies at ± 15%			81,772.52
Total Estimated Construction Cost			$627,100.00

2. Rights-of-Way

PARCEL NUMBER	LAND SIZE ACRES	LAND UNIT COST	LAND COST	STRUCTURE COST	TOTAL COST
74101-00-026	0.63	5,400	$ 3,402.00	$ -0-	$ 3,402.00
-031	0.98	5,410	5,301.80	-0-	5,301.80
-030	0.62	5,750	3,565.00	19,147.50	22,712.50
74112-38-002	0.05	2,250	112.50	-0-	112.50
Sub-totals			$ 12,381.30	$ 19,147.50	$ 31,528.80
Acquisition Fees @ ± 5%			618.70	952.50	1,571.20
Total Rights-of-Way Cost			$ 13,000.00	$ 20,100.00	$ 33,100.00

Total Estimated Cost of Reach Number Three $660,200.00

d. Reach Number Four, 26th Street to 25th Street

1. Construction Costs

ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
Channel Excavation	1580 CY	2.00	3,160.00
Structural Excavation	93 CY	4.50	418.50
Compacted Embankment	3520 CY	1.00	3,520.00
Compacted Backfill	42 CY	5.00	210.00
12-inch Concrete Lining	1390 CY	80.00	111,200.00
4-inch Concrete Lining	1260 SY	8.00	10,080.00
Structural Concrete	767 CY	200.00	153,400.00
Streamwater Diversion	Lump Sum		6,300.00
Clearing and Grubbing	Lump Sum		2,200.00
Underdrain System	180 LF	10.00	1,800.00
Relocate 6-inch water line	Lump Sum		1,200.00

ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
Telephone Relocation	Lump Sum		$ 384.15
Sub-total			$323,872.65
Engineering Contingencies at ± 15%			48,127.35
Total Estimated Construction Cost			$372,000.00

2. Rights-of-Way

PARCEL NUMBER	SIZE ACRES	LAND UNIT COST	LAND COST	STRUCTURE COST	TOTAL COST
74113-00-013	0.21	2,290	$ 480.90	$ -0-	$ 480.90
-012	0.18	3,550	639.00	-0-	639.00
-02-007	0.14	12,000	1,680.00	-0-	1,680.00
-006	0.12	6,070	728.40	-0-	728.40
-005	0.09	4,500	405.00	-0-	405.00
-004	0.07	9,100	637.00	-0-	637.00
-003	0.05	9,100	455.00	-0-	455.00
-008	0.01	1,210	12.10	-0-	12.10
Sub Totals			$5,037.40	-0-	$ 5,037.40
Acquisition at ± 5%			262.60	-0-	262.60
Total Rights-of-way			$5,300.00	-0-	$ 5,300.00

Total Estimated Cost, Reach Number Four $377,300.00

e. Reach Number Five, 25th Street to 21st Street

1. Construction Cost

ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
Channel Excavation	17,200 CY	1.50	25,800.00
Structural Excavation	410 CY	4.50	1.845.00
Compacted Embankment	390 CY	0.75	292.50
Compacted Backfill	90 CY	5.00	450.00
12-inch Concrete Lining	3230 CY	80.00	258,400.00
Riprap Channel Lining	3760 CY	18.00	67,680.00
Streamwater Diversion	Lump Sum		26,400.00
Clearing and Grubbing	Lump Sum		9,300.00
Underdrain System	500 LF	10.00	5,000.00
Telephone Relocations	Lump Sum		1,575.85
Electrical Relocations	Lump Sum		13,163.63
Sub-totals			$409,906.98
Engineering and Contingencies at ± 15%			61,493.02
Total Estimated Construction Cost			$471,400.00

2. Rights-of-Way

PARCEL NUMBER	LAND SIZE ACRES	LAND UNIT COST	LAND COST	STRUCTURE COST	TOTAL COST
74113-00-011	0.08	2,290	$ 183.20	$ -0-	$ 183.20
-052	0.12	7,000	840.00	-0-	840.00
-054	0.56	9,400	5,264.00	-0-	5,264.00
-033	0.95	7,080	6,726.00	-0-	6,726.00
-032	0.18	21,200	3,816.00	-0-	3,816.00
-031	0.15	25,900	3,885.00	-0-	3,885.00
-049	0.11	25,000	2,750.00	-0-	2,750.00
-054	0.06	9,400	564.00	-0-	564.00
-043	0.05	10,600	530.00	-0-	530.00

PARCEL NUMBER	LAND SIZE ACRES	LAND UNIT COST	LAND COST	STRUCTURE COST	TOTAL COST
-036	0.44	22,500	$ 9,900.00	$ -0-	$ 9,900.00
-028	0.28	6,520	1,825.60	-0-	1,825.60
-027	0.19	22,600	4,294.00	-0-	4,294.00
-026	0.21	21,200	4,452.00	-0-	4,452.00
- -048	0.20	10,600	2,120.00	-0-	2,120.00
-008	0.11	9,660	1,062.60	-0-	1,062.60
-007	0.09	5,220	469.80	-0-	469.80
-050	0.09	11,800	1,062.00	-0-	1,062.00
-004	0.01	4,980	49.80	-0-	49.80
-001	0.07	9,890	692.30	-0-	692.30
74114-36-007	0.01	14,200	142.00	-0-	142.00
-002	0.04	14,200	568.00	-0-	568.00
-008	0.14	14,200	1,988.00	-0-	1,988.00
Sub-totals			$53,184.30	-0-	$53,184.30
Acquisition at ± 5%			2,615.70	-0-	2,615.70
Total Rights-of-Way			$55,800.00	-0-	$55,800.00

Estimated Total Cost, Reach Number Five $527,200.00

f. Reach Number Six, 21st Street to Highway 24

1. Construction Cost

ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
Channel Excavation	7,700 CY	$ 1.75	$ 13,475.00
Structural Excavation	510 CY	5.00	2,550.00
Compacted Embankment	880 CY	0.80	704.00
Compacted Backfill	30 CY	10.00	300.00

ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
12-inch Concrete Lining	670 CY	$ 80.00	$ 53,600.00
4-inch Concrete Lining	750 SY	8.00	6,000.00
Riprap Channel Lining	7050 CY	18.00	126,900.00
Streamwater Diversion	Lump Sum		8,600.00
Clearing and Grubbing	Lump Sum		2,800.00
Underdrain System	200 LF	10.00	2,000.00
Sub-total			$216,929.00
Engineering and Contingencies at ± 15%			32,571.00
Total Estimated Construction Cost			$249,500.00

2. Rights-of-Way

PAPCEL NUMBER	LAND SIZE ACRES	LAND UNIT COST	LAND COST	STRUCTURE COST	TOTAL COST
74114-37-016	0.86	$ 200	$ 172.00	-0-	$ 172.00
-38-011	0.23	5,140	1,182.20	-0-	1,182.20
-013	0.34	500	170.00	-0-	170.00
-007	0.10	8,120	812.00	-0-	812.00
-006	0.01	9,740	97.40	-0-	97.40
Sub-totals			$ 2,433.60	-0-	$ 2,433.60
Aquisition at ± 5%			166.40	-0-	166.40
Total Rights-of-Way Costs			$ 2,600.00	-0-	$ 2,600.00

Total Estimated Cost, Reach Number Six $252,100.00

g. Reach Number Seven, Highway 24 to Trailer Park

1. Construction Costs

ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
Channel Excavation	44,400 CY	$ 1.50	$ 66,600.00
Compacted Embankment	88,700 CY	1.50	133,050.00
Riprap Channel Lining	39,100 CY	18.00	703,800.00
Streamwater Diversion	Lump Sum		42,400.00
Clearing and Grubbing	Lump Sum		16,600.00
Underdrain System	900 LF	10.00	9,000.00
Telephone Relocation	Lump Sum		220.00
Electrical Relocation	Lump Sum		29,424.59
Sub-total			$1,001.094.59
Engineering and Contingencies at ± 15%			150,205.41
Total Estimated Construction Cost			$1,151,300.00

2. Rights-of-Way

PARCEL NUMBER	SIZE ACRES	LAND UNIT COST	LAND COST	STRUCTURE COST	TOTAL COST
R/W:					
74114-39-005	0.88	2,940	2,587.20	-0-	2,587.20
74141-00-011	10.24	1,620	16,588.80	-0-	16,588.80
017	2.23	1,380	3,077.40	-0-	3,077.40
74132-00-002	0.16	720	115.20	-0-	115.20
74132-00-008	0.37	5,400	1,998.00	-0-	1,998.00
Easements:					
74141-00-011	2.55	405	1,032.75	-0-	1,032.75
-00-017	3.86	345	1,331.70	-0-	1,331.70
74132-00-008	0.13	1,350	175.50	-0-	175.50

PARCEL NUMBER	LAND SIZE ACRES	LAND UNIT COST	LAND COST	STRUCTURE COST	TOTAL COST
Sub-totals			$26,906.55	-0-	$26,906.55
Acquisition at ± 5%			1,393.45		1,393.45
Total Rights-of-Way			$28,300.00		$28,300.00
Estimated Total Cost, Reach Number Seven					$1,179,600.00

h. Reach Number Eight, Trailer Park to 8th Street.

1. Construction Cost

ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
Channel Excavation	64,100 CY	2.00	$ 128,200.00
Structural Excavation	370 CY	2.00	740.00
Compacted Embankment	2,090 CY	1.00	2,090.00
Compacted Backfill	60 CY	1.00	60.00
12-inch Concrete Lining	8,080 CY	80.00	646,400.00
4-inch Concrete Lining	6,180 SY	8.00	49,440.00
Structural Concrete	413 CY	200.00	82,600.00
Streamwater Diversion	Lump Sum		31,200.00
Clearing and Grubbing	Lump Sum		13,500.00
Underdrain System	670 LF	10.00	6,700.00
Relocate 4-inch water	Lump Sum		800.00
Relocate 8 inch water	Lump Sum		1,200.00
Telephone Relocations	Lump Sum		2,200.00
Sub-totals			$ 965,130.00
Engineering and Contingencies at ± 15%			144,770.00
Total Estimated Construction Cost			$1,109,900.00

2. Rights-of-Way

PARCEL NUMBER	SIZE ACRES	LAND UNIT COST	COST	STRUCTURE COST	TOTAL COST
74132-00-008	2.28	5,400	$ 12,312.00	-0-	$ 12,312.00
74133-00-041	1.97	5,400	10,638.00	3,515.00	14,153.00
-002	0.79	5,750	4,542.50	-0-	4,542.50
-008	0.46	18,000	8,280.00	-0-	8,280.00
-011	0.11	28,300	3,113.00	-0-	3,113.00
-007	0.09	9,430	848.70	-0-	848.70
-012	0.39	28,200	10,998.00	-0-	10,998.00
Sub-totals			$ 50,732.20	$ 3,515.00	$ 54,247.20
Acquisition at ± 5%			2,567.80	185.00	2,752.80
Total Rights of way			$ 53,300.00	$ 3,700.00	$ 57,000.00

Total Estimated Cost, Reach Number Eight $1,166,900.00

i. Reach Number Nine, 8th Street to Monument Creek

1. Construction Cost

ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
Channel Excavation	13,400 CY	2.00	$ 26,800.00
Structural Excavation	1,260 CY	3.00	3,780.00
Compacted Embankment	4,900 CY	1.00	4,900.00
Compacted Backfill	140 CY	5.00	700.00
12-inch Concrete Lining	5,410 CY	80.00	432,800.00
4-inch Concrete Lining	5,340 CY	8.00	42,720.00
Streamwater Diversion	lump Sum		24,000.00
Clearing and Grubbing	Lump Sum		9,800.00
Relocate 8 inch Sewer	Lump Sum		3,100.00

ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
Relocate 6 inch water	Lump Sum		800.00

Sub-total	$549,400.00
Engineering and Contingencies at ± 15%	82,400.00
Total Estimated Construction Cost	$631,800.00

2. Rights-of-Way

PARCEL NUMBER	LAND SIZE ACRES	LAND UNIT COST	LAND COST	STRUCTURE COST	TOTAL COST
74134-00-019	0.41	$ 32,900	$ 13,489.00	$ -0-	$ 13,489.00
-004	1.44	7,600	10,944.00	-0-	10,944.00
Subtotals			$ 24,433.00	-0-	$ 24,433.00
Acquisition at ± 5%			1,267.00	-0-	1,267.00
Total Rights-of-way			$ 25,700.00	-0-	$ 25,700.00

Total Estimated Cost, Reach Number Nine	$657,500.00

j. Fountain Creek Channel Cost Summary

REACH NUMBER	CONSTRUCTION COST	RIGHT OF WAY COST	TOTAL COST
1	1,531,300.00	$ 77,900.00	$1,609,200.00
2	1,016,600.00	45,100.00	1,061.700.00
3	627,100.00	33,100.00	660,200.00
4	372,000.00	5,300.00	377,300.00
5	471,400.00	55,800.00	527,200.00
6	249,500.00	2,600.00	252,100.00
7	1,151,300.00	28,300.00	1,179,600.00

REACH NUMBER	CONSTRUCTION COST	RIGHT OF WAY COST	TOTAL COST
8	1,109,900.00	57,000.00	$1,166,900.00
9	631,800.00	25,700.00	657,500.00
Total	$7,160,900.00	$330,800.00	$7,491,700.00

2. West Side Basins

The following is a detailed Cost Estimate of facilities to be installed in the respective West Side drainage basins, including engineering and contingencies.

BASIN	ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
Columbia Road	5'x5' Concrete Channel	65 LF	$ 25.35	$ 1,647.75
	6'x6' RCB	28 LF	118.74	3,324.72
	Total			$ 4,972.47
Ridge Road	36-inch RCP	420 LF	$ 38.50	$ 16,170.00
	Inlets	4 ea	1,100.00	4,400.00
	Total			$ 20,570.00
Red Canyon	12'x4' Concrete Channel	160 LF	$ 257.12	$ 41,139.20
Palmer Trail	9'x8' U-box Channel	65 LF	211.81	$ 13,767.65
	48-inch RCP	450 LF	49.50	22,275.00
	Total			$ 36,042.65
33rd Street	54-inch RCP	490 LF	60.00	$ 29,400.00
	Inlets	4 ea	1,100.00	$ 4,400.00
	Total			$ 33,800.00
Basin "A"	36 inch RCP	135 LF	38.50	$ 5,197.50
Camp Creek	Add to existing headwall	Lump Sum		$ 3,500.00
Basin "B"	Remove 24 inch RCP	110 LF	15.00	$ 1,650.00
	54 inch RCP	150 LF	60.00	9,000.00
	Total			$ 10,650.00

BASIN	ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
28th Street	Remove 33 inch CMP	350 LF	$ 15.00	$ 5,250.00
	Remove 54 Inch CMP	2,150 LF	25.00	53,750.00
	33 inch RCP	350 LF	35.00	12,250.00
	54 inch RCP	2,150 LF	60.00	129,000.00
	Total			$ 200,250.00
Fairview	Remove 36 inch RCP	130 LF	20.00	$ 2,600.00
	78 inch RCP	235 LF	110.00	25,850.00
	Total			$ 28,450.00
24th Street	Spillway Modification	Lump Sum		$ 7,500.00
	Remove 48 inch RCP	800 LF	25.00	20,000.00
	Remove 48 inch x 76 inch RCP	300 LF	30.00	9,000.00
	Remove 66 inch RCP	400 LF	30.00	12,000.00
	54 inch RCP	800 LF	60.00	48,000.00
	53"x83" RCP	300 LF	75.00	22,500.00
	72 Inch RCP	400 LF	95.00	38,000.00
	Added inlets	4 ea	1,100.00	$ 4,400.00
	Total			$161,400.00
23 rd Street	Added inlets	10 ea	1,100.00	$ 11,000.00
21st Street	Remove 18 inch RCP	400 LF	15.00	$ 6,000.00
	21 inch RCP	400 LF	22.50	9,000.00
	30 Inch RCP	600 LF	30.00	18,000.00
	Total			$ 33,000.00
Area "D"	4'x4' Ditch	310 LF	19.68	$ 6,100.80
	4'x4' RCB	115 LF	106.00	12,190.00
	4'x3' Ditch	398 LF	16.04	6,383.92
	Total			$ 24,674.72

BASIN	ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
20th Street	42" RCP	530 LF	43.00	$ 22,790.00
	Inlets	2 ea	1,100.00	2,200.00
	Total			$ 24,990.00
14th Street	Remove 12 inch VCP	800 LF	10.00	$ 8,000.00
	Remove 48 inch VCP	1,630 LF	25.00	40,750.00
	Remove 54 inch VCP	700 LF	30.00	21,000.00
	Remove 43"x68" VCP	300 LF	30.00	9,000.00
	Remove 3.3'x4' RCB	400 LF	35.00	14,000.00
	Remove 2'x5' RCB	400 LF	35.00	14,000.00
	Remove 2.5'x5'	800 LF	40.00	32,000.00
	Remove 3'x5.5' RCB	2,020 LF	45.00	90,900.00
	Remove 66 inch CMP	260 LF	30.00	7,800.00
	Remove 60 inch CMP	400 LF	30.00	12,000.00
	Remove 2-48inch RCP	140 LF	30.00	4,200.00
	54 inch RCP	800 LF	60.00	48,000.00
	60 inch RCP	1,630 LF	65.00	105,950.00
	66 inch RCP	2,480 LF	80.00	198,400.00
	84 inch RCP	1,930 LF	130.00	250,900.00
	72 Inch RCP	480 LF	95.00	45,600.00
	7'x8' RCB	182 LF	195.00	35,490.00
	36 inch RCP	400 LF	38.50	15,400.00
	48 inch RCP	400 LF	49.50	19,800.00
	42 inch RCP	400 LF	43.00	17,200.00

BASIN	ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
	Inlets	6 ea	$ 1,100.00	$ 6,600.00
	Total			$ 996,990.00
10th Street	Remove 18 inch RCP	400 LF	15.00	$ 6,000.00
	Remove 21 inch RCP	400 LF	15.00	6,000.00
	24 inch RCP	400 LF	24.00	9,600.00
	27 inch RCP	800 LF	27.00	21,600.00
	36 inch RCP	470 LF	38.50	18,095.00
	30 inch RCP	550 LF	30.00	16,500.00
	48 Inch RCP	50 LF	49.50	2,475.00
	Inlets	11 ea	1,100.00	12,100.00
	Total			$ 92,370.00
8th Street	Remove 18 inch RCP	450 LF	15.00	6,750.00
	Remove 21 inch RCP	550 LF	15.00	8,250.00
	Remove 24 inch RCP	300 LF	24.00	7,200.00
	30 inch RCP	1,050 LF	30.00	31,500.00
	36 inch RCP	800 LF	38.50	30,800.00
	Inlets	7 ea	1,100.00	7,700.00
	Total			$92,200.00
Chestnut Street	Remove 18 inch RCP	250 LF	15.00	$ 3,750.00
	Remove 21 inch RCP	250 LF	15.00	3,750.00
	30 inch RCP	500 LF	30.00	15,000.00
	36 inch RCP	1,300 LF	38.50	50,050.00
	48 inch RCP	150 LF	49.50	7,425.00
	Inlets	5 ea	1,100.00	5,500.00
	Total			$ 85,475.00

BASIN	ITEM DESCRIPTION	QUANTITY	UNIT COST	COST
South 21st Street	Excavation	630 CY	2.50	$ 1,575.00
	Embankment	1,960 CY	1.50	2,940.00
	Riprap Channel Lining	870 CY	25.00	21,750.00
	Total			$ 26,265.00

Total West Side Drainage Basin Improvements Cost $ 1,932,936.54

SECTION V

FINANCIAL ASSISTANCE

V FINANCIAL ASSISTANCE

The financial assistance programs available to assist in the financing for construction of the Fountain Creek Channelization,are described in this section. This effort must be taken jointly between the City and El Paso County because the channel meanders across the City Limit. The following shows the portions of the channel lying within the juristiction of the respective governing bodies.

CHANNEL REACH	LOCATION	CENTERLINE LENGTHS-FEET		
		COLORADO SPRINGS	EL PASO COUNTY	TOTAL
1	Manitou Springs to Ridge Road	546	969	1,515
2	Ridge Road to 31st Street	1,570	1,565	3,135
3	31st Street to 26th Street	877.35	1,940	2,817.35
4	26th Street to 25th Street	548	-0-	548
5	25th Street to 21st Street	2,248	-0-	2,248
6	21st Street to Highway 24	732	-0-	732
7	Highway 24 to Trailer Park	3,690.32	-0-	3,690.32
8	Trailer Park to 8th Street	2,660	-0-	2,660
9	8th Street to Monument Creek	2,099.68	-0-	2,099.68
	Totals	14,971.35	4,474.00	19,445.35
		77%	23%	100%

For this reason, it may be advisable for the City and County to form a "Colorado Springs Urban Flood Control District" to jointly administer the project.

A. USACE Small Flood Control Projects

This program is authorized by section 205 of the 1948 Flood Control Act and is administered by the USACE office of the Chief of Engineers. The maximum federal participication is one million dollars in construction cost, exclusive of rights-of-way and similar costs. The local entities then maintain the project which must be complete in itself and economically justified.

Local governments may apply for funding through the Districts Engineers office. The feasibility study by the Corps is required, which must be funded through congress. The project funding is then placed on a priority listing for appropriation. The entire process normally takes 8 to 10 years.

B. USACE Protection of Essential Highways, Bridge Approaches and Public Works

This program is authorized by section 14 of the 1946 Flood Control Act for the installation of bank protection of highways, highway bridges and essential public works endangered by flood-caused erosion.

Each project selected must be engineeringly feasible, complete within itself and economically justified. Non Federal interests such as local governments, are responsible for all project costs in excess of $50,000. The local sponsor must maintain the project after completion.

C. FmHA and SCS Water Shed and Flood Prevention Loans

These programs are very similar in nature and are administered by the USDA-Farmers Home Administration and the USDA-Soil Conservation Service as authorized by the Watershed Protection and Flood Prevention Act of 1956, as amended. Both programs are rural oriented and it is doubtful that this project will qualify.

The FHA program is limited to loans of Five million dollars maximum with up to 50 years to repay, while the SCS program may be a total grant of up to five million dollars. The emphasis is on flood control dams to limit the discharge peaks of storms. The latter program is designed and administered by SCS engineers, and a good example is the Kiowa Creek Project in Elbert and El Paso Counties that was installed in the late 1950's.

D. Other Programs Previously Used

Several governmental programs have been used by local governments in studies leading up to this study, two of which are as follows.

1. USACE Flood Plain Management Services

This program, authorized by the Flood Control Act of 1960, was the basis for the Corps studies on Monument, Upper and Lower Fountain Creeks that were used as a basis for the design of works in this study.

2. HUD Flood Insurance

This program, administered by the Federal Insurance Administration and authorized by the Housing and Urban Development Act of 1968, provides subsidies enabling persons to insure against damages resulting from floods.

The City has become eligible by furnishing proof of their positive interest and adopting land use and control measures consistent with stipulated criteria. HUD is now designating the flood hazard areas within the City and developing maps for use by the City in administering the program.

SECTION VI

SUMMARY

VI SUMMARY

The US Army Corps of Engineers prepared a flood plain information report on Fountain Creek in August, 1974, showing that the portion of the Creek in Colorado Springs is the most dangerous from the standpoint of loss of life and property damage in the City The existing 100 year flood plain, upon which the current flood plain ordinance is based, contains the following assorted businesses and people.

REACH OF CHANNEL	NUMBER OF STRUCTURES INUNDATED			PERSONS INUNDATED	
	DWELLING UNITS	BUSINESSES	MOTEL CAMPGROUND UNITS	RESIDENTS	SHOPPERS
Manitou to Ridge Road	12	4	48	194	-0-
Ridge Road to 31st Street	25	10	41	314	296
31st Street to 26th Street	5	8	58	214	72
26th Street to 25th Street	10	10	35	69	86
25th Street to 21st Street	-0-	9	-0-	-0-	1275
21st Street to Highway 24	8	2	-0-	32	24
Highway 24 to Trailer Park	-0-	3	-0-	-0-	16
Trailer Park to 8th Street	55	10	-0-	174	266
8th Street to Monument Creek	-0-	11	100	322	188
TOTALS	155	67	282	1319	2223

A Master Plan for the channelization of the creek is described and shown in this report that will reduce the flood plain to a level that it may be managed in accordance with the City flood plain ordinance. It is not intended to fully channelize to contain the entire design flow, although this is necessary in several cases. Rather, the flood plain limits are reduced to minimize structural damage and prevent loss of life, and to enable local businesses to install individual structural protection as prescribed by the ordinance. The total cost of this channelization and the priorities assigned for construction of the various channel reaches are as follows.

CHANNEL REACH	REACH #	PRIORITY NUMBER	COST OF CHANNELIZATION		
			CONSTRUCTION	RIGHTS OF WAY	TOTAL COST
Manitou to Ridge Road	1	4	1,531,300.00	$ 77,900.00	$1,609,200.00
Ridge Road to 31st Street	2	1	1,016,600.00	45,100.00	1,061,700.00
31st Street to 26th Street	3	3	627,100.00	33,100.00	660,200.00
26th Street to 25th Street	4	7	372,000.00	5,300.00	377,300.00
25th Street to 21st Street	5	6	471,400.00	55,800.00	527,200.00
21st Street to Highway 24	6	8	249,500.00	2,600.00	252,100.00

CHANNEL REACH	REACH #	PRIORITY NUMBER	COST OF CHANNELIZATION		
			CONSTRUCTION	RIGHTS OF WAY	TOTAL COST
Highway 24 to Trailer Park	7	9	1,151,300.00	28,300.00	$1,179,600.00
Trailer Park to 8th Street	8	2	1,109,900.00	57,000.00	1,166,900.00
8th Street to Monument Creek	9	5	631,800.00	25,700.00	657,500.00
Total Costs			$7,160,900.00	$330,800.00	$7,491.700.00

In addition, the various drainage basins along the West Side that outfall into this reach of Fountain Creek were studied and various drainage facilities are proposed to provide adequate drainage protection in keeping with the standards throughout the remainder of the City. In most cases, only those structures necessary to provide an adequate inlet to the channel are specified, but in some cases it proved necessary to perform an extensive investigation of the entire basin because of specific problems. The basins draining into 24th and 23rd Streets as well as 19th and 14th Streets fall into this latter category.

The total cost of drainage projects required among the West Side basins are as follows.

Columbia Road	$ 4,972.47
Ridge Road	20,570.00
Red Canyon	41,139.20
Palmer Trail	36,042.65
33rd Street	33,800.00
Basin "A"	5,197.50
Camp Creek	3,500.00
Basin "B"	10,650.00
28th Street	200,250.00
Fairview	28,450.00
26th Street	-0-
Basin "C"	-0-
24th Street	161,400.00
23rd Street	11,000.00
21st Street	33,000.00
Basin "D"	32,376.50
20th Street	24,990.00