HEMET MASTER FLOOD CONTROL

AND DRAINAGE PLAN

Prepared For

THE CITY OF HEMET

RIVERSIDE COUNTY, CALIFORNIA

January 24, 1984

CITY COUNCIL
Patricia Herron, Mayor
Donald S. Baskett
Lester Corey
Ken Nishino
Donald G. Young

PLANNING COMMISSION
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ACKNOWLEDGEMENT

Valuable assistance and data used in the investigation were contributed by the City of Hemet and the Riverside County Flood Control and Water Conservation District. This cooperation is gratefully acknowledged.

Special mention is made of the following individuals:

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Councilman Donald S. Baskett
Councilman Lester Corey
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Councilman Donald G. Young

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January 24, 1984

Mr. Lyle W. Alberg
City Manager
City of Hemet
450 East Latham
Hemet, CA 92343

SUBJECT: Hemet Master Flood Control and Drainage Plan

Dear Mr. Alberg:

We are pleased to transmit herewith our final report on a Master Flood Control and Drainage Plan for the City of Hemet.

The report incorporates all of the changes adopted by the City Council at its meeting of January 24, 1984, and includes those specific changes recommended by the City staff and Planning Commission during and following the several public meetings and hearings held on the matter.

I want to express my personal appreciation to you, Dave Oltman and Mark Goldberg for the tremendous assistance and cooperation we have received during the preparation of the plan. Pam Easter of your staff has also been of great assistance to us. Finally, you and the City Council should be aware of the substantial assistance and cooperation we have received from Ken Edwards and the staff of the Riverside County Flood Control and Water Conservation District during all stages of the plan preparation.

We are particularly appreciative of the patience and helpful advice and assistance rendered throughout the planning process by the City Council. We believe the enclosed document will be a most useful tool to the City as it seeks to provide needed drainage and flood control facilities for the expanding development of the City. It has been our great pleasure to assist the City in this most challenging endeavor.

Very sincerely,

Robert H. Born

Robert H. Born, P.E.

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CHAPTER I
INTRODUCTION

Background

Because of the relatively flat topography and large tributary drainage areas, the City of Hemet and surrounding valley area have experienced flooding and drainage problems for many years. The upper reaches of the tributary areas are mountainous and can contribute large runoff flows to the lower valley floor. Records of floods prior to 1952 in the Hemet area are deficient except for those along the San Jacinto River north of Hemet. The floods of January, 1952; February, 1969; March, 1978; and February, 1980, and more recently in February, 1983 and August, 1983 have been well-documented and have caused considerable property damage in the area. During these historical flood periods, traffic circulation has been impeded and access for vital public services has been denied.

Land use in the area has been primarily agricultural in nature for many years except for the areas within the City and in unincorporated areas immediately to the north and east. This practice has dispersed or obliterated the natural stream patterns and replaced it with drainage ditches along the various roads. The drainage system has thus, in most cases, been completed without a general plan and has resulted in inadequate channel capacities and widespread inundation. Moderate levels of flooding have been tolerated in the agricultural areas in the past due to the greater absorption capacity of the agricultural land, although widespread crop damage occurs during most major flood events.

Within the past fifteen years considerable growth has occurred in the Hemet area. Much of the agricultural area has been converted to residential subdivisions. Hemet has been transformed into a significant and attractive retirement community without some of the growing pains which have been associated with previously-

developed metropolitan areas. It is anticipated that incentives for this normal healthy development will continue indefinitely with corresponding increases in land values. The actual rate of development will depend on the need for housing and related commercial activity within the area, as well as on economic conditions throughout the nation.

The influx of development has increased the potential for flooding and the need for flood protection as a direct consequence of the increase in impervious surfaces. Previously, considerable land development has occurred without the appropriate level of storm drainage facilities to convey the flow downstream. These activities require prudent plans for reducing the flood damage potential within the City of Hemet and its Sphere of Influence under both present and future conditions.

Previous Studies

Several engineering studies have been made in the past regarding existing drainage patterns and channelization projects for the greater Hemet area. All of the studies have either been completed by or under the direction of the Riverside County Flood Control and Water Conservation District (RCFC&WCD). The first such study entitled "Master Drainage Plan for the Hemet Area" was completed in July of 1969 by the RCFC&WCD. It proposed a major portion of the storm drainage facilities for the central Hemet area. The dominant feature of those facilities was the Hemet Channel. Subsequently, a major portion of the Hemet Channel, and two of its major open channel tributaries, the Whittier Channel and Stetson Avenue Channel, and other smaller channels have been constructed by the RCFC&WCD as essentially proposed in those plans in the 1970-1980 period. In 1977, an updated version of the central Hemet plan was published to reflect the new hydrologic and soil condition information made available since the first report was issued, particularly after the results of the 1969 floods were evaluated. This report revised the sizes and configuration of several of the previously proposed storm

drains. These changes did not require revisions to the channels already constructed. The design criteria used in this plan and subsequent plans by the RCFC&WCD has been reviewed and utilized in this report. The planning work completed in the 1977 revision has also been incorporated into this report.

In June of 1971, the U.S. Army Corps of Engineers, Los Angeles District, California, published a report entitled "Flood Plain Information, Salt Creek, Hemet to Railroad Canyon Reservoir, Riverside County, California". This report presented information on the flood hazard along Salt Creek in the southwest area of Hemet, and the communities of Winchester and Sun City, Riverside County, California. This report analyzed the flow magnitude of future floods designated as the Intermediate Regional and the Standard Project Flood. The Intermediate Regional Flood is defined as one which could occur on the average of about once in 100 years, but it could occur in any year or more than once in any year. The Corps defines the Standard Project Flood as the largest flood that can be expected from the most severe combination of meteorlogic and hydrologic conditions considered reasonably characteristic of the geographic region. Using the Corps' methodology these flows were determined for various reaches in their study area. The flood plain areas for the two flood designation were then completely mapped. The areas mapped under that program affecting the study area for this report is primarily in the southwest and south Hemet area in the Salt Creek Basin.

Subsequently, preliminary engineering plans for the Salt Creek Channel were prepared under the direction of RCFC&WCD and issued in July of 1973. This project presented several alternatives for channelization of Salt Creek along the same alignment from Hemet to Sun City. The alignment was revised in a 1974 amendment of the plan to utilize the existing MWD siphon near Olive Avenue.

The Salt Creek Channel would provide adequate downstream capacity for the discharges from the Hemet Channel and would channelize the flood plain to allow present and future development to occur. The recommended channel as adopted by the Board of Supervisors is a "greenbelt" channel. This channel is designated for a mild profile slope that allows maximum velocities of 5 fps. The side slopes are also mild and are proposed to be planted with vegetation. Designed for the 100-year flow, the channel allows for maximum recreation and other open space useage and is more pleasant in appearance than the more traditional lined and reveted channels. The complete EIR process has been completed for the portion of the Salt Creek project extending from Lyon Avenue to Railroad Canyon Reservoir.

Portions of the downstream channel outside the study area have been completed. The channel reach between Lindenberger Road and a point just above Railroad Canyon Reservoir was constructed in 1980 under the direction of the RCFC&WCD with assistance from the California Department of Transportation. As of this writing, no portion of the channel has been constructed in the study area, although planning for the reach between Lyon Avenue and Sanderson Road has been underway for the past several years by the owners of the Seven Hills development. As least two possible alternative configurations of the Salt Creek channel have been considered to date as part of their planning effort.

In September of 1978, the RCFC&WCD published a report entitled "Master Drainage Plan for the Little Lake Area". This report proposed a storm drainage system for an area east of Hemet bounded by Meridian Street on the west, Lake Hemet Canal on the South, Bautista Creek Channel on the east and the San Jacinto River on the north. This area is under the County of Riverside's jurisdiction but is within the City of Hemet's Sphere of Influence. It lies completely within the San Jacinto watershed.

The major features of the Little Lake plan include a storm drain running north along Meridian Street to the San Jacinto River and several storm drain laterals discharging to the Bautista Wash. A small retention basin is proposed at the intersection of Stetson Avenue and Lake Street. Discussions with the RCFC&WCD staff indicate this basin may be funded and constructed in the near future. This would be the first implementation of the Little Lake plan. That planning work has been incorporated into this report.

Adjacent to the Little Lake area and east of the Bautista Creek Channel is the Valle Vista area. This area has been master-planned by RCFC&WCD but the report remains unpublished. This area is under the County of Riverside's jurisdiction and is also within Hemet's Sphere of Influence. This plan proposes several storm drain lateral tie-ins to the Bautista Creek Channel and the San Jacinto River and all such features have also been incorporated into this report.

In July of 1981, the RCFC&WCD published a draft report entitled "Master Drainage Plan for the West Hemet Area". That plan proposed a storm drainage system for the area generally west of the Hemet channel and east of the San Diego Aqueduct. The study area lies partially within the corporate boundaries of the City of Hemet, but also includes areas outside of the present boundaries within the City's Sphere of Influence. In 1982 a revision of the plan was made to remove the portion of the system from the plan which was outside the Salt Creek watershed, and generally north of Menlo Avenue. This revision also allowed elimination of some of the retention basin capacity previously proposed. An update of land use planning was made along Florida Avenue and Ryan Airport requiring further storm drain facilities. The final draft of this plan has been incorporated into this report. The features of the original plan which did not serve the Salt Creek watershed have also been incorporated, in slightly revised form, into plans presented in this report for the North Hemet areas.

In October of 1981, the RCFC&WCD published a report entitled "Master Drainage Plan for the Southwest Hemet Area". That report proposed a storm drainage system for the area bounded on the west by the San Diego Aqueduct, on the north by the Hemet Channel and Stetson Avenue, on the south by the Salt Creek watershed and on the east by a line approximately 100 feet east of Sanderson Avenue. This area is also presently divided between the City of Hemet and the County. The plan is predicated on the existence of the Salt Creek Channel throughout the entire reach of the Plan. None of its facilities would function properly without the construction of the Salt Creek Channel. Due to the very flat gradients that exist in this area, a high portion of the system was designed to be in open channel to reduce construction costs, even though such channels would require additional rights-of-ways and more expensive bridge crossings. That planning work has also been incorporated into this report.

In January of 1982, the RCFC&WCD published a report entitled "Master Drainage Plan for the San Jacinto Area". That plan proposed a storm drainage system for the City of San Jacinto, a small portion of the City of Hemet and adjacent county areas. The area included within the study area for that report is bounded on the east by Meridian Street, on the south by the Salt Creek/San Jacinto watershed divide, on the west by State Street and on the north by the boundary of the City of Hemet's Sphere of Influence. That plan utilizes the Parkhill Retention Basin, constructed in 1980, for the collecting of flows originating to the east along Florida Avenue as well as south of Florida Avenue and then discharges it to the north through a system of storm drains partially constructed near the basin. This flow combines with flow along Santa Fe Street and would eventually discharge into the proposed Buena Vista Retention Basin, outside and to the north of the study area for this report. Flow along State Street would combine with the discharge from the Buena Vista Retention Basin, and would eventually discharge to the San Jacinto River.

A significant portion of that planning work has also been incorporated into this report.

Until 1982, the City of Hemet relied primarily on planning documents and recommendations of the RCFC&WCD for technical flood control planning guidance in the processing of subdivisions and other land development projects. In 1982, the City Council decided that the time had arrived for the development of a Master Flood Control Plan that would more fully consider the broader objective of the City's own General Plan.

Concurrently with the authorization of preparation of a Master Flood Control and Drainage Plan the City Council authorized the creation of a new staff position of City Engineer, which, together with supplemental flood control consulting advice as required, would advise the City staff, the Planning Commission and City Council on proposed drainage planning policy as well as provide day-to-day guidance on implementation of the Master Flood Control and Drainage Plan. By these means and with final approval and adoption of the Plan, the City is now in a position to move ahead quickly in the implementation of critically needed flood control and drainage facilities and policies. Proper implementation of the Plan will continue to require close coordination and cooperation between the City and the RCFC&WCD. This coordination and cooperation will ensure an even-handed and equitable management of the Plan throughout the Sphere of Influence of the City of Hemet.

Scope of Study

In order to develop a plan that will reduce the flood damage potential as well as optimize the use of existing facilities, Born, Barrett & Associates was retained by the City of Hemet to update the City's Storm Drainage Master Plan. Because of the considerable planning work completed by the RCFC&WCD in the past and the desirability of having compatible drainage plans for the

City and the County, special consideration was placed on continuing many of the concepts developed during the early planning efforts into adjacent study areas required to be master planned by the City as a result of recent annexation and development activity.

Particular attention was accordingly focused on the principal tributaries to the Salt Creek Channel above Lyon Avenue. The plan also focuses on the need for bridge crossings to allow for proper circulation across Salt Creek and its tributaries during flood emergencies in order to access for vital public services.

In addition, emphasis was placed on a construction staging program, and a workable financial and implementation program that would meet the needs of the City. The scope of the present study is therefore as follows:

1. General field investigation of the study area. The study area as is indicated in Figure 3-2.

2. Review of the most recent zoning ordinances and land use projection adopted by the City and the County.

3. Review of the existing drainage master plans and those submitted by RCFC&WCD during the course of the study. Update drainage zones, design criteria, hydrology and flow computations as required.

4. Evaluation of existing drainage problems within the study area and the capacity of the existing drainage system.

5. Prepare a Master Flood Control and Drainage Plan that will eliminate existing deficiencies and will allow continued development within the study area.

6. Development of preliminary cost estimates to implement the proposed plan.

7. Preparation of a staged improvement program that will allow incremental construction of the recommended facilities within financial constraints.

8. Review alternative funding and institutional approaches for implementing the Master Flood Control and Drainage Plan.

9. Recommend and summarize the best apparent funding and institutional program.

During the course of the plan preparation, the RCFC&WCD instituted proceedings for the creation of benefit assessment districts within the Salt Creek and San Jacinto River watershed portions of the City of Hemet's Sphere of Influence, based on enabling legislation permitted under Chapter 10 (Commencing with Section 60400), Division 2, Title 6 of the California Government Code. Although the District failed to secure the necessary majority vote on the proposition at a special validating election held on March 8, 1983, the plan contemplates the use of such a financing mechanism for the funding of a significant portion of the future capital outlay program for implementing the master plan.

HEMET2

CHAPTER II
EXECUTIVE SUMMARY

Introduction

The investigation of flood problems in Hemet and environs has shown that runoff from even modest storms can impede transportation access throughout the City of Hemet. Major storms, which since 1952 have occurred on the average of once every 5 years, cause serious public and private property damage and can block critical transportation access routes across town for vital ambulance, fire and police services for periods of up to four hours.

The investigation has also shown that the manifold flood problems experienced within the City and its Sphere of Influence are due in part to the high intensity storms which can occur during both summer and winter periods. These storms are quickly converted to significant surface runoff on the mild sloping valley floor. The lack of defined natural drainage courses and rapid growth of urban development causes significant flooding throughout the area.

Rapid urbanization of the study area without concurrent construction of an adequate flood control and drainage infrastructure system has exascerbated the problem due to the greater imperviousness of urban culture as compared with the former agriculture. The lack of timely construction of the flood control and drainage infrastructure system has tended to transfer some of the most serious problems to both developed and undeveloped areas downstream. There are few neighborhoods within Hemet which do not experience serious drainage problems during major storm events, and the entire community suffers from transportation blockages and damage to streets, and other public utilities which can sever citizens from access to vital public services during

emergency periods. Thus, the entire community shares in the consequences of the problem and in the responsibility for its solution.

It has also been shown that flood waters are not respectors of political boundaries. Land development projects have been approved without adequate provision for downstream flood control and drainage facilities. As a result, property owners in the downstream areas within the jurisdiction of both the County of Riverside and the City of Hemet have suffered the inconvenience, damage, and, in some cases, serious threat to their safety and well-being. It is therefore obvious that a comprehensive solution to the flood problems within the Sphere of Influence of the City of Hemet will require a cooperative, integrated effort on the part of the City of Hemet and the County of Riverside, underwritten by the solid support of all the property owners of both jurisdictions.

Acting in its capacity as the governing body of the Riverside County Flood Control and Water Conservation District (RCFC&WCD), the Board of Supervisors of the County of Riverside has caused significant flood control and drainage planning to be undertaken within areas of concern to the City of Hemet. Funds for such studies have been provided through Zone 4 of the District, which has also been the vehicle for financing some of the most critically needed backbone stormwater channel facilities in the areas just west of the highly developed portions of the City. The RCFC&WCD has also caused selected underground storm drains and retention basins to be constructed in the central and northeastern portions of the City and environs, and also has participated in the development, operation and maintenance of significant improvements to Bautista Channel and the San Jacinto River in the far eastern portions of the Sphere of Influence, in cooperation with the U. S. Army Corps of Engineers. Recent planning efforts of the RCFC&WCD have focused on updating of earlier

planning efforts, completion of required environmental reviews, and the acquisition of rights-of-way and completion of planning for an interim Salt Creek Channel between Lindenberger Road and Patterson Avenue.

In early 1983 the RCFC&WCD proposed a financing program for meeting the most critical flood control needs within component watersheds of the Zone 4 area over the ensuing 15-year period. It was proposed that the needed works would be financed by a benefit assessment program authorized under Section 60400 et seq of the California Government Code. At a special validating election held on March 8, 1983, the proposition failed to receive the necessary majority vote support.

As a result of a combination of continuing interest in development activities in the northern, western and southwestern portion of the City and its environs, several significant annexations have been approved since 1980. These annexations have caused the City Council to sponsor a complete review of the City's General Plan as well as several of its component elements. In part due to the review of all elements of the General Plan, as well as severe storms which occurred during the 1978-80 period, the Hemet City Council authorized the employment of Born, Barrett & Associates to undertake a comprehensive review of all previous flood control and drainage planning efforts within the City's Sphere of Influence and to update and extend those efforts in areas where near-future development will require new storm water conveyance and regulatory systems. The planning effort was directed to encompass the entire Sphere of Influence, as shown on Figure 1-1, and was to include considerations of the most recent zoning ordinances and land use projections adopted by the City and County. The object of the planning was to be the preparation of a Master Flood Control and Drainage Plan which, upon implementation, would eliminate existing deficiencies and also allow for continued development within the study area.

The scope of work for the investigation provided that the report would include preliminary cost estimates to implement the proposed plan, together with a proposed staged construction program that would allow incremental construction of the recommended facilities within financial constraints. Following a review of alternative funding and institutional approaches for implementing the Master Flood Control and Drainage Plan, the report was to include recommendations and a summary of the apparent best funding and institutional program.

Study Area

The City of Hemet had a 1980 population of about 22,500 with a median age of 65 years. Convenience of access to nearby metropolitan areas and favorable climate has made the community an attractive retirement center.

The investigation area, comprising the Sphere of Influence of the City, covers an area of approximately 100 square miles, as shown on Figure 3-2 within the study area. The annual rainfall average is just under 11 inches per year, with about 65 percent of the annual rainfall occurring between December and March. Elevations rise from 1,660 feet at the eastern edge of the study area to 4,524 feet in the upper ranges of the Salt Creek watershed boundary southeast of the City. Land slopes range in the order of one percent in the central Hemet area to as high as 50 percent in the upper Salt Creek watershed.

Major drainage courses within the area include the San Jacinto River, which drains about 23 percent of the study area, and the Salt Creek, which drains about 74 percent of the study area. About three percent of the study area lies within the Santa Margarita River watershed, which drains directly to the Pacific Ocean and is not a part of the Santa Ana River watershed of which the San Jacinto River and Salt Creek are parts.

For convenience of study and reference, the study area has been divided into eight subareas, as follows:

Salt Creek Watershed	San Jacinto Watershed
Central Hemet	San Jacinto
West Hemet	Little Lake
Southwest Hemet	Valle Vista
South Hemet	Northwest Hemet

Boundaries of the foregoing study areas are depicted on Figures 6-1 through 6-4 and 6-6 through 6-9.

Soils of the study area are quite permeable and runoff therefore dramatically increases as they become covered with impermeable surfaces associated with urban development. Land use in the valley areas has historically been devoted to agricultural pursuits, and the rapid development of the land has affected both runoff rates as well as recharge of the underlying groundwater supply. Groundwater extractions have further contributed to a gradual lowering of the water table. Groundwaters in the upper Salt Creek and upper San Jacinto areas are generally suitable for most beneficial uses whereas at the western end of the study area near Winchester they are undesirable for domestic purposes, with high levels of total dissolved solids, chlorides and nitrates.

In planning the flood control and drainage system, current land use and current land use plans have been given careful consideration. Where such plans have not been completed or are otherwise out of date, the City's General Plan and selected specific land use plans have been utilized, so that calculated ultimate runoff rates will reflect currently projected ultimate land uses in the tributary areas.

Existing Drainage Facilities and Flood-Prone Areas

Existing regional flood control facilities within the study area have either been constructed by the Riverside County Flood Control and Water Conservation District or by the U.S. Army Corps of Engineers in cooperation with the District.

The Hemet Channel was constructed by the RCFC&WCD in the early 1970's, and is depicted on Figures 4-1 through 4-3. The channel is lined down to Cawston Avenue and has a capacity of about 1,850 cfs at that point. The downstream portion of the Hemet Channel is unlined to its confluence with Salt Creek.

The Florida Avenue Storm Drain is largely an underground storm drain tributary to the Hemet Channel, extending westerly from San Jacinto Street along an alignment shown in Figure 4-1. Between Allessandro and Palm Avenues, the drain is a concrete-lined channel, with a capacity of 325 cfs.

The Whittier Channel, as shown on Figure 4-1, was constructed by the RCFC&WCD in 1971-72, is concrete-lined and extends westerly from Lyon Avenue to the Hemet Channel. It has a capacity of 690 cfs. The Stetson Avenue Channel was constructed by the RCFC&WCD in 1974-75 as a concrete-lined facility extending from Palm Avenue to Cawston Avenue. At Cawston Avenue, the channel has a capacity of 1,350 cfs. Between Cawston Avenue and the Hemet Channel, the Stetson Avenue Channel is unlined. The Stetson Avenue Channel is depicted in Figures 4-4 and 4-5.

The Parkhill Retention Basin was constructed by the RCFC&WCD in 1980, and is depicted on Figure 4-6. The basin covers an area of about 9 acres and is designed to regulate a maximum inflow of 750 cfs down to an outflow of 17 cfs.

The Bautista Creek Channel was constructed in the 1960's by the U. S. Army Corps of Engineers and is depicted on Figure 4-9. The

channel drains an area of about 50 square miles, and has a design discharge of 16,500 cfs at its lower end. A short segment of unlined channel above its junction, as depicted on Figure 4-11, is undergoing review by the Corps of Engineers.

Two Valle Vista Channels were constructed by the RCFC&WCD in the mid-1970's and are shown on Figure 4-9. The two channels are constructed in part as underground storm drains and in part as open channels and have a combined capacity at their lower end of approximately 1,800 cfs.

As noted earlier, a majority of Hemet's streets are flooded even during modest storms. During major events, a significant portion of the City and environs are subjected to damaging floods. Depicted on Figure 4-12 through 4-23 are flooding conditions throughout the community during recent significant storm periods. Areas subject to flooding during the 100-year flood event are depicted on Figures 4-24 through 4-31.

Design Criteria

Design criteria used in sizing facilities comprising the Master Flood Control and Drainage Plan were consistent with criteria currently employed by the RCFC&WCD or the U.S. Army Corps of Engineers. All open channels were designed with sufficient capacity to convey runoff which would occur with a 100-year return period storm, with the tributary area fully developed as envisioned by currently adopted land use plans. All underground storm drain facilities were designed for the tributary 10-year frequency storm. When street capacities were found to be inadequate to convey the 10-year storm within curb faces, an underground drain was initiated with capacity to convey the entire 10-year storm runoff to the nearest downstream outlet. Accordingly, when runoff exceeds that from a 10-year storm, it will generally be contained within the street right-of-way. Utilizing both the street capacity and that of the underground facilities,

100-year protection would be provided within the street right-of-way boundaries.

For watershed areas of up to 500 acres in extent, the modified rational method was used to estimate peak flows, utilizing rainfall intensity-duration data developed by the RCFC&WCD and listed in Table 5-1. More elaborate computerized unit hydrograph methods were utilized for routing flows for capacity determinations in larger watersheds. Total rainfall for a given watershed was determined either from the NOAA Atlas 2 or the RCFC&WCD Hydrology Manual for storm durations of 3, 6 and 24 hours and for return periods of 2 to 100 years.

Facility design standards employed in the report reflect either current RCFC&WCD or Army Corps of Engineers criteria. Channels with velocities exceeding 6 cfs were planned with linings. In some cases, particularly in the South Hemet area, soft bottoms with rock riprap side slope protection were provided where velocities could be managed below 5 cfs. Velocities in concrete-lined channels were maintained below 15 fps and in unlined channels below 5 fps. Minimum velocities were set at 2.5 fps. Freeboards of one foot or more were provided for all open channels and rock riprap revetments were all designed to comply with RCFC&WCD or Army Corps of Engineers criteria.

Retention basins were provided at selected locations where the cost of alternative open channels were found to exceed on a capitalized annual basis, the cost of the retention basin including maintenance.

The plan contemplates the use of interim channels as part of the staging program in order to ease the initial costs of the flood control program until the required funding for the ultimate facility can be generated.

Proposed Master Flood Control and Drainage Plan

Features of the recommended plan are shown on Figures 6-1 through 6-9 and estimated capital costs of implementation are displayed in Tables 6-2 through 6-11. A summary of estimated capital costs for all subareas is presented in Table 2-1.

TABLE 2-1

HEMET MASTER FLOOD CONTROL AND DRAINAGE PLAN

COST SUMMARY - ALL SUBAREAS

(ENR INDEX 4934)

Subarea	Master Plan Cost*
Central Hemet (I)	$ 23,339,000
West Hemet (II)	14,429,000
Southwest Hemet (III)	9,187,000
South Hemet (IV)	32,650,000
San Jacinto (V)	9,043,000
Little Lake (VI)	13,310,000
Valle Vista (VII)	4,581,000
Northwest Hemet (VIII)	4,513,000
TOTAL	$111,052,000

* Includes construction and right-of-way costs, and 30% for engineering administration and contingencies

Central Hemet Area - Proposed facility plans to serve the Central Hemet Area are shown in Figure 6-1. The area is the recipient of flood runoff originating as far east as Parkhill, and, that includes many streets in the fringe areas without curbs and gutters and many of smaller drains are old and of inadequate capacity. An extensive underground drain system is required to remove flood waters from surface streets and to safely discharge them into the existing Stetson, Whittier and Florida Avenue Channels, which in turn feed into the Hemet Channel. All open channel features of the plan have been completed except for the Sanderson Avenue Channel. Planning for that facility has already been commenced by the City. The plan for this area would reduce serious flooding along Florida, Acacia, Mayberry, Whittier and Stetson Avenues. Lines 1A-3 and 1C should be installed at an early date to relieve flooding along Whittier Avenue and along Sanderson at the intersection of Acacia and Florida Avenues. The total capital cost of facilities recommended for the Central Hemet Area is approximately $23.3 million, based on current price levels, as detailed in Table 6-3.

West Hemet Area - Proposed facility plans to serve the West Hemet Area are shown in Figure 6-2. Most of the open channels planned for the area are presently unlined and are of inadequate capacity. Additionally, runoff from the entire area discharge into Salt Creek near at Patterson Avenue. Upstream from Lindenberger Road the Salt Creek Channel is not defined, and flooding will continue to occur over a broad shallow flood plain until such time as the Salt Creek Channel can be improved.

Flooding along Menlo and Devonshire Avenues and ponding of water along the east side of the San Diego Aqueduct will be considerably reduced by implementation of the proposed plan, although a portion of the ponding below Florida Avenue would continue under the plan until damage from flooding would be substantially higher than is the case with present land use in the area.

A dominant feature of the plan is the Devonshire Retention Basin, which would be capable of reducing the calculated 100-year inflow of 1,280 cfs to a discharge of 270 cfs. Such a discharge could be more economically conveyed through the proposed Line 2A with a much lower capital cost than would be the case by eliminating the upstream retention basin and attempting to convey the entire 1,280 cfs through a larger open channel. Slopes in the area are quite flat and channel and rights-of-way widths are necessarily wide and costly in the area. The initial step in implementing the West Hemet Plan would be the construction of Line 2A and the Devonshire Retention Basin, followed thereafter by the installation of Lines 2C and 2D to relieve flooding along Menlo and Devonshire Avenues when desired.

The total capital cost of facilities recommended for the West Hemet Area based on current price levels, is estimated to be about $14.4 million, as detailed in Table 6-4.

Southwest Hemet Area - Proposed facility plans to serve the Southwest Hemet Area are shown in Figure 6-3. Prior to its full implementation, this plan requires that the proposed Salt Creek Channel be completed from Sanderson Avenue downstream to Lindenberger Road. A majority of the area is completely within the 100-year flood plain without the Salt Creek Channel, and proper drainage for future development of the area without channelization of Salt Creek is not feasible.

Because of the flat slopes and the concomitant hydraulic constraints encountered by underground storm drain facilities, most of the drainage facilities serving the area are proposed to be open channels, and many are unlined where velocities can be kept below the 5-6 fps range. The main components of the system serving the Southwest Hemet Area, other than Salt Creek, are Lines 3A and 3B. A portion of Line 3B is unlined, although all tributary laterals would be concrete-lined.

No part of the plan has been implemented to date, although the RCFC&WCD has initiated planning for the implementation of an interim channel for Salt Creek between Lindenberger Road and Patterson Avenue. Additionally, the City of Hemet, acting through the Hemet Redevelopment Agency, has instituted preliminary plans for the extension of that interim channel from Patterson Avenue to State Street.

The total capital costs of facilities recommended to serve the Southwest Hemet Area is estimated to be approximately $9.2 million, based on current price levels, as detailed in Table 6-5. Table 6-5 does not include costs for the Salt Creek Channel.

South Hemet Area - Proposed facility plans to serve the South Hemet Area are shown in Figure 6-4. A major portion of the South Hemet Area lying between State Street and Lyon Avenue and north of Newport Road was recently annexed to the City, and increasing interest in the possibilities for development prompted the inclusion of the area in the master plan.

The dominant features of the South Hemet Plan are the series of lined channels designed to convey runoff from Pepper Creek, Avery Canyon, Cactus Valley and St. John's Canyon to the upstream end of the presently authorized Salt Creek Channel at Lyon Avenue. A permanent retention basin would be installed just upstream from Lyon Avenue to provide regulatory capacity in the downstream channel of Salt Creek during the period of existence of both the upstream and downstream reaches of the Salt Creek Channel as an interim facility. After the Salt Creek Channel is eventually enlarged to its full ultimate capacity, the Lyon Avenue Retention Basin would continue to provide regulatory capacity pending possible future enlargement of the downstream channel, as well as serving as a recreational lake.

An illustration of the greenbelt alternative concept, which is also herein proposed as an alternative to the conventional channel concepts depicted on Figure 6-4, is shown in Figures 6-5A and 6-5B. The draft EIR presented in Chapter VIII covers both the recommended and the alternative channel concepts.

The Lyon Avenue Retention Basin shown on Figure 6-5A would have a surface area of approximately 30 acres, would have an average depth of six feet, and would have a maximum storage capacity of approximately 180 acre-feet. A proposed recreational lake on Pepper Creek at Cornell Street is also proposed as a feature of the greenbelt concept for Pepper Creek. It would have a surface area of about 12 acres, an average depth of about 7-1/2 feet and a storage capacity of about 90 acre-feet.

The remainder of the Salt Creek Channel downstream of Lyon Avenue has already been authorized by the Board of Supervisors of the RCFC&WCD in accordance with the plan first presented in a report prepared for the District by Neste, Brudin & Stone, entitled "Conceptual and Preliminary Engineering Plan - Salt Creek Channel", dated July 19, 1972 and later discussed in the Final Environmental Impact Report thereon dated 1977 prepared under the sponsorship of the RCFC&WCD.

The total capital cost of facilities recommended for the South Hemet Area, including the remainder of the Salt Creek Channel between Lyon and Patterson Avenues is estimated to be approximately $32.6 million based on current price levels, as detailed in Table 6-6. As noted on page 7-21, the interim channel facility (currently proposed to be constructed by the Hemet Redevelopment Agency between Lyon Avenue and Lindenberger Road) would have a total capital cost of $24.2 million including bridges at State Street (2 @ 4 lanes) Lyon Avenue (1 @ 2 lanes) and excluding costs for the reach from Lyon to Sanderson Avenue to be

constructed by the owners of the Seven Hills development. That reach will be constructred to its full 100-year ultimate capacity by the Seven Hills interests.

San Jacinto Area - Proposed facility plans to serve the San Jacinto Area are shown in Figure 6-6.

The major existing facility is the Parkhill Retention Basin., The major features of new construction would be the addition of inlet Line 5A to the basin and outlet Lines 5B and 5C, together with associated laterals. Implementation of the San Jacinto Area plan will require the construction of other features of the San Jacinto Area plan within the Sphere of Influence of the City of San Jacinto.

The total capital capital cost of facilities as recommended for the portion of the San Jacinto Area within the Hemet Sphere of Influence is estimated to be approximately $9.0 million, based on current price levels, as detailed in Table 6-8.

Little Lake Area - Proposed facility plans to serve the Little Lake Area are shown in Figure 6-7. Major features of the Little Lake Plan include the Meridian Street Channel an the continued use of the Bautista Wash watercourse, in addition to the tributaries thereto.

The total capital cost of facilities as recommended for the portion of the Little Lake Area is estimated to be approximately $13.3 million, based on current price levels, is detailed in Table 6-9.

Valle Vista Area - Proposed facility plans to serve the Valle Vista Area are shown in Figure 6-8. The plan is based on planning first conducted by the RCFC&WCD in 1974 and updated to reflect changed conditions within the subarea. All features of the plan are within tributary to the San Jacinto River directly

or to the Bautista Creek Channel constructed by the Corps of Engineers in the 1960's. The Corps of Engineers is reviewing the outlet of Bautista Creek Channel with the objective of extending the lined-channel directly to the San Jacinto River. Storm relief is critically needed along Palm and Florida and require the construction of Line 7B with its laterals 1 through 4.

The total capital cost of facilities as recommended for the Valle Vista Area is estimated to be approximately $4.6 million, based on current price levels, as detailed in Table 6-10.

Northwest Hemet Area - Proposed facility plans to serve the Northwest Hemet Area are shown in Figure 6-9.

Permanent drainage services within the area require a future connection to the San Jacinto River through an agricultural area not likely to urbanize for a number of years. An interim Eaton Retention Basin is required if development of the area is to occur before the downstream outlet is available. A single basin for such purpose is preferred over several smaller basins. Development plans would have to be rejected if the retention basin is not provided in order to avoid potential claims for damage.

The total capital cost of facilities as recommended for the Northwest Hemet Area is estimated to be approximately $4.5 million, based on current price levels, as detailed in Table 6-11.

Construction Staging Program - A ranking system in terms of priority of need is proposed as part of the Master Flood Control and Drainage Plan. Table 6-12 presents the proposed ranking for projects in the Salt Creek watershed, and Table 6-13 presents the proposed ranking for projects in the San Jacinto River watershed. It is recommended that the suggested rankings in Tables 6-12 and 6-13 be used as a basis for discussions between the City

of Hemet and the RCFC&WCD concerning annual updates of the 5-year capital outlay program for Zone 4.

Funding and Implementation

The concluding section of Chapter Vll presents a summary of the consequences of the use of alternative sources of funding the Master Flood Control and Drainage Plan. Suggested 5- and 10-year capital outlay programs are presented in Tables 7-1 and 7-2 which indicate the signficant funds which must be expended to complete at least the interim segments of the Salt Creek Channel and some of its major tributaries if further development of the Salt Creek valley area is to continue. Over a 15-year period, it is recommended that a $50 million construction program be initially considered for planning purposes, subject to the resumption of normal economic conditions. It is further recommended that initial developer/subdivision fees, be established at $3,000 per acre, with remaining capital costs of the program being financed from Zone 4 property taxes, capital fund contributions from the Hemet Redevelopment Agency through the implementtion of its proposed Hemet Redevelopment Project. It is recommended that other required funds be derived from Special Assessment District Proceedings. The report points out problems associated with setting developer/subdivision fees at two high a level as well as problems associated with undertaking excessively large Special Assessment District proceedings. Accordingly, the report recommends caution and a continuous monitoring effort to achieve the greatest possible equity in the choices of funding sources and magnitudes.

Additional institutional recommendations necessary for the proper implementation, administration and management of the Master Flood Control and Drainage Plan are presented in the final sub-section of Chapter VII, including the principal recommendations that the environmental review process for the Plan be completed and that the Plan be adopted as the Flood Control and Drainage Element of the Hemet General Plan.

HEMET 3

CHAPTER III
STUDY AREA

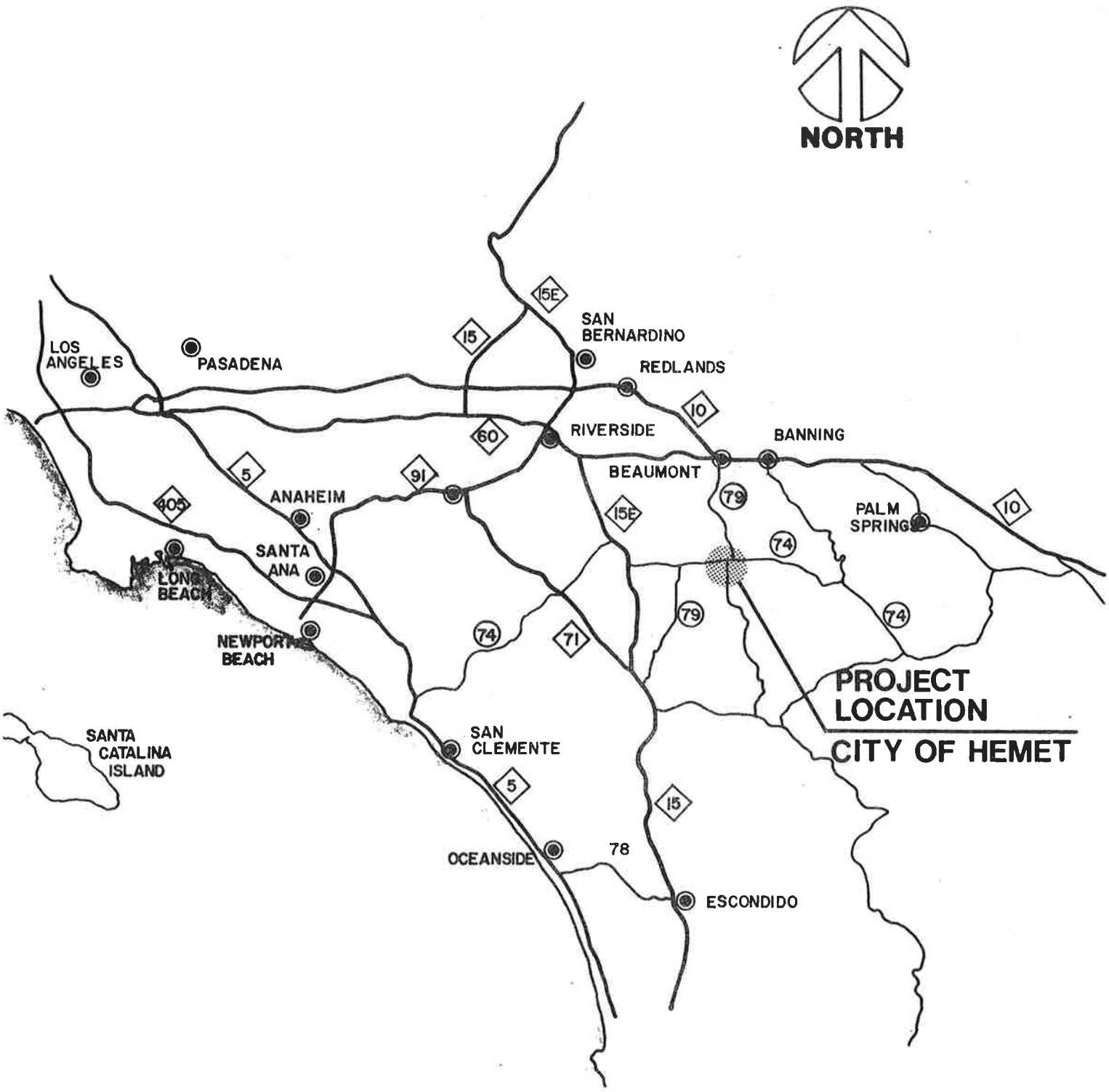
General

The City of Hemet is located in the west central part of Riverside County approximately 30 miles southeast of the City of Riverside. State Highway 74 runs through the central downtown area of the community and provides access to Riverside via Interstate 15E to the west and Palm Desert to the east. The City's location in relation to major highways and near by communities is shown on Figure 3-1.

Hemet had a 1980 population of 22,454 people. Hemet's population is made up of a greater level of senior citizens than is the norm for the other California cities with a median age of 65 years. Hemet has transformed over recent years from an agricultural center to a major retirement area. The City is served by a variety of convenient commercial centers and a few light industrial areas.

For investigation of drainage facilities, an area of approximately 100 square miles in size, was defined utilizing the Salt Creek watershed boundary and the City of Hemet Sphere of Influence as shown on Figure 3-2. Several of the boundaries coincide with study areas utilized by the U.S. Army Corps of Engineers (COE) and the Riverside County Flood Control and Water Conservation District (RCFC&WCD) for earlier drainage investigations.

In evaluating drainage facilities and runoff characteristics for an area, several aspects of the physical environment must be considered. These include climate, topography, soil characteristics, groundwater levels, land use and the interrelationship of these characteristics. These factors are briefly discussed in the following paragraphs.



Location Map

FIGURE 3-1

Climate

The climate in the Hemet Study Area is typical of San Jacinto Valley and is defined as semi-arid. This definition is characterized by dry, rainless summers with high daytime temperatures and warm nights. The exception to this conditions occurs when tropical thunderstorms emanating from the south and northwest directions prevail during the summer months. Their intensity are generally high but of shorter duration relative to winter storms. They have been known to produce over two inches of rainfall in a one-hour period.

Yearly rainfall averages 10.88 inches for the City of Hemet as indicated in Table 3-1. On the average, 65 percent of the annual rainfall normally occurs between December and March. The average annual temperature for the area is 62°F. The average high is approximately 99°F in July and the low 34.5°F in January. However, extremes of 120°F and 7°F have been recorded.

Topography

Elevations within the city limits of Hemet vary from 1,496 feet at the San Diego Aqueduct to 1,660 feet at its easterly boundary. The highest point in the study area is at the upper end of the Salt Creek watershed at 4,524 feet. These elevations are based on the mean sea level datum as established by the United States Geological Survey (USGS).

Land slopes are relatively gentle and generally tend towards the west and the south. Slopes vary from 1.0 percent in Central Hemet to 0.2 percent in West Hemet. In the upper reaches of the Salt Creek watershed the slopes can be as high as 50 percent.

The study area comprises three major drainage areas, the majority of which being within the Salt Creek and San Jacinto River watersheds, and a small portion being within the Santa Margarita River watershed. Flows from the Salt Creek and San Jacinto watersheds

TABLE 3-1

MONTHLY AVERAGE PRECIPITATION

Month	Inches	Percent
January	1.87	17.20
February	1.75	16.10
March	1.78	16.40
April	1.19	10.90
May	0.20	1.80
June	0.03	0.30
July	0.12	1.10
August	0.23	2.10
September	0.35	3.20
October	0.46	4.20
November	1.30	12.00
December	1.60	14.70
TOTAL	10.88	100.00

Source: N.O.A.A., Climatological Data, Hemet Section

merge at Railroad Canyon Reservoir on the San Jacinto River, which then flows to Lake Elsinore. With the exception of the small area within the Santa Margarita River watershed, the study area comprises a portion of the larger Santa Ana River Basin.

Within the study area, the Salt Creek watershed comprises 76 square miles or 74 percent of the total area. The San Jacinto watershed comprises 24 square miles or 23 percent of the study area.

The major drainage areas have been further divided for purposes of the study into subareas as indicated on the Drainage Subarea Location map (Figure 3-3) and Table 3-2 that follow.

Some of the subareas have been utilized by the RCFC&WCD in their previous studies and will be referred to in this report. The South Hemet subarea is the largest and contains several natural channels draining canyons in the upper Salt Creek watershed including St. John's Canyon, Cactus Valley, Avery Canyon, and Pepper Creek. These channels eventually meet and become what is known as Salt Creek within the South and Southwest Hemet area.

TABLE 3-2

DRAINAGE SUBAREAS

Salt Creek Watershed	San Jacinto Watershed
Central Hemet	San Jacinto
West Hemet	Little Lake
Southwest Hemet	Valle Vista
South Hemet	Northwest Hemet

Soils and Groundwater

The study area soils have been completely mapped and the following information is summarized from the soil survey of Western Riverside Area, California, published in November, 1971, by the U.S. Department of Agriculture, Soil Conservation Service. The predominant soil type inside the city limits is San Emigio Fine Sand Loam. The predominant soil type outside the City and tributary to the valley fill area is Cienaba Rocky Sandy Loam. The San Emigdio Fine Sandy Loam is deep, well-drained and occurs on

alluvial fans. It is formed in alluvium derived dominately from sedimentary rock sources. Generally, the surface layer consists of eight inches of light brownish grey fine sandy loam. The next 14 inches is of similar color and texture, grading to a layer of light grey fine sandy loam extending to a depth of 60 inches or more. The permeability of this soil is moderate. Runoff is medium and the hazard of water erosion is moderate. The soil has good load carrying capability. The majority of these soils lie on slopes of 0-20 percent necessitating the provision of drainage when roads, homes, or other structures are constructed.

Cienaba Rocky Sandy Loam is described as a very deep, excessively drained soil occurring on uplands. It is formed in coarse grained igneous rock. Generally, the surface layer consists of 4-11 inches of brown sandy loam. The upper layer of subsoil is generally 4-8 inches of brown sandy loam underlain by 2-14 inches of light, yellowish brown, gravelly coarse sand. The subsoil grades into weathered granodiorite. Rock outcrops occupy 2-10 percent of the surface. Permeability of this soil is very high. Runoff is rapid and the hazard of water erosion is high. When development occurs in areas with this soil type, the main limitations are slopes, variable depth to bedrock, extremely low moisture-holding capacity and hazards from erosion.

The study area overlies portions of the San Jacinto, Hemet and Winchester Groundwater Basins. Groundwaters of the upper San Jacinto and upper Salt Creek areas near the sources of recharge are generally of superior quality to other portions of the study area in terms of total dissolved solids (< 500 mg/l). Beneath the Bautista Creek area of San Jacinto Basin and throughout most of the main Salt Creek portion of the Hemet Basin, TDS levels range in the order of 500-1,000 mg/l and in the 1,000-2,000 mg/l range in the Winchester Basin. Chloride ion concentrations are also high in the Winchester Basin, as are nitrates. Nitrate concentrations exceeding the normally-regarded safe limits for

infants are found throughout the Winchester Basin and occassionally in parts of the Hemet Basin.

In accordance with the objectives of the California Regional Water Quality control Board, Santa Ana Region, the Master Plan discussed herein attempts to maximize historical recharge capabilities wherever possible in order to maintain the yield and highest possible levels of groundwater quality. Unfortunately, groundwater levels throughout most of the study area, except within the Winchester Basin, have been declining over the years as a result of excessive draft compared with natural recharge. Accordingly, the plan provides for the provision of soft bottom channels in all areas where recharge water is of superior quality and where the potential of preservation of groundwater quality is greatest.

Land Use

In order to provide a sound basis for predicting future land use within the study area, the storm water facilities recommended in this report are based on priority listings of land use planning sources as indicated in the following Table 3-3.

Existing land use and topography were utilized throughout the study as a background for development. Permanent structures were considered to remain unless they constitute a non-conforming use or are planned otherwise. Open areas and existing agricultural areas were planned for their current zoning or land use plan as was appropriate. Conflicts between existing zoning and future land use plans were not found to be consequential in runoff calculations.

Hemet's planned land use is mostly low and medium density residential in nature. General commercial development is proposed to be located along Florida Avenue, State Street and San Jacinto Street. Industrial areas are planned adjacent to Ryan Field and

TABLE 3-3

PRIORITY LISTING OF LAND USE PLANNING SOURCES

Priority	Category
1.	Existing Land Use - Riverside County Flood Control and Water Conservation District topographic maps from aerial photography dated 12/20/72.
2.	(a) City of Hemet Zoning Ordinance designations or (b) County of Riverside Zoning Ordinance designations.
3.	General Plan for the City of Hemet as adopted, June, 1982.
4.	Page Ranch Conceptual Land Use Plan - Haworth, Carroll and Anderson, Inc., dated October, 1979.
5.	Hemet - San Jacinto Area General Plan - Ruhnav-Evans and Steinmann, A.I.A.

the north Buena Vista area. The central Hemet area would maintain its low and medium density nature. This area is, however, growing further away from the central area. Areas on the outskirts of town are contemplated to remain agricultural and rural in character for a number of years.

HEMET 4

CHAPTER IV

EXISTING DRAINAGE FACILITIES AND FLOOD-PRONE AREAS

General

The location of existing drainage facilities and flood-prone areas within the study area are based on field investigations conducted during early 1982, and information compiled from flood insurance maps and record drawings provided by the City's Public Works department and the RCFC&WCD. In addition, a review was made of information prepared by the U.S. Army Corps of Engineers.

Within the existing city limits, storm flow generally discharges into the streets flowing from east to west without underground facilities. The flow follows the natural slope of the terrain except as diverted by the existing street system. This condition was generally acceptable when the land was in agricultural use. Since most of the rainfall was absorbed by the land and the runoff that did occur was generally carried in roadside ditches, causing only minor damage. Due to increases in urban development, a large portion of land has been covered with impervious areas which produce larger quantities of runoff. The roadside ditches have quickly become inadequate and have allowed major flooding of streets and adjacent property. With the subsequent construction of drainage facilities some of this flow is now picked up by open channels and directed eventually to the south and west. However, major flooding still occurs within the City and its Sphere of Influence. Without the ultimate system being available to receive the increase discharge, some of the developments within the City have been required to install temporary retention basins to reduce peak flows from their developments.

As previously described, there are two principal watersheds which drain through the City. Approximately 90 percent of the present city limits lie within the Salt Creek watershed. The major

constructed facility for handling storm flows in the City is the Hemet Channel. Additional storm facilities have been installed outside the city limits in the San Jacinto watershed. The major storm facility constructed in this watershed is the Bautista Creek channel. The other permanent structure is the Park Hill Retention Basin built just north of Florida Avenue at the intersection of Devonshire Avenue and Columbia Avenue.

Florida Avenue Storm Drain

The Florida Avenue Storm Drain was constructed by the RCFC&WCD in the early 1960's and was the City's first permanent storm drain facility. Its location is depicted in Figure 4-1. It consists of an underground storm drain running westerly along Florida Avenue from San Jacinto Street to Inez Street, from thence it angles in a southwesterly direction parallel to the east side of the AT&SF Railroad track. Just downstream from this point near Alessandro Avenue the drain becomes a trapezoidal concrete channel. The existing storm drain has a 10-year flow capacity when utilized in conjunction with the proposed ultimate drainage system. It consists of reinforced concrete pipe (RCP) varying in diameter from 42 inches to 60 inches. The existing capacity of the line is approximately 105 cfs at San Jacinto Street and 145 cfs at Inez Street. Currently, storm flows exceed the capacity of this storm drain on a regular basis due to the incompleteness of the drainage system. When the proposed extension of the Florida Avenue drain and the installation of the storm drain along Acacia Avenue are completed, adequate protection along Florida Avenue in the noted reach will be provided.

The concrete channel portion of the drain continues from near Alessandro Avenue to Palm Avenue along the eastside of the AT&SF Railroad tracks. The channel is sized for the 100-year flow of 325 cfs in this reach and will be adequate for the ultimate system.

Hemet Channel

The Hemet Channel shown in Figure 4-1, is a continuation of the Florida Avenue storm drain and begins approximately at the crossing of Palm Avenue. It is the major storm drain facility for the City of Hemet and is the main artery for conveyance of most drainage waters within the present city limits. It was constructed in its existing condition by the RCFC&WCD in the early 1970's, except for revisions in 1980 at Acacia Avenue.

The channel is trapezoidal in shape and extends from Palm Avenue to the intersection of Patterson and Olive Avenues in Winchester. The channel is concrete-lined from Palm Avenue to Cawston Avenue and is designed for the ultimate drainage system. Figure 4-2 depicts a typical concrete-lined portion of this channel. The channel has capacity that exceeds the 100-year flow of 770 cfs just downstream of the intersection with Acacia Avenue and flow of 1,850 cfs just upstream of the intersection with Cawston Avenue. Beyond Cawston Avenue the channel is unlined and is only an interim facility at this time. Figure 4-3 depicts a typical unlined portion of this channel. The channel terminates in a low flow area of Salt Creek.

Two existing lateral channels running from east to west tie into the Hemet Channel. These channels are lined and are located along Stetson and Whittier Avenues. They are both designed for the ultimate drainage system with a 100-year flow rate allowance. A third channel along Acacia Avenue was built as part of the Hemet Channel project and extended easterly 400 feet along Acacia Avenue from the Hemet Channel.

In 1980, however the concrete channel was removed and an underground storm drain was installed from the Hemet Channel to State Street. The portion replacing the concrete channel is a reinforced concrete box (RCB) extending from the Hemet Channel to Palm Avenue. It runs easterly from there as a 72-inch RCP and

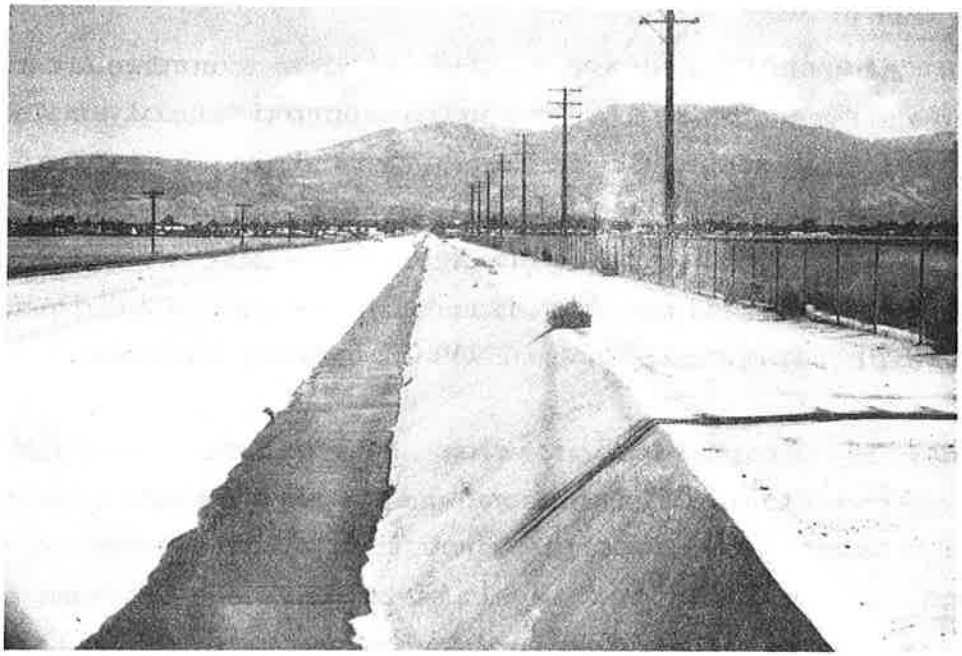


Figure 4-2
Hemet Channel looking upstream from Sanderson Avenue.

Figure 4-3
Interim Hemet Channel
looking downstream from Stetson Avenue.

then a 66-inch RCP to State Street. This line is designed for the ultimate drainage system.

The Whittier Channel is concrete-lined and extends easterly from the Hemet Channel to Lyon Avenue. It has a capacity that exceeds the 100-year flow of 690 cfs. It was constructed in 1971-72. It is designed for the ultimate system but as yet has not been extended upstream by an underground storm drain.

The Stetson Avenue Channel is concrete-lined from Cawston Avenue to Palm Avenue. It was constructed in the 1974-75 period. Downstream of Cawston Avenue the channel is unlined and ties into the unlined portion of the Hemet Channel. Just downstream of Palm Avenue the channel capacity exceeds the 100-year flow of 1,050 cfs and just upstream of Cawston Avenue it exceeds a flow of 1,350 cfs. The concrete segment of the channel, shown in Figure 4-4, is part of the ultimate drainage system. The upstream segments of the line remains uncompleted, as shown in Figure 4-5.

Parkhill Retention Basin

The Parkhill Retention Basin is located at the corner of Devonshire Avenue and Columbia Street, as shown in Figure 4-6 which depicts a plan view of the existing drainage facility. It is presently just east of Hemet's city limits and is in the San Jacinto watershed. Construction was completed in 1980 and it occupies an area of approximately 9 acres. The basin is sized for a maximum inflow of 750 cfs and an outflow of 17 cfs. The inlet structure to the basin has been constructed but is not as yet connected to the upstream drainage area. Since construction of the inlet structure an apartment building was constructed in the path of the inlet line. When the upstream facilities are constructed, a new inlet structure will have to be constructed on Columbia Street.

The basin is sized for the 100-year storm event tributary to the area west of Meridian Street and south of the Parkhill divide

Figure 4-4
Stetson Channel looking upstream from Cawston Avenue.

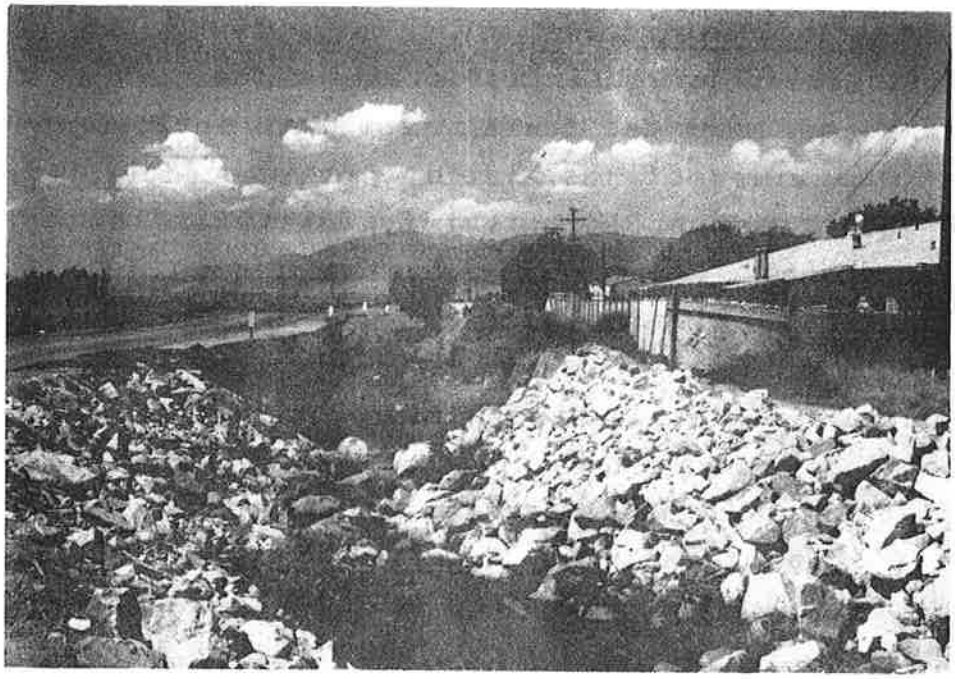


Figure 4-5
Stetson Channel looking
downstream from Cawston Avenue.

within the San Jacinto watershed. The system will also require a storm drain system along Florida Avenue tributary to the basin. The tributary area to the basin is presently oversized and will remain so until the proposed Little Lake area drainage system is installed, particularly the Meridian Street drain.

The outlet line for the basin has been constructed to a point just downstream of Oakland Avenue and begins as a 24-inch RCP. It runs westerly along Devonshire to Yale Street. At Yale Street it becomes a 30-inch RCP and runs northerly to Parkview Street and then turns westerly. Near Village Road the line becomes a 36-inch RCP and then a 42-inch RCP before reach in Girard Street. At Girard Street the line turns and runs northerly to Oakland Street. Just downstream of Campus Way the line becomes a 48-inch RCP. At Oakland Street the line turns and runs westerly to Monte Vista Way and then turns northerly, discharging into an open trapezoidal earth channel. As shown in Figure 4-7, all of the foregoing facilities, exclusive of this earth channel, are part of the ultimate system. The channel runs north towards Menlo Avenue but presently stops short of it and discharges into an open area. At the present this flow continues into the street at Menlo Avenue causing considerable flooding, as shown in Figure 4-8, and then flows northerly along San Jacinto Street.

Bautista Creek Channel

The Bautista Creek Channel is tributary to the San Jacinto River and is in the San Jacinto watershed. A plan view of the channel is shown in Figure 4-9. It runs along the edge of two subarea boundaries, the Little Lake and Valle Vista areas. It was built in the sixties by U.S. Army Corps of Engineers and is maintained by the RCFC&WCD. The Bautista Creek drainage area comprises about 50.2 square miles with a considerable portion outside the study area.

The channel consists of inlet wing levees and a transition section in the upper watershed near Bautista Canyon Road. An

Figure 4-7
Interim discharge channel from end of
Parkhill Retention Basin outlet,
looking downstream from Oakland Avenue.

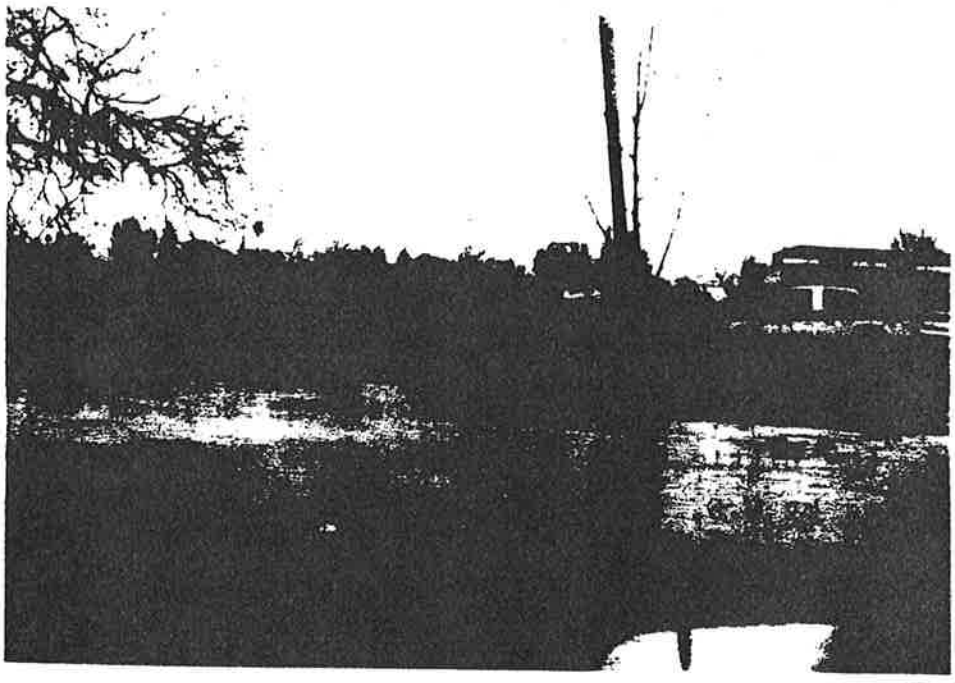


Figure 4-8
Looking upstream at discharge
from the interim channel onto Menlo Avenue

open concrete-lined trapezoidal channel, as shown in Figure 4-10, continues from this point to Florida Avenue to the north. The design discharge for the channel is 16,500 cfs. Downstream of Florida Avenue the channel discharges into the Bautista creek where a partial system of levees exists. The outlet from the concrete channel is depicted in Figure 4-11. It then continues into the San Jacinto River.

This channel provides considerable protection from flows originating in the upper Bautista watershed area. Only local flows to the east in the Valle Vista area are generally discharged into the channel in the low areas. The area downstream of Florida Avenue is susceptible to flooding as was shown by the February, 1980 storms. The Corps of Engineers has reviewed this reach of the channel and has prepared preliminary plans for extending the concrete channel from Florida Avenue to the San Jacinto River.

An additional channel was constructed in the early 1960's that connects to the Buatista creek channel in the upper area along Fairview Avenue and the Lake Hemet Canal. It runs northerly from the intersection of Bautista Canyon and Fairview Avenue to the Lake Hemet Canal. It then runs northeasterly paralleling the canal to a connection with the Bautista Creek channel. The channel is lined and trapezoidal in shape. It's capacity varies from 690 cfs at Bautista Creek channel to 80 cfs at its upper limit.

Valle Vista Channels

The Valle Vista Channels run northerly along Georgia Avenue and Schultz Road in the Valle Vista area and tie into the San Jacinto River. Both are designed to meet the needs of the ultimate drainage system and were constructed in the mid-1970's.

The channel along Georgia Avenue begins at the intersection with Acacia Avenue. It is a concrete-lined, rectangular channel and has a capacity of 730 cfs. It was sized for additional upstream

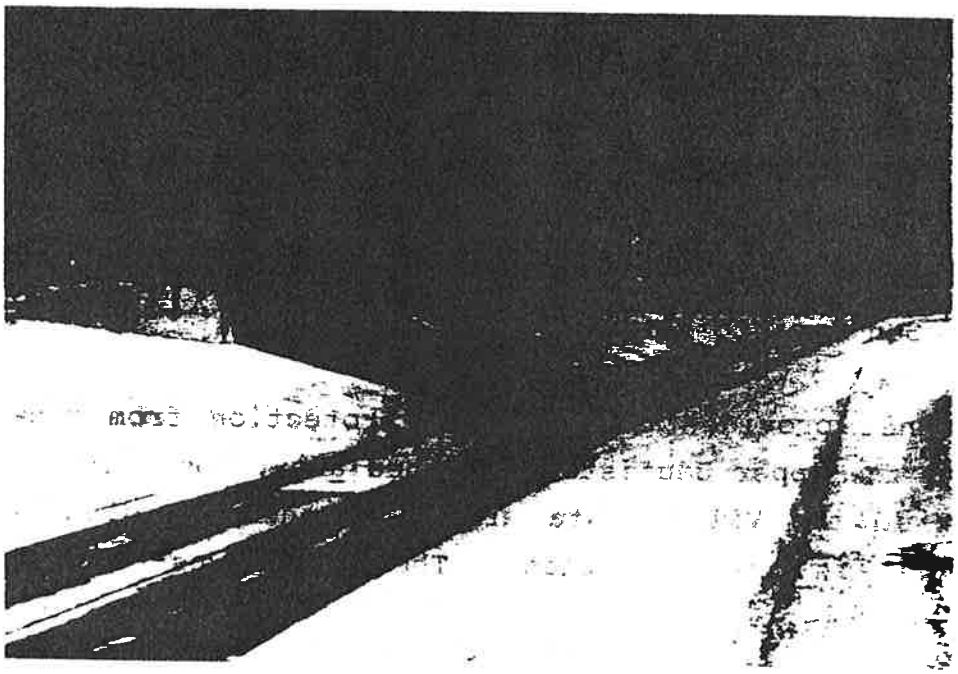


Figure 4-10
Bautista Creek Channel looking
upstream at Florida Avenue.

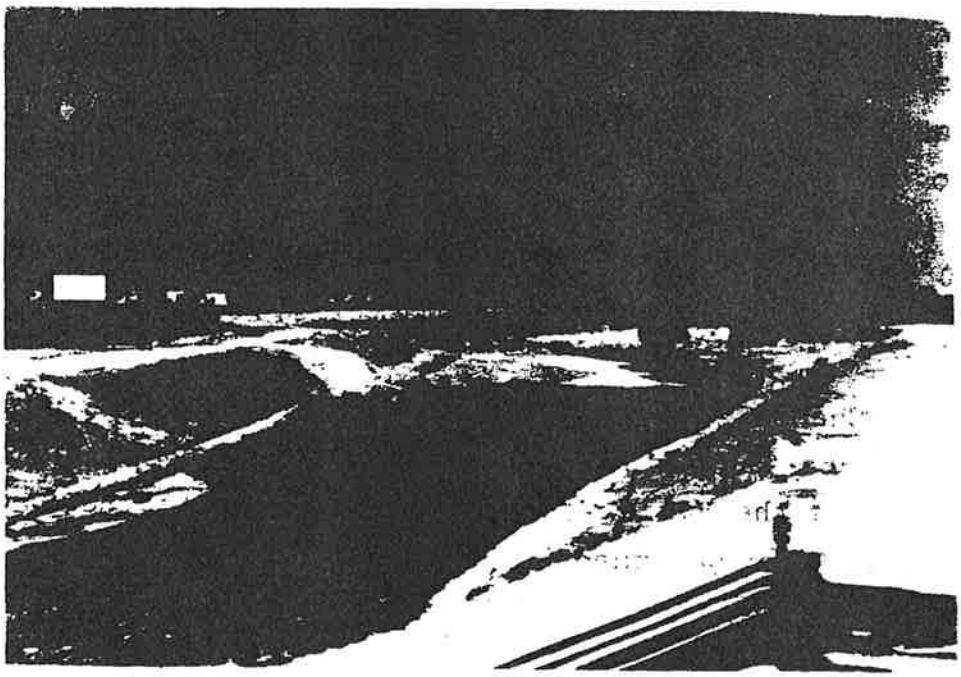


Figure 4-11
Bautista Creek Channel
looking downstream from Florida Avenue

facilities that have not been built. It runs northerly for approximately 660 feet and then turns underground into a 78-inch RCP. The capacity of the pipe is approximately 770 cfs. At the San Jacinto river flood plain just downstream of Florida Avenue, it discharges into an open channel section protected by rock lining through a transition section. It then continues towards the mouth of the river in an open earthen channel. A plan view of the channel is shown in Figure 4-9.

The channel along Schultz Road begins north of Acacia Avenue and then runs northerly. The channel is concrete-lined and rectangular in shape to Acacia Avenue, with a capacity of approximately 1,020 cfs. At this location it turns underground into a 93-inch RCP which has a capacity of approximately 1,040 cfs. This line continues northerly along Schultz Road to just downstream of Florida Avenue and discharges into a rock riprap energy dissipator in the San Jacinto river flood plain. A plan view of the channel is shown in Figure 4-9.

Flood-Prone Areas

The study area is split into two principal watersheds, the Salt Creek and the San Jacinto as noted previously. The Salt Creek watershed's tributaries extend generally to the south of the Central Hemet Area. Major flows pass through this area due to the mountainous area to the south. This system is made up of St. Johns Canyon, Cactus Valley, Avery Canyon and Pepper Creek. These flows come together and comprise the Salt Creek flows beginning at its Lyon Avenue crossing and continuing to the west towards Winchester. This system of channels is essentially unimproved. State Street, Newport Street and other downstream streets, i.e., Simpson and Warren Roads, are continually flooded during storm events from these flows. Even with the construction of the facilities described in the previous section, a major portion of the City of Hemet and its Sphere of Influence is subject to severe flooding. A majority of the streets are flooded during even modest storm events. The major east-west streets of Menlo

Avenue, Devonshire Avenue, Florida Avenue, Acacia Avenue, Whittier Avenue, and Stetson avenue are flooded during most storm events and, at times, many intersections are impassable. Flood waters in these streets travel from east to west. Flows to the east of the Hemet Channel along Florida Avenue, Acacia Avenue, Whittier Avenue, and Stetson are picked up by their respective channels and storm drains and are discharged into the Hemet Channel. However, storm drains along these streets have not been extended upstream to prevent the overflowing of curbs and the flooding of intersections. Floodwaters to the west of the Hemet Channel along these same streets travel to the west and tend to collect and pond in areas next to the San Diego Aqueduct Channel. Flows in the Hemet Channel travel to the southwest and eventually into the Salt Creek Channel.

The area generally to the north and east of Central Hemet is within the San Jacinto watershed. A large tributary flow through this area is contained within the Bautista Creek Channel. Local flooding in this area travels northwest towards the San Jacinto River. Storm flows north of Florida Avenue travel to the north along State Street, Santa Fe Street and San Jacinto causing considerable flooding. This same pattern is found along the north-south streets north of Menlo Avenue.

Figures 4-12 through 4-23 illustrate flooding conditions at selected locations in the study area.

Special note is made of the house depicted in Figure 4-15. Because of the prohibitive cost of flood proofing this house, the City of Hemet, on recommendation of its flood control consultants, has recently purchased the house and lot as a more cost-effective solution to the flooding problem.

It is recommended that the City consider the feasibility of devoting this property to interim use as a retention basin until a permanent flood control facility along Menlo Avenue can be

completed. Excavated material should be retained on-site as a screening berm until the permanent use of the property can be determined.

Areas subject to flooding from the 100-year flood have been plotted from flood insurance maps of the area and are shown in the following Figures 4-24 through 4-31. They generally show areas of potential flooding in the study area but are limited to those areas that have been studied by the National Flood Insurance Program. As defined by the flood insurance maps some areas plotted may be of a slightly higher frequency flood than the 100-year event. These areas include shallow flooding areas of less than one foot and storm events between the 100 and the 500 year event.

Figure 4-12
Flooding along State Street (looking south)
at intersection with Avery Canyon discharge

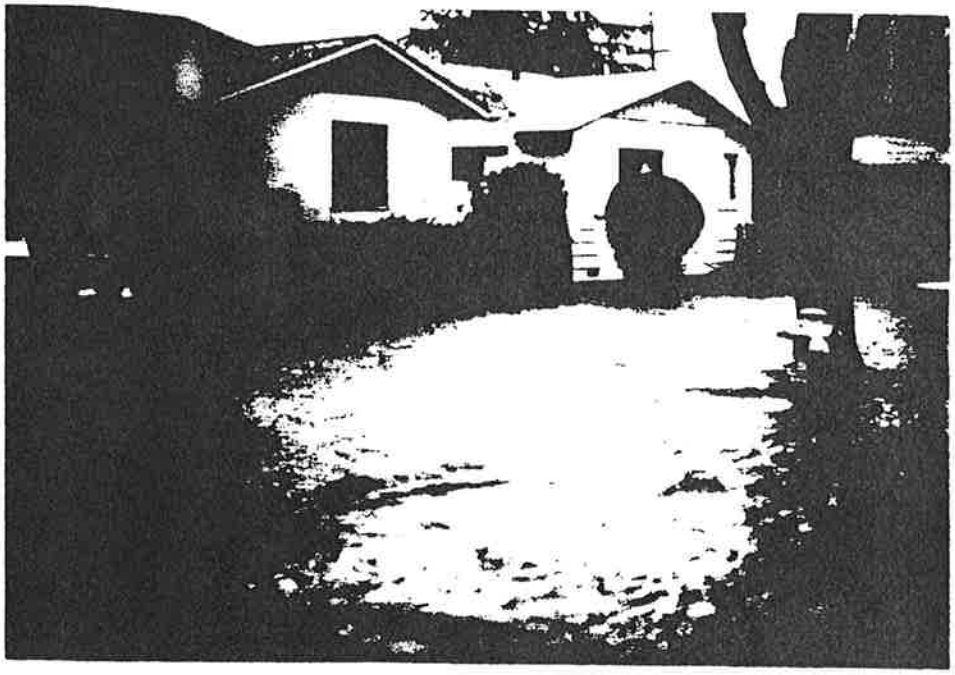


Figure 4-13
Flooding along Whittier Avenue
east of Santa Fe Street (looking southwest)

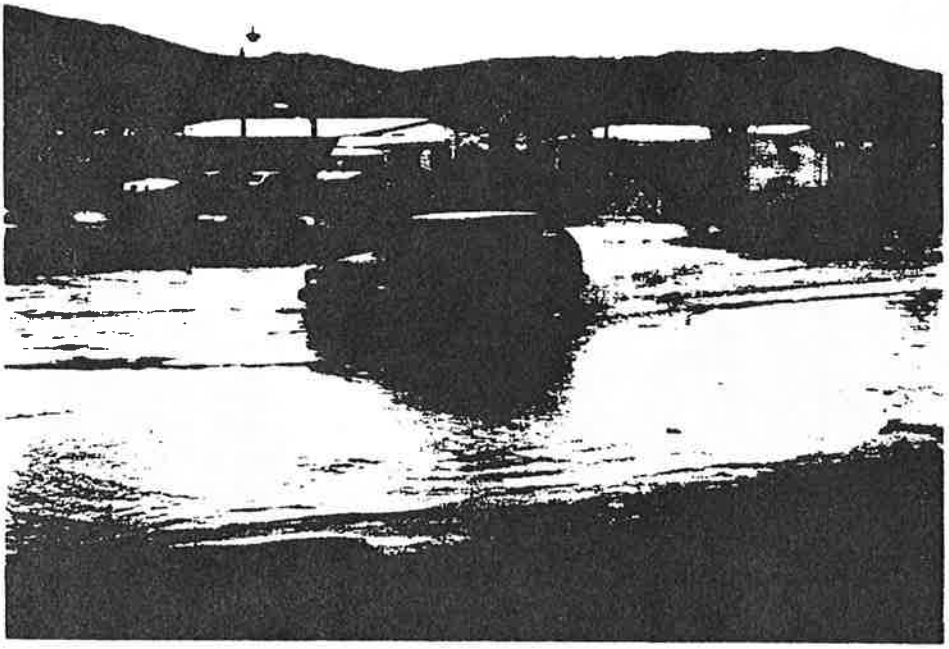


Figure 4-14
Flooding along Menlo Avenue
near San Jacinto Street (looking northeast)

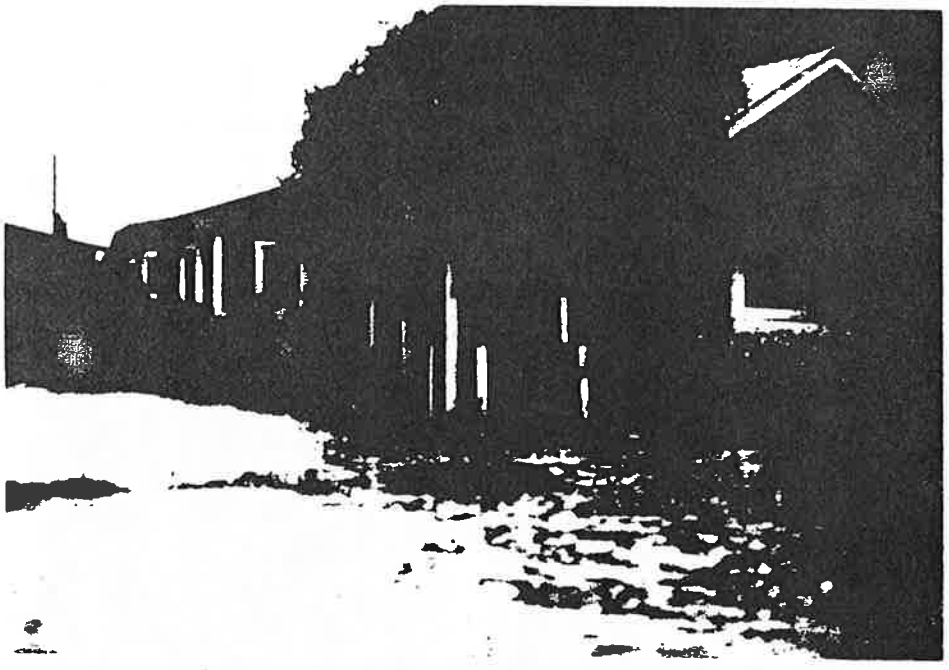


Figure 4-15
Flooding along Menlo Avenue
near Lyon Avenue (looking north)

Figure 4-16
Flooding at the intersection of Florida Avenue
and Sanderson Avenue (looking south)

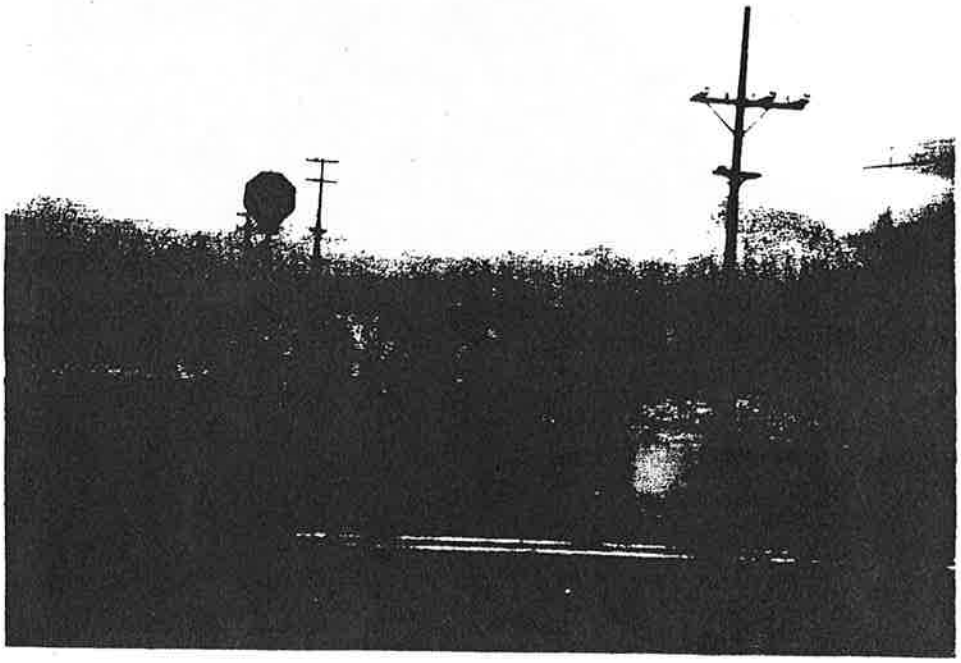


Figure 4-17
Flooding at the intersection of Acacia Avenue
and Sanderson Avenue (looking east)

Figure 4-18
Flooding at the intersection of Sanderson Avenue and Devonshire Avenue (looking west)

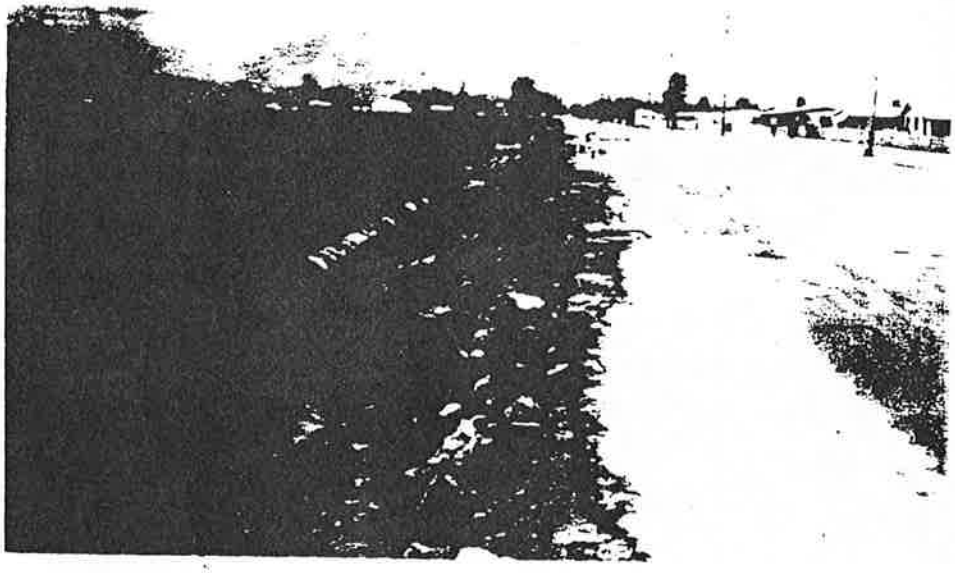


Figure 4-19
Evidence of erosion looking east upstream along Devonshire Avenue from Sanderson Avenue

Figure 4-20
Flooding along Warren Road just
south of Harrison Road (looking south)

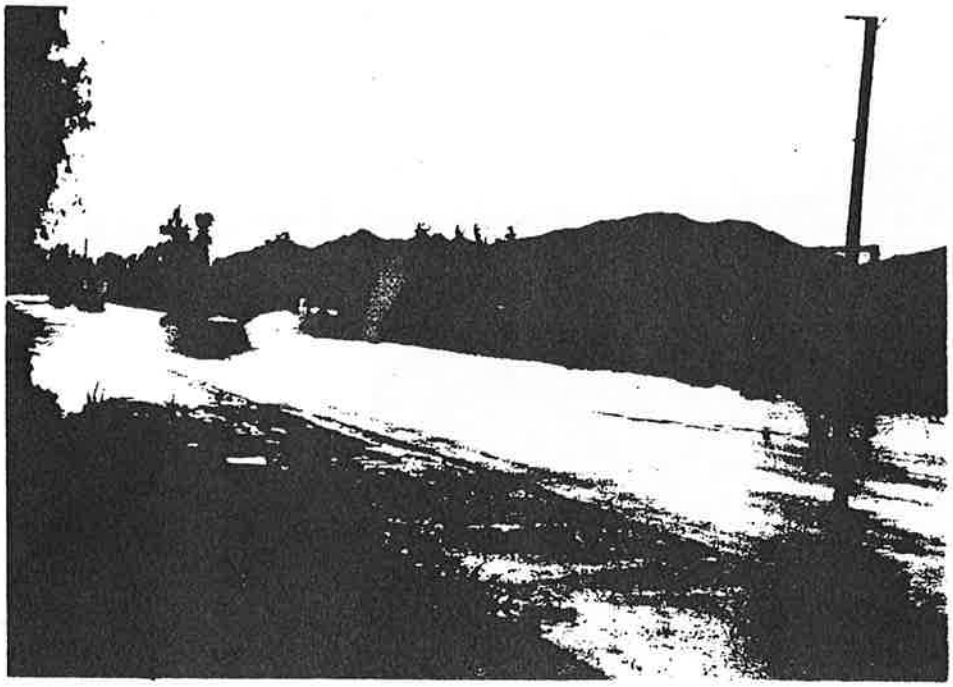


Figure 4-21
Flooding along Simpson Road at
the San Diego Aqueduct Channel siphon (looking northwest)

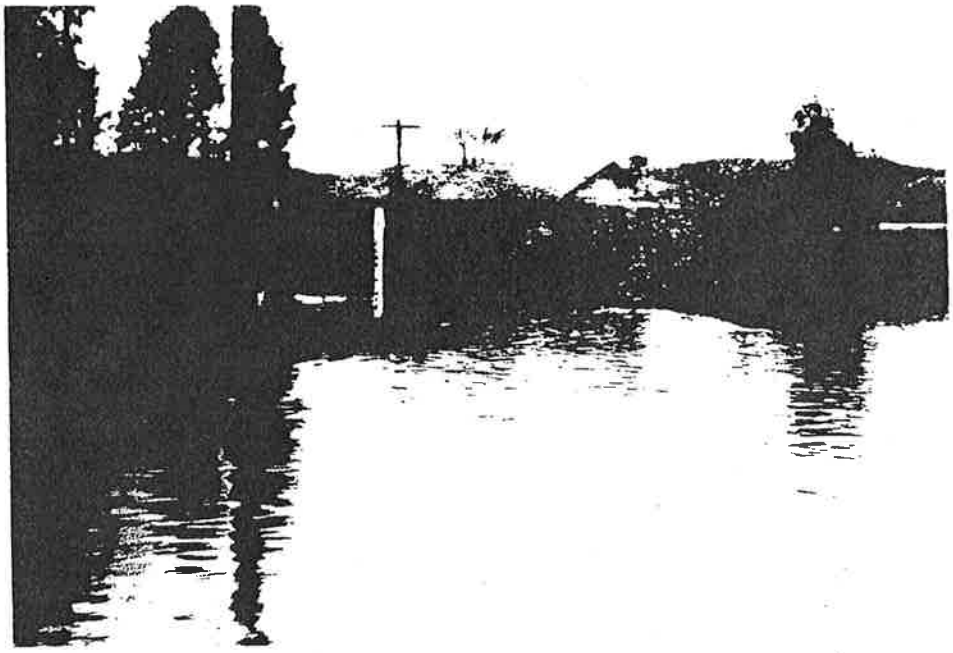


Figure 4-22
Flooding at the intersection of
California Avenue and Simpson Road (looking northeast)

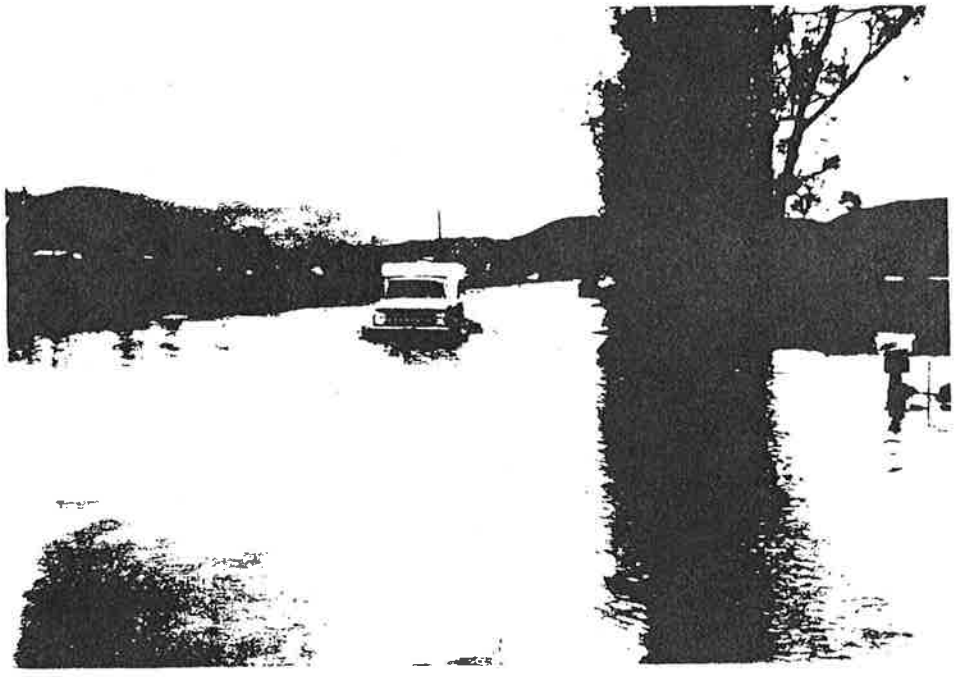


Figure 4-23
Flooding at the intersection of
California Avenue and Simpson Road (looking northeast)

HEMET 5

CHAPTER V
DESIGN CRITERIA

General

An areawide study of drainage facilities consists of the layout and analysis of a network of underground storm drains, open channels and inlets; evaluation of the existing system of storm drains and laterals; and consideration of facilities such as retention basin and pumping stations. Provision for drainage from local streets and future subdivisions consisting of storm water inlets and drainage laterals involves local considerations which are best dealt with by the city Department of Public Works staff and consulting engineers representing developers at the time developments are proposed to the City. Accordingly, facilities considered in this report are those which serve relatively large tributary subareas. The areal extent of the drainage subareas given detailed attention varies from about 40 to 80 acres, depending upon location, routing of storm drainage water for ultimate disposal, potential near-future development, ground slope, and presence of existing drainage problems requiring attention.

Design Storm

All storm drainage facilities proposed herein are planned to serve ultimate development of the tributary area. This required the use of runoff coefficients and times of concentration anticipated in the future. Although the recommended system provides for ultimate development, facilities need not necessarily be constructed until an area develops. Staged construction may be undertaken based on the rate of growth in an area.

The design criteria used in this Master Drainage Plan is generally consistent with previous planning work completed by the RCFC&WCD. All open channels are designed for the tributary

100-year frequency storm runoff. All underground storm drain facilities are designed for the tributary 10-year frequency storm. It is intended that all underground storm drains be located within existing or future street rights-of-ways. Runoff from a 10-year frequency storm is allowed to accumulate in the streets until it reaches the top of the curb. An underground drain is then initiated which intercepts the flow and conveys the entire 10-year storm runoff to an outlet downstream. When runoff exceeds the 10-year frequency storm, it will generally be contained within the street right-of-way. Utilizing both the underground facilities and the street capacity, 100-year protection would be provided.

Hydrology

The hydrology for the plan has been determined by two methods: the modified rational method and the synthetic unit hydrograph method.

The modified rational method is widely used to estimate peak flows in small watersheds. It has been used primarily in this report for watersheds up to 500 acres in size for the 10-year frequency design flows. The design flows are based on the area of the drainage basin, rainfall intensity, and the runoff coefficient.

The rainfall intensity is determined using intensity duration curves or tables. Table 5-1 has been prepared by the RCFC&WCD and has been utilized in this plan for the greater Hemet area. An adjustment has been made for the San Jacinto area to represent the intensities found there. The table was prepared in 1977 and utilized all previously recorded rainfall data and publications in the area including the heavy storms of 1969. Since 1977 additional rainfall data has not justified a change in the indicated intensities.

TABLE 5-1

HEMET AREA

RAINFALL INTENSITY VS. DURATION

Duration (min.)	2-Year Frequency (in./hr.)	5-Year Frequency (in./hr.)	10-Year Frequency (in./hr.)	100-Year Frequency (in./hr.)
10	1.05	1.55	1.95	3.10
11	1.00	1.47	1.85	2.94
12	0.95	1.41	1.76	2.80
13	0.91	1.35	1.69	2.68
14	0.87	1.30	1.63	2.57
15	0.84	1.25	1.57	2.49
16	0.81	1.21	1.52	2.40
17	0.79	1.17	1.47	2.32
18	0.76	1.14	1.43	2.25
19	0.74	1.11	1.39	2.18
20	0.72	1.08	1.35	2.13
22	0.69	1.03	1.28	2.05
24	0.65	0.98	1.23	1.93
26	0.63	0.94	1.18	1.85
28	0.60	0.90	1.13	1.78
30	0.58	0.87	1.10	1.72
32	0.56	0.84	1.06	1.66
34	0.54	0.81	1.02	1.61
36	0.53	0.79	0.99	1.56
38	0.51	0.76	0.96	1.51
40	0.50	0.74	0.94	1.47
44	0.47	0.71	0.89	1.40
48	0.45	0.68	0.85	1.33
52	0.43	0.65	0.82	1.28
56	0.42	0.62	0.79	1.23
60	0.40	0.60	0.76	1.18
65	0.39	0.58	0.73	1.14
70	0.37	0.55	0.70	1.10
75	0.35	0.53	0.67	1.05

Source: Riverside County Flood Control & Water Conservation District

The duration utilized in the calculations is equal to the time of concentration flow to the point of interest. The time of concentration is determined by calculating the overland flow time from the top of the basin and adding the flow time in any channels or pipe used to carry stormwaters to the point of concentration.

Then a rainfall intensity is selected from Table 5-1. The rainfall intensity curves give lower intensities for longer times of concentration. The drainage area is calculated and a composite runoff coefficient determined by using the proper runoff coefficient curves for each type of land use and soil type, and obtaining a weighted average. The land use types vary from undeveloped to commercial usage. Their location was determined as indicated in Chapter 3. The soil types were reclassified utilizing the U.S. Soil Conservation Services' four hydrologic groupings. The runoff coefficient curves have been prepared for the various hydrologic groupings and are as indicated in the RCFC&WCD hydrology manual.

Finally, the rainfall intensity, area, and runoff coefficient are multiplied and the result is a design flow at the point of concentration for the design selected. The formula is usually written:

$$Q = CIA$$

Where: Q = runoff in cubic feet per second
C = runoff coefficient
I = rainfall intensity in inches per hour
A = area in acres

All street systems were checked for the 10-year flow determined by the above method and all underground storm drains were sized for the resulting flow.

The synthetic unit hydrograph method enables the transportation of observed rainfall-runoff data from gaged drainage basins to ungaged basins and is widely used in hydrology studies. Correlation of the two basins is made on the basis of differences in physical basin characteristics such as shape, area and slope.

The U.S. Army Corps of Engineers, Los Angeles District has monitored major flood events in southern California over the past 40 years. They have developed relationships for gaged basins that can be applied to other ungaged basins in the area. The RCFC&WCD has adapted their methods so as to be applicable to the characteristics of the western Riverside County area. This method for computing hydrographs has been utilized in this report. The method is applicable to watersheds in excess of 300 to 500 acres in size. Generally, this will coincide with locations where open channels are required due to economic considerations.

The method requires development of a unit hydrograph for the approporiate concentration point of interest. The hydrograph is a curve showing the time distribution of runoff (flow vs. time graph) that would result at the concentration point from a unit storm effective rainfall over the drainage area tributary to that point. The unit storm is defined as a storm producing effective rainfall at a rate of one-inch per hour for unit duration.

Summation hydrographs have been developed that indicate runoff that would result from the continuous generation of the unit storm effective rainfall over an area. The hydrograph scales have been modified to express the discharge in percent of ultimate discharge and time in percent of lag time. This hydrograph is called a S-graph. Four S-graphs have been developed for the western Riverside county area; Valley, Foothill, Mountain and Desert and are representative of each watershed type. The Valley S-graph is most applicable to the greater Hemet area.

The lag time is calculated based upon the physical characteristics of the drainage area by the empirical formula:

$$\text{Lag (hours)} = 24n \left[\frac{L(Lca)}{S^{1/2}}\right]^{(.38)}$$

Where:

n = The visually estimated mean of the n (Mannings formula) values of all collection streams and channels within the watershed.

L = Length of longest watercourse, in miles

Lca = Length along longest watercourse, measured upstream to a point opposite the centroid of the area, in miles

S = Overall slope of longest watercourse between headwaters and the collection point, in feet per mile.

The lag time is used to calibrate the S-graph to the basin for which the unit hydrograph is being prepared.

The calculations further require the determination of a unit distribution graph. It is calculated by subtracting from the percentage of ultimate discharge for each unit time period taken from the S-graph, the percentage of ultimate discharge for the previous time period. The synthetic unit hydrograph is then determined by multiplying the previous graph ordinates by K, the ultimate discharge. The ultimate discharge, K, is defined by the formula:

K = (cfs-hours/inches) = 645A, where

A = Drainage area in square miles

The flood hydrograph for the desired concentration point and design storm are determined utilizing the unit hydrograph and characteristic rainfall data. It requires determining the total effective rainfall over the particular drainage area and its pattern over the storm period.

The total point rainfall for a drainage area can be determined either from the National Oceanic and Atmospheric Administration (NOAA) Atlas 2 or the RCFC&WCD hydrology manual for storm durations of 3, 6 and 24-hours and return periods of 2 to 100 years.

The rainfall patterns used with the method for the Hemet area were the 3- and 6-hour thunderstorm flood hydrographs modeling the Indio storm of September 24, 1939. The pattern of the major storm of March, 1938 in the area was utilized for the 24-hour general storm flood hydrograph. These patterns are then adjusted by the point rainfall values on a unit time basis and by appropriate loss rates to determine an effective rainfall rate per unit time.

The flood hydrograph is then determined by multiplying the effective rainfall rate for the first unit time period, times each unit hydrograph value and summing the results. These computations are best handled by computer programs developed by the RCFC&WCD, which programs have been extensively used in the preparation of this report.

Facilities Standards

Application of the hydrology methods described in the previous section and the hydraulic analysis of the existing and proposed drainage system requires the use of facilities standards in order to provide consistent results. These facilities standards must include requirements for all of the conveyance system components.

The conveyance system consists of natural stream beds and man-made channels, culverts, and pipelines. Manning's equation is a

standard method used to calculate velocity and capacity of open channels and conduits used to carry stormwater flows. Water surface profiles in this report have been calculated for all open channels using standard backwater computer programs. In addition, underground lines have been analyzed to determine hydraulic and energy grade lines using Bernoulli's energy equation.

In order to provide comparable results, the friction factors utilized in the formulas for various materials must be consistent. Table XIV, Values of Effective Absolute Roughness and Friction Formula Coefficients in ASCE Manual 37, "Design and Construction of Sanitary and Storm Sewers" 1970, provides friction factors for use in the Manning equation. Table 5-2 gives recommended values for material typically used in storm drain conduits. These factors fall within the range of values given in Table XIV and are based on engineering judgement as to the probable construction standards and maintainable conditions of a conduit in service. Table 5-2 presents coefficients for three different materials, asbestos cement, corrugated metal, and concrete. Plastic and fiberglass pipe are not yet readily available in the larger diameter needed for storm drains. For this reason, these materials were not included in Table 5-2.

TABLE 5-2

RECOMMENDED VALUES OF MANNINGS FRICTION FACTOR

Materials	Factor
Asbestos Cement Pipe	0.012
Reinforced Concrete Pipe	0.013
Corrugated Metal Pipe	
Unlined	0.024
Paved invert	0.019
Fully paved	0.015
Concrete Box Culverts	0.015
Concrete Lined Channels	0.015

Asbestos cement is not readily or economically available in diameters larger than 36 inches. Corrugated metal pipe is available in a full range of diameters. In addition, arch shapes of corrugated metal are also available. Corrugated metal pipe is relatively easy to install and has the ability to deform under loading without damage. Unfortuantely, the pipe is subject to corrosion and even when fully coated with asphalt the expected life is not as long as concrete or asbestos cement. Concrete is available both as precast pipe and cast-in-place pipe throughout the range of sizes required for drainage in Hemet. The long life, low maintenance, high strength and ready availability of concrete make it the most desirable of the materials available for storm drain construction. Corrugated metal may be used for temporary drains.

The velocity of flow provided in storm sewers should be in the range of 2.5 feet per second to 10 feet per second for facilities designed to accommodate the 10-year flow. The standards for facilities designed to accommodate the 100-year flow should meet the minimum velocity standard of 2.5 feet per second. Due to the infrequency of use at design flows, the maximum velocity can be as high as 20 feet per second although 15 feet per second is more desirable. Open channels should provide a minimum freeboard of one foot at the design flow. Where velocities are high, a greater freeboard should be provided to allow for wave action and other uncertainties. Velocities in concrete-lined, open channels should be kept below 15 feet per second and unlined channels will require velocities under 5 feet per second to prevent erosion.

In some instances rock riprap channel linings were found to be more economical than concrete, particularly where it was feasible to retain soft bottoms to allow for recharge of the underlying groundwater supply. In all such cases, riprap linings were designed according to criteria promulgated by the RCFC&WCD or the Corps of Engineers, which generally relate rock riprap size, weight, toe depths, and revetment thickness to depth of flow and

velocity. It is to be recognized that both unlined and riprap-lined channels will have greater maintenance costs than will be the case with concrete-lined channels.

Greenbelt channels, with their greater rights-of-way widths, will also have greater maintenance costs than riprap-lined channels. Greenbelt channels also have greater bridge crossing costs than either riprap or concrete-lined channels for the same reason. As discussed in the EIR, a careful weighing of both capital and annual costs in the development of recommended channel configurations was necessary to complete the economic evaluations for selection of the recommended Master Plan.

Unlined earthen channels were found to be the least costly on a life cycle basis except where riprap linings were required. In either case, soft bottoms were proposed to enhance the opportunity for groundwater recharge. Concrete linings were found to be the next most costly and are proposed where velocities cannot be contained by rock riprap linings. Finally, greenbelt channels were found to be the most costly on a life cycle basis. However, their open space and recreational benefits are deemed worthy of further consideration before actual design concepts are finalized, particularly where supplemental grants from the Federal Land and Water Conservation Fund or future state recreational grant programs can be obtained to fund a part of the facility. Such grants can frequently be applied to the rights-of-way portions of multi-purpose projects.

Transitions between greenbelt and lined channels would be designed in such a manner as to provide complete hydraulic continuity between one channel section and the next downstream section. Excessive variations between one channel concept and another should be avoided to minimize the cost of the transition structures and backwater calculations should be accomplished to determine water surface elevations through the transitions, including channel sections at all bridge crossings.

Retention Basins

The storm water retention basin is a means of reducing peak discharges in urban areas in order to relieve loads on downstream drainage facilities. The retention basin as herein described differs from a storm water percolation pond. Percolation ponds are designed to capture urban storm inflow and dispose of it over a period of time by means of percolation into the ground. Retention basins control runoff by storing it and providing controlled discharge into downstream outlets.

Retention basins are generally proposed to minimize the overall cost of drainage facilities in an area. Where relatively natural, flat terrain exists, larger conduits and open channels are required. Closed conduits can be used with steeper slopes. To determine the cost-effectiveness of a retention basin, an analysis can be made of the drainage system that would be needed with and without a proposed retention basin. Maximum outflow from the basin is designed to be about 20% of the inflow to the basin. Proposed basins in this report were sized for the 100-year inflow. Spillways were designed for the 1000-year flow to ensure the unlikely occurrence of overtopping the basin walls. Generally, retention basins are found economical when the terrain is flat and the overall drainage area is large.

There are some disadvantages to retention basins that can, in part, affect their economic appeal. Retention basins are generally unlined and require more maintenance work than lined channels. They can be a breeding site for weeds, brush and rodents. Ponding of water can also lead to mosquitoes and odor problems. The public sometimes feels the basins are unsightly and frequently protest their location in their neighborhood. As an area becomes increasingly developed it is more difficult to locate a basin near the existing developments. For the above reasons, only those basins that have very strong economic justification have been proposed herein for the ultimate drainage system.

Currently, interim retention basins have been installed in new developments within the city. They have been required due to the lack of adequate downstream drainage facilities. When the ultimate drainage system is installed it is proposed that they be removed from service.

Federal Regulations

The City of Hemet is a participant in the Federal Flood Insurance Program pursuant to a contract between the Federal Flood Insurance Administration and the City. Pursuant to that agreement, applicable federal regulations and the City's Flood Plain Management Ordinance, this Master Flood Control and Drainage Plan has been adopted to ensure the continuation of the benefits of the Federal Flood Insurance Program within the City of Hemet.

The Federal Flood Insurance Program is currently administered by the Federal Emergency Mangement Agency (FEMA). As required by FEMA regulations, proposed modifications of the 100-year flood plain described herein must be submitted to and approved by FEMA before development can be authorized within the existing 100-year flood plain. Upon a finding that proposed plans do accomplish the basic FEMA flood control objectives, FEMA will advise the City of its approval of the proposed flood plain boundary modifications. That approval must be received from FEMA before development of any part of the flood plain can be authorized by the City. Failure to observe FEMA regulations in this regard can place at risk the continuation of the Flood Insurance Program as well as other Federal loan guarantees and subsidies presently available to the City of Hemet and its citizens.

HEMET 6

CHAPTER VI

PROPOSED MASTER FLOOD CONTROL AND DRAINAGE PLAN

General

This chapter describes the proposed drainage facilities for the entire study area. The study area has been divided into eight subareas as described previously. Profiles of each storm drain line are provided in a separate appendix addition to this main report. Engineering criteria used for design of the proposed facilities are outlined in Chapter V. In general, all open channel facilities have been designed to carry the tributary 100-year frequency storm runoff and all underground storm drain facilities for the tributary 10-year frequency storm. Open channels have been proposed when their costs are less than an underground storm drain of equivalent capacity. Retention basins have been proposed when considerable cost savings can be achieved as compared with a comparable open channel system.

Cost estimates for the proposed facilities are also provided in this chapter. The cost estimates are broken down by each subarea and further by individual storm drain lines within each subarea. A cost summary table for all subareas is also provided. Finally, a construction staging program has been developed. It prioritizes those facilities that are needed in sequence to protect the greatest portion of the property within the city limits while considering the necessary downstream outlet channels.

Central Hemet Area

This subarea, shown on Figure 6-1 after page 6-2, is located within the Salt Creek watershed at its easterly boundary. It is generally bounded by Florida Avenue on the north, a line just south of Stetson Avenue on the south, and Cawston and Sanderson Avenues on the east. The Hemet Channel is included in its

entirety. For illustration purposes, the Hemet Channel is shown on the Southwest Plan, Figure 6-3, for all portions of the channel downstream of Stetson Avenue.

A drainage plan for this area was developed by the RCFC&WCD as early as July of 1969. Several aspects of the system were subsequently installed. The plan was then reviewed and revised in July of 1977 to reflect increased hydrology information. This plan has been reviewed as part of the current investigation, updated as needed and is as shown on Figure 6-1.

The main outlet channel is designated as the Hemet Channel, Line 1A. It runs diagonally in a northeasterly to southwesterly direction towards Winchester, just east of, and parallel to, the Santa Fe Railroad. Its ultimate capacity has been constructed from Florida Avenue to Cawston Avenue as an open concrete channel. It continues downstream towards Winchester as an unlined interim channel at the present. It is proposed to continue this line as an open concrete channel to its junction with the Salt Creek Channel.

The Hemet Channel will receive flow from lines located on Florida Avenue, Acacia Avenue, Whittier Avenue, Stetson Avenue and Sanderson Avenue. Generally speaking, streets located between the above streets will be served by laterals off the main lines. At the present time, all open channels have been constructed for this plan except that along Sanderson Avenue. The underground storm drain portion of the plan has been partially constructed along Florida Avenue but otherwise the storm drain lines remain unconstructed.

Flooding along the streets of Florida, Acacia, Mayberry, Whittier and Stetson within the plan boundary would be reduced considerably by the construction of this plan. Recently, more pronounced

flooding has occurred along Whittier Avenue and at the intersection of Sanderson Avenue and Acacia and Florida Avenues foreven less magnitude storms. These locations (Lines IA-3 and IC) should be considered for high priority construction funding.

West Hemet Area

As noted on Figure 6-2 after page 6-6, this subarea is located within the Salt Creek watershed, which serves as its easterly and northerly boundary. It is bounded on the west by the San Diego Aqueduct Channel and on the south generally by Florida Avenue and the Hemet Channel.

This drainage plan has undergone several revisions prior to its completion. As originally envisioned by the RCFC&WCD in October of 1981, certain areas north of the Salt Creek watershed (i.e., in the San Jacinto watershed) would have been diverted to the south into the subject's plan. Because such a plan would subject both the City and the District to potential litigation for diverting flows between watersheds, the boundary was subsequently modified so as to ensure that the Salt Creek system would only carry drainage waters originating within its own watershed. This revision also allowed elimination of a retention basin near Menlo Avenue and Kirby Street and a reduction in the size of the Devonshire Basin by 30 percent. Further review of current land use designations in the Florida Avenue and Acacia Avenue areas required an addition of a line on Florida Avenue and an extension of a line up to Acacia Avenue. The final version of the plan as adopted and recommended by this study is shown on Figure 6-2.

The main outlet channel (Line 2A) for the West Hemet subarea runs parallel to, and just east of, the San Diego Aqueduct Channel. It receives flow from the entire West Hemet plan and discharges it to the Hemet Channel near the junction of the Aqueduct siphon and the Hemet Channel. For this plan it was found that full channelization of this line under the Santa Fe Railroad tracks was not cost-effective. A substantial savings could be realized

by allowing the land immediately upstream of the tracks to remain as flood plain. This land is currently within the 100-year flood plain and would not be subjected to greater flooding potential. As adjacent land values increase in the future, full channelization of the line may be appropriate and can be evaluated at that time. In the interim, the area should be designated for flood plain use in the land use ordinance and in the Land Use Element of the General Plan.

Line 2A continues upstream from the Hemet Channel to Florida Avenue as an unlined channel. Line 2E serving the West Hemet trailer park and Acacia Avenue discharges into Line 2A downstream of Florida Avenue. A portion of this line is also unlined. Unlined channels are only recommended herein when the velocities in the channel are less than five to six feet per second. Since unlined channels can be a maintenance problem, concrete linings should be reconsidered during design of the proposed channels. All other open channels in the West Hemet plan are proposed to be concrete-lined.

As Line 2A continues upstream, it discharges into the Devonshire Retention Basin as its outlet channel. By the provision of temporary storage, this basin reduces inflow rates to lesser rates. The maximum 100-year inflow rate to the basin is 1,280 cfs with a corresponding outflow discharge of 270 cfs from the basin. This reduction allows Line 2A to be a considerably smaller channel with less costly associated construction. It is perceived that the basin could be designed for multiple uses in addition to flood control aspects, i.e., parks and recreation uses.

The inflow to the basin is attributable to Lines 2C and 2D. These lines generally serve the streets of Devonshire and Menlo within the plan. Line 2C is an open concrete channel from the basin upstream to Kirby Street. It continues upstream as an underground storm drain along Menlo Avenue with laterals along

Kirby Street, Lyon Avenue, Palm Avenue and Devonshire Avenue. Line 2D discharges into Line 2C just upstream of the Devonshire Basin. It continues upstream on the north side of Devonshire Avenue as an open concrete channel to Cawston Avenue and then upstream along Devonshire Avenue as an underground storm drain to the east of Sanderson Avenue.

Flooding along the streets of Menlo and Devonshire and ponding of water east of the San Diego Aqueduct Channel would be reduced considerably by the construction of this plan. At present, no part of this plan has been constructed. The first step in implementing this plan would be construction of Line 2A and the Devonshire Retention Basin. Lines 2C and 2D could then be extended upstream to prevent flooding along Menlo and Devonshire Avenues.

Southwest Hemet Area

As shown on Figure 6-3 after page 6-10, this subarea is located within the Salt Creek watershed, which serves as its southerly boundary. It is also bounded by Stetson Avenue and the Hemet Channel on the north, the San Diego Aqueduct Channel on the west, and a line to the east, some 1,000 feet from Sanderson Avenue.

Prior to its implementation, this plan requires that the proposed Salt Creek Channel be completed from Sanderson Avenue downstream. A majority of the area is completely within the 100-year flood plain without the channel. Proper drainage for future development of this area is not practical without it.

During the planning process, the channel was assumed to have a bottom width of 230 feet, side slopes of 15 to 1, and a right-of-way requirement of 520 feet. Alternatives to this assumption will affect the lateral tie-ins to the channel. These details can be revised in future planning or during design if required. A discussion of the Salt Creek Channel and its alternatives will be presented in the following section covering the South Hemet Area.

Due to the relatively flat existing grades in this subarea, the majority of the facilities proposed are open channels. In the future, if sufficient street grading is provided during development, it is conceivable that open channels could be replaced with underground storm drains.

The main components of the plan other than Salt Creek and its laterals are Lines 3A and 3B. Line 3A is a concrete-lined trapezoidal channel that outlets into the Hemet Channel. It runs upstream and parallel to Thornton Avenue along its south side. It has several open channel laterals running north and south including one along Fischer Street. Line 3A transitions upstream of Cawston Avenue into an underground storm drain. If Line 3A is constructed before additional improvements to the Hemet Channel are made, some grading at the channel will be necessary.

Line 3B discharges into the Salt Creek Channel and is the main outlet channel for this plan. It runs northerly upstream from the Salt Creek Channel as an unlined trapezoidal channel along the east side of the San Diego Aqueduct Channel. Velocities below 6 fps allow it to be left unlined until it turns easterly where higher velocities require a concrete lining. All channels in this plan are concrete-lined except for this segment of Line 3B. Line 3B continues easterly upstream to approximately 2,000 feet past Warren Road. All laterals discharging into Line 3B are concrete-lined trapezoidal channels. These laterals will serve Simpson Avenue, Warren Road and Harrison Avenue.

An additional open channel, Line 3C, is needed to serve the area bounded by Thornton Avenue, Harrison Avenue and Fischer Street. This channel begins at the Hemet Channel and goes easterly upstream to Warren Road as a concrete-lined trapezoidal channel. It then continues 1,300 feet upstream as a 39-inch and then 36-inch diameter storm drain.

Line 3D discharges into the proposed Salt Creek channel near Cawston Avenue. It is a concrete-lined trapezoidal channel that runs northerly along the east side of Cawston Avenue some 1,200 feet. It then turns easterly for another 500 feet and transitions into a 42-inch and then 36-inch diameter storm drain.

Line 3E discharges into the Stetson Avenue channel at Sanderson Avenue. It is a concrete-lined trapezoidal channel that runs southerly along the east side of Sanderson Avenue. It is designed to accept flows from the easterly subarea boundary to Sanderson Avenue between Stetson Avenue and north of Harrison Avenue.

Lines 3F, 3G, 3H, 3I and 3J are small concrete-lined trapezoidal channels that are designed to receive local flows from the area immediate north of the proposed Salt Creek Channel. Their peak discharges vary from 20 cfs to 65 cfs.

Lines 3K, 3L, 3M, 3N, 3O and 3P serve the south side of the Salt Creek Channel including the nearby foothills. Each line has been designed as a concrete-lined trapezoidal channel. This will allow capture of sheet flow from the foothills where streets and gutters are not available.

As stated earlier, the first step in implementing this plan is to construct the Salt Creek Channel. However, Lines 3A, 3C and 3E can be constructed to the existing facilities under the present conditions. At present, no part of this plan has been constructed. After the Salt Creek Channel is constructed, then the proposed laterals can be installed as development requires it.

South Hemet Area

Increasing interest in development of the South Hemet area, coupled with a need for upgrading of exising zoning in the area prompted the Hemet City Council to initiate proceedings in early 1983 for the annexation of a significant area between Lyon Avenue

and State Street lying north of Newport Avenue to the City. Features of the Master Flood Control and Drainage Plan for that area are depicted on Figure 6-4 after page 6-18.

The dominant feature of the South Hemet Plan is a series of lined channels designed to convey runoff from Pepper Creek, Avery Canyon, Cactus Valley and St. John's Canyon to the upstream end of the presently-authorized Salt Creek Channel at Lyon Avenue. All channels are proposed with either concrete or rock riprap linings. A greenbelt alternative is also proposed in each instance along with the lined channel concepts; and all are evaluated in the final EIR.

In order to reduce the number of channels, the Pepper Creek Channel (Line 4C) and the Avery Channel would join just west of State Street into a single channel (Line 4B) which would cross the lower Diamond Valley area in an east-west direction. Drainage from Cactus Valley (Line 4A) be joined with flows from St. John's Canyon in a single channel through Diamond Valley in a south to north direction, lying just west of the alignment of the future extension of Palm Avenue.

Subsequent to completion of the Draft Master Flood Control and Drainage Plan Report, and while it was undergoing public review, the City of Hemet was requested to consider a proposed Annexation No. 92 of additional territory to the City bounded on the west by State Street, on the south by Gibbel Road, on the east generally by the Santa Rosa Hills, and on the north by the existing city limits. The alignment of the channel proposed to serve the area is depicted on Figure 6-4. The extended line would be designed to carry the 100-year design flow ranging from 1,750 to 2,000 cfs and would consist of some 5,450 feet of lined channel lying generally along the toe of the foothill area in order to minimize impacts on street frontage along State Street. The channel would be trapezoidal in shape, with bottom widths ranging from 10 to 15 feet and depths of flow ranging from 4 to 7 feet. Because of

excessive velocities, almost the entire reach will be concrete-lined. A short portion just east of State Street will be riprap-lined with a soft bottom.

The combined 100-year discharge of all channels upstream from Lyon Avenue would be 9,200 cfs. The Lyon Avenue Retention Basin would be provided just upstream from Lyon Avenue to serve as a means of relieving discharges down Salt Creek until the proposed interim channel from the west end of the Seven Hills development to Lindenberger Road can be upgraded to its full 100-year capacity. Thereafter, the Lyon Avenue Retention Basin would continue to regulate the flows of Salt Creek so as to provide additional capacity in the downstream system for runoff from unforeseen contingencies.

All channels above the proposed Lyon Avenue Retention Basin would be designed to convey the 100-year flow, based on presently-conceived plans for development of the tributary watersheds. It is anticipated that the scenic locations of some of the foothill areas may foster a desire for development of those areas to a higher density than is provided by present zoning restrictions. Accordingly, the impact of that development, if permitted, on the cost of downstream drainage facilities should be considered at the time any such developments plans are considered. All such development plans should also be evaluated on a comprehensive basis during periodic reviews of the Hemet Master Flood Control and Drainage Plan. Even though many of the downstream plan features proposed herein will be capable of enlargement, rights-of-way acquisition proposed herein should anticipate the ultimate configurations of the individual features. Intensive foothill development will require special attention to the potential for erosion of the steep hillside channels.

Channel capacities within the South Hemet Plan area are all noted on Figure 6-4. The Cactus Valley and Pepper Creek Channels

(Lines 4D and 4C respectively) were both found to require reinforced concrete linings east of State Street because of extremely high velocities. West of State Street, those channels would be amenable to the use of rock riprap linings with drop structures to reduce velocities below the level which would erode the soft bottoms.

Channel alignments shown on Figure 6-4 have been chosen in order to facilitate the selection of either of the lined channel or greenbelt configurations, as well as to achieve other objectives of the Open Space and Conservation Elements of the Hemet General Plan. Wherever possible, channel alignments have been selected to enhance rather than hinder future development options for lands presently in agricultural uses.

A conceptual depiction of a potential greenbelt development plan for the Pepper Creek Channel (Lines 4B and 4C) is presented on Figures 6-5A and 6-5B after page 6-20. As will be noted from Figures 6-5A and 6-5B, several of the regional and community open space, recreational, and educational interpretive features of the Open Space and Conservation Elements would be achieved with the greenbelt concept, as will many of the local park and recreational objectives with savings in the cost of both the flood control and open space/recreational costs.

In order to reduce velocities in the steeper reaches of Pepper Creek east of State Street under the greenbelt concept, grouted rock riprap drop structures are proposed at all bridge crossings. One such structure will form a low dam just west of Cornell Street for a combined retention basin/recreational lake. A natural constriction at that point lends itself to such a structure, which would be landscaped to enhance the visual attractiveness of the Cornell Basin and environs. Under the greenbelt concept, all velocities along Line 4C would be reduced to non-erosive levels which could support either turf or other

typical park/golf course surface treatments. A notable feature of the greenbelt concept, as shown on Figures 6-5A and 6-5B, is that it would support an additional 27 holes of public and/or private golf course activity to supplement the existing 18 holes at the Seven Hills development and the 9 holes at the Echo Hills Golf Course.

The Salt Creek Channel continues westerly from Lyon Avenue through the Seven-Hills development to Patterson Avenue. The portion of the channel west of the Seven Hills development is depicted on Figure 6-3. The configuration and right-of-way requirements for this portion of the channel are as authorized by the Riverside County Board of Supervisors and have been accepted for this report. The channel is a greenbelt type with a bottom width of approximately 150 feet and side slopes of 20:1. Rights-of-way requirements for the channel will be approximately 500 feet in width.

Two alternate channel alignments, A and B, both capable of carrying a 100-year design flow of 9,200 cfs at Lyon Avenue are depicted on Figures 6-3 and 6-4. One alternative alignment, Alignment A, was previously approved by the City Council in connection with action on tentative maps for Tracts 17727, 17728, 17729, and 17738 within the Seven Hills development. Alignment A would depart from the alignment authorized by the Board of Supervisors beginning at Lyon Avenue and would extend some 8,700 feet downstream along an alignment some 600 feet south and approximately parallel to the authorized alignment.

Alignment A would have sufficient capacity to carry a 50-year flood with an overflow area through an adjacent golf course fairway area capable of carrying the difference between the 50-year and 100-year floods. In approving this alignment and design concept, the City Council stipulated, in part, that the project would be consistent with the then-recently approved Southwest Hemet General Plan, that the developer would be

required to participate in the cost of a low-flow ("Arizona" type) channel road crossing at Lyon Avenue, and that the project must also be approved by the Federal Emergency Management Agency (FEMA). Because some of the conditions imposed by the City Council are mutually contradictory, it is doubtful that the concept and alignment in their present form could be approved for construction by FEMA without further Council action. Additionally, the developer has determined that he is unable to finance the cost of the required inlet facility at the present time.

A second alignment, termed Alignment B on Figure 6-3, would follow the same alignment as Alignment A between Lyon Avenue and the westerly limit of the Seven Hills development, but would be designed to carry the full 100-year design flow. The channel would be trapezoidal in shape with riprap sides and a bottom width of 100 feet.

Just east of Sanderson Avenue, Alignment B would swing to the south of the presently authorized channel in a southwesterly direction to just north of Simpson Avenue and would thence continue westerly along the north side of Simpson Avenue. Approximately 700 feet east of Warren Road the channel would turn southwesterly across the present alignment of Simpson Avenue and rejoins into the authorized channel alignment at Warren Road.

Alignment B, having both advantages and disadvantages over the presently authorized alignment of Salt Creek, was first proposed by affected property owners concerned over the adverse impacts of the diagonal alignment of the authorized channel through their property. Alignment B would be a few hundred feet shorter than the authroized alignment and would have slightly greater excavation quantities as a result of passage of the channel through a small saddle just east of Cawston Avenue. Also, while some tributary channels would have to be lengthened to accommodate the revised alignment, others would be shortened to the extent that

the overall length of tributary channels would be approximately 800 feet less with Alignment B and the overall cost of tributary channel modifications would be accordingly lower.

A major advantage to Alignment B would be the opportunity for a direct connection between Sanderson and Simpson Avenues on an alignment with and roughly parallel to the channel, without the necessity for a major four-lane bridge crossing of the channel. Other crossings would still be required, but they would all be two-lane bridges. It would appear that the major advantage of Alignment B over the authorized alignment would be the less serious adverse land use impacts and the likelihood of lower rights-of-way costs. Furthermore the three major affected property owners have been contacted and have advised that they favor Alignment B. Therefore, for the purpose of this Plan, the Alternative Alignment B is proposed as part of the Plan along with the presently authorized alignment, with both the greenbelt and riprap-lined design concepts being proposed for later design consideration.

It is also proposed that both the greenbelt and the riprap-lined channel design concept be made a part of the Master Plan for Salt Creek downstream from Warren Road. At Warren Road, the channel would have a 100-year design flow of 9,200 cfs, increasing to 11,700 cfs at Patterson Road.

Currently, an interim channel has been proposed that would follow the alignment of the ultimate channel above. The channel would be constructed from State Street to Patterson Avenue. The financing plan for the project is currently being finalized by the Hemet Redevelopment Agency. The portion of the channel through Seven Hills would be financed entirely by the private developer, and that segment of the channel would be constructed to its ultimate capacity.

San Jacinto Area

As shown in Figure 6-6 after page 6-28, this subarea is located along the southern boundary of the San Jacinto watershed. It is generally bounded by Meridian Street on the east, State Street on the west and the City of Hemet's Sphere of Influence on the north.

The implementation of this plan requires considerable downstream channelization within the northerly San Jacinto Area to provide an appropriate outlet. Drainage planning work for the area has been completed by the RCFC&WCD but none of the facilities have been constructed as yet. The facilities required but not shown in Figure 6-6 are an open channel, Line E, that outlets near the San Jacinto reservoir and proceeds upstream to the proposed Buena Vista Retention Basin located near Buena Vista Street and Esplanade Avenue. An inlet channel to the basin, Line C, would also be required, that proceeds upstream, parallel to Santa Fe Street to the study area limit. In addition, Line E-2, a storm drain along State Street, would be required from its junction with Line E to the study area limits. These facilities would be required for a proper outlet for the facilities shown in Figure 6-6.

The major existing facility within the plan is the Parkhill Retention Basin and its outlet line. The retention basin is located at the corner of Devonshire Avenue and Columbia Street. The outlet line is constructed to just downstream of Oakland Avenue with discharge into the existing street.

The major features of this plan include the inlet Line 5A and outlet Lines 5B and 5C for the Parkhill Retention Basin. Line 5A serves Florida Avenue with laterals along Stanford Street, Dartmouth Street and Cornell Street. The line begins at the basin as a concrete-lined trapezoidal channel that turns upstream to Florida Avenue. At this point, the line becomes a reinforced concrete box drain to contain the flow underground for approximately 500 feet. From this point, the line continues upstream as

a underground storm drain varying in size from 75 to 39 inches in diameter.

The outlet channel from the Parkhill Retention Basin will be extended as part of this plan. It is designated as Line 5B. It continues downstream from Oakland Avenue to Menlo Avenue as a concrete-lined trapezoidal channel. The RFCF&WCD has already obtained the necessary rights-of-way for this portion of the channel. It crosses underneath Menlo Avenue and down San Jacinto Street to the north as an underground storm drain. There it joins Line 5C, an underground storm drain which serves Washington Avenue. Laterals 5C-1, -2 & -3 serve the upstream area of this line along Park Avenue. Line 5C continues downstream to the west along Midway Street as a concrete-lined channel and crosses underneath Santa Fe Street. At this point the storm drain, 5C-4, that runs along Santa Fe Street and Devonshire Avenue connects to Line 5C. The channel proceeds westerly some 600 feet and then turns to the north and continues to the study area limit. Here, the channel would have to be continued to a proper outlet as indicated in the plans noted previously.

In addition to the foregoing lines, a storm drain along State Street is required to pick up flows west of Santa Fe Street. The storm drain, designated as Line 5E-2, begins at Oakland Avenue as a 30-inch storm drain. It proceeds downstream to the north to Menlo Avenue. It crosses underneath the Santa Fe Railroad tracks to the west and then turns north at State Street. It continues northerly along State Street to the study area limit. From that location, the drain would be continued northerly as indicated in the plans noted previously.

Flooding in this subarea along the streets of State, Santa Fe, Midway, San Jacinto and Florida, as well as along the railroad, would be reduced considerably by the construction of this plan. The first steps in allowing implementation of this plan would logically be construction of the Buena Vista Retention Basin and

its outlet, Line E, to the San Jacinto Reservoir which is located outside the city's Sphere of Influence. After this construction, facilities from the basin southerly along State, Santa Fe and San Jacinto Streets could be constructed with an adequate downstream outlet. The inlet channel to the Parkhill Retention Basin and storm drain along Florida Avenue could be constructed at the present time.

Little Lake Area

This subarea, as noted in Figure 6-7 after page 6-32, is also located within the San Jacinto watershed, along its southerly boundary. It is bounded on the west by Meridian Street, on the east by the Bautista Creek channel, and on the north by the San Jacinto River and the City of Hemet's Sphere of Influence.

This plan was originally published by the RCFC&WCD and subsequently adopted by the Board of Supervisors in te Fall of 1978. The plan has been reviewed as part of the current investigation and is recommended for adoption as part of this plan. To date, only a short segment of the storm drain facilities indicated have been constructed.

Major facilities within the Little Lake area include the Meridian Street channel and the utilization of the existing Bautista Wash watercourse. The Meridian Street channel is a concrete-lined trapezoidal channel that would outlet into the San Jacinto River. It proceeds upstream from the San Jacinto river across to Meridian Street. It continues along the east side of Meridian Street until its junction with the Bautista Wash. The Bautista Wash would remain as is, in its natural condition. Full implementation of the plan would require acquisition of the required rights-of-way within the wash, adequate in size to contain flood flows. Bautista Wash is ideally suited to be developed as an improved greenbelt channel with recreational amenities at a later date if desired.

The majority of the lines indicated on Figure 6-7 either outlet into the Meridian Street channel or the Bautista Wash. The exception to this are Lines 6J-1 and -2 which are storm drains outleting into the Bautista Creek channel.

Line 6A intersects the Meridian Street Channel at Washington Avenue as an underground storm drain. It proceeds upstream along Washington Avenue and then Mountain Avenue. Its lateral storm drain lines, Lines 6A-1, -2 and -3 serve the surface streets of Hemet, Soboba and Lake.

Line 6B also outlets into the Meridian Street channel just downstream of Park Avenue. It proceeds upstream along Meridian Street to just past Whittier Avenue as an underground storm drain. Its lateral storm drain lines, Lines 6B-1, -1a, -2, -3 and -4, serve the surface streets of Florida, Acacia, Mayberry, Whittier, Hemet and Soboba.

Lines 6C, 6C-1, 6D, 6D-1, 6E, 6F, 6G, 6H, 6K and 6L are all proposed underground storm drains discharging into the Bautista Wash. Their alignment and sizes are as indicated in Figure6-7. Line 6G is the outlet line for the proposed Little Lake Retention Basin located at Stetson Avenue and Lake Street.

The first major step in implementing this plan would be to construct the Meridian Street Channel from the San Jacinto River to its connection with the Bautista Wash. The subsequent construction of Line 6B along Meridian Street from the Bautista Wash past Whittier Avenue would relieve existing flooding along this street. It would also pick-up surface flows not planned for in the San Jacinto plan. The additional lines shown could then be constructed as warranted by development, with proper outlets downstream already in place.

Valle Vista Area

As shown in Figure 6-8 after page 6-36, this subarea is located within the San Jacinto watershed. It is bounded on the north and the east by the San Jacinto River, on the west by the Bautista Creek channel and on the south by an area tributary to the greater Valle Vista area.

This drainage plan was originally developed by the RCFC&WCD as early as 1974. It has subsequently been revised by the same agency in 1981 to reflect approved developments that were contrary to the original land use assumptions assumptions. The plans have remained as in-house documents at the agency and have not been published. The plan has been reviewed, and updated as required by the Hemet master flood control planning effort. Its final recommended version is as shown on Figure 6-8.

Existing facilities consist of concrete channels and storm drains running along Georgia Avenue and Schultz Road that outlet into the San Jacinto River. Both were constructed in the mid-seventies by the RCFC&WCD. Recent residential development near the intersection of Chicago and Olive Avenue required construction a storm drain line to serve the first phase of the development as shown on Figure 6-8. The size of that line varies from 36 inches to 48 inches in diameter. The owner plans to eventually develop almost the entire area bounded by Chicago, Olive and Fairview Avenue. This development required that Line B be shifted from its original diagonal alignment through this property, to an alignment north to the San Jacinto River. Approval of tentative tract maps for this property will be required to convey associated flood flows to the San Jacinto River.

Since it is bordered on three sides by channels and rivers, this subarea is conveniently located for relatively easy discharge to proper drainage outlets downstream. Lines 7A-1 and 7A-2 are both concrete channels that are proposed to connect to the existing drainage facilities along Georgia Avenue and Schultz Road which

discharge into the San Jacinto River. Line 7B is the main outlet for drainage flows in the central Valle Vista area. It will receive flows from along Florida Avenue, and Palm Avenue by means of storm drain Lines 7B-1, -2, -3 and -4. The main line, 7B, begins at its uppermost point at Florida Avenue as a concrete-lined rectangular channel that continues to Palm Avenue. It extends 600 feet further as a concrete-lined trapezoidal channel and then transitions into an unlined trapezoidal channel section. It continues northerly for some 2,300 feet and then converts to a concrete-lined channel as velocities increase above 6 fps. Just upstream of the San Jacinto River the channel transitions into a 96-inch diameter underground storm drain with discharge to the San Jacinto River.

The lines comprising the 7C system all discharge into the Bautista Creek channel and are proposed as underground storm drains. Line 7C-1 varies in size from 30 inches to 66 inches in diameter and serves Whittier Avenue and its upper tributary area. Line 7C-2 varies in size from 36 inches to 51 inches in diameter and serves Mayberry Avenue and its surrounding area. The area between Acacia, Florida and Fairview Avenue is served by an existing concrete spillway at the Bautista Creek Channel and Florida Avenue. At such time that Florida Avenue has a curb and gutter installed along its southerly side, a catch basin and storm drain section would be needed at this location. Line 7C-3 varies in size from 27 inches to 42 inches in diameter and serves the area between Palm, Florida and Fairview Avenue. Line 7C-4 varies in size from 33 inches to 48 inches in diameter and serves the area between Cedar, Chicago and Olive Avenues.

The Corps of Engineers (COE), Los Angeles District, is currently in the planning and design stages of extending the Bautista Creek channel from just downstream of Florida Avenue to beyond Cedar Avenue. Both Lines 7C-3 and 7C-4 would be affected by this revision. Their profiles provided, in Appendix A, are based on preliminary information on this proposed extension. In addition,

a short 33-inch diameter storm drain will be stubbed out at the intersection of the channel with Olive Avenue as part of the COE project. The drain will serve the relatively small area between Olive, Chicago and Palm Avenue, and has a 100-year flow of 35 cfs.

Flood control facilities available at the present would allow the installation of the 7A and 7C lines. Both should be implemented as required by development. Storm relief along Palm and Florida Avenue are presently most critical and require the construction of Line 7B, and then its laterals 1 through 4.

Northwest Hemet Area

As shown in Figure 6-9 after page 6-40, the Northwest Hemet area is located within the San Jacinto watershed along its southerly boundary. It is bounded generally on the east by State Street, on the west by a line 1,500 feet west of Cawston Avenue, and on the north by the City of Hemet's Sphere of Influence.

The Northwest Hemet Area can only be served ultimately by a discharge to the San Jacinto River, some five plus miles to the north. As discussed under the West Hemet plan, it is physically possible to discharge drainage waters from this area through the Salt Creek drainage system because of the flatness of the terrain. However, such a solution could expose the constructing agency to potential liability and was discarded.

The most logical location of an exit facility to serve the area would be some type of channelization structure discharging approximately between Sanderson and Kirby, preferrably along a common property line. Determination of features of such an outlet facility is beyond the scope of this plan and would be completed at a later date when warranted by prospects of development.

The recommended plan herein includes all permanent facilities except for the interim Eaton Retention Basin as shown on Figure 6-9. The Eaton Retention Basin, located just west of the intersection of Kirby Street and Eaton Avenue, could be reduced in size or removed completely when the ultimate drainage facility discharging to the north is constructed. The Eaton Retention Basin has been sized for the 24-hour duration 100-year storm event without outlet discharge. Collected flood flows in the basin would be allowed to percolate into the ground or evaporate. In addition, temporary pumps could be utilized, if desired, to remove the collected waters at low flow rates with discharge to the existing streets after the storm has passed at rates approximating the existing flow rates. Drainage west and north of the retention basin will have to be picked up by facilities north of the City's Sphere of Influence.

Two alternatives to the recommended plan could be considered. The first would be to construct the outlet channel to the north without the interim retention basin. This alternative requires the construction of the entire channel prior to further development within the area and before the internal collection system is installed. Such a solution is not considered cost-effective and has been rejected at this time. Based on discussions with the RCFC&WCD, such a solution could not be implemented for a number of years. A second alternative would be to require that no future development in the planning area be allowed. While such an approach is certainly the least costly and logical approach if neither adequate downstream facilities or interim regulatory capacity are not available, it would impose the greatest burden on property owners desiring to develop their property. The recommended plan is a viable alternative that allows development upstream of the basin to proceed, with the entire collection system capable of being incorporated into an overall, ultimate drainage system discharging to the San Jacinto River which would also serve the intervening area.

The major features of the plan include an interim retention basin lying north of Eaton Avenue approximately halfway between Kirby and Sanderson Avenues, and a storm drain line along Eaton Avenue to just west of Palm Avenue. As noted earlier, the Eaton Retention Basin has been sized to retain the 100-year storm event without discharge. Its location, as indicated on Figure 6-9, could be relocated to the west if found to be in the public interest because of local land use development projects. The final location can be determined just prior to design work for the collection system. A series of separate, smaller interim retention basins could also be utilized, but their allocated costs to individual developments would be more costly, and as would their maintenance costs. The proposed interim retention basin as well as others which may be found feasible would all be subject to the provision of City of Hemet Resolution No.2108, dated June 8, 1982, if constructed and operated under city jurisdiciton.

The inlet line into the Eaton Retention Basin is a concrete-lined channel and runs easterly to Kirby Street. All of the other storm drain facilities in this plan are planned to be underground storm drains. The major line, 8B-1, then runs southerly along Kirby Street and then easterly along Eaton Avenue to just west of Palm Avenue. It receives flow along this reach from five laterals, 8B-6, 8B-5, 8B-4, 8B-3 and 8B-2. Their size varies from 33 inches to 54 inches in diameter and they would all be RCP.

The implementation of this plan requires construction of the Eaton Retention Basin and open channel portion prior to the installation or operation of the proposed tributary storm drain lines. The facility may be staged to permit its construction in increments to meet phased development needs. After its construction, Line 8B-1 could proceed upstream with laterals constructed as each is reached by the main line.

Estimated Costs

In order to determine the overall economic feasibility of the proposed drainage plan, it was necessary to prepare preliminary cost estimates for the proposed improvements. Cost estimates are based on the premise that all construction will be accomplished by competitively bid contracts.

Because of the wide diversity of costs of various components which enter into the construction of drainage facilities, it is necessary to establish a basis for cost estimates which will measure the effects of wage rates and material prices at a particular location and point in time.

The Engineering News-Record magazine (ENR), a weekly publication for the construction industry, publishes index numbers which reflect a compilation of changes in construction costs. These indices are based on a weighted average of costs of key construction materials and labor on national and regional levels. The cost of construction work has risen considerably in past years. It is not expected to continue at high rates, but it will continue to escalate. To ensure that all costs are comparable, an ENR index figure of 4934 for the Los Angeles Area has been adopted for cost data presented herein, and is believed to be representative of conditions expected to prevail in the winter of 1983 for the Hemet area. Estimates may be updated in future years by adjustment of the costs to conform to the then-current index value.

Storm drainage facilities costs were developed from bid tabulations from previous construction projects, contractor contacts, and other published data, including current construction data from the files of the RCFC&WCD. All costs were adjusted to reflect a cost level prevailing in the winter of 1983. These costs include furnishing, laying, and jointing of reinforced concrete pipe, installing unreinforced concrete slabs for lined channel, excavation and backfill, bedding material, manholes,

connections to existing pipes, pavement replacement, some interference with existing utilities, and contractors overhead and profit. Bridges have been included in the construction cost for all open channels as needed for street crossings.

The subarea drainage plans are based on the assumption that underground storm drains will be constructed in the existing street right-of-way. Additional rights-of-way will be required for open channels and proposed retention basins constructed on private land. Values for rights-of-way have been included in plan costs. A real estate appraiser was employed for this study to complete a market survey of areas where open channels and retention basins would be located in the study area. Values developed from this survey have generally been used for right-of-way costs, and are as indicated in Table 6-1. Estimated rights-of-way costs utilized by the RCFC&WCD have also been reviewed and incorporated herein where appropriate. Costs presented in Table 6-1 are applicable to construction work on existing privately-owned land, and are not applicable to construction work to accomplish in city streets, county roads and other rights-of-way already owned by public agencies.

In preliminary engineering studies, it is not possible to conduct the analysis to the detail necessary to define the exact location or all potential conditions of development which could have a substantial bearing on the cost of the proposed work. To allow for unforeseen difficulties or variations from study plans, a percentage of the preliminary estimate is often added for contingencies. This same procedure is also used to estimate the cost of engineering design and supervision of construction. While the larger the project the lower the percentage is likely to be, a 30 percent allowance for all such costs has been used for planning purposes. The total cost for each subarea, including, both construction and right-of-way costs, are shown in Table 6-2.

TABLE 6-1

ESTIMATED RIGHT-OF-WAY COSTS

HEMET DRAINAGE STUDY AREA

Area	Range of Probable Costs in dollars per acre
San Jacinto River Area	$ 9,000 - 12,000
Central Hemet Area	10,000 - 14,000
West Hemet/Devonshire Ave.	6,000 - 10,000
West Hemet/SD Aqueduct Channel	4,000 - 8,000
Southwest Hemet/Warren Rd.	5,000 - 9,000
Salt Creek/Sanderson Ave.	6,000 - 9,000
Upper Salt Creek/Palm Ave.	6,000 - 8,000
Pepper Creek/State St.	7,000 - 11,000
Pepper Creek/Stanford St.	8,000 - 12,000

TABLE 6-2

HEMET MASTER FLOOD CONTROL AND DRAINAGE PLAN

COST SUMMARY - ALL SUBAREAS

(ENR INDEX 4934)

Subarea	Master Plan Cost*
Central Hemet (I)	$ 23,339,000
West Hemet (II)	14,429,000
Southwest Hemet (III)	9,187,000
South Hemet (IV)	32,650,000
San Jacinto (V)	9,043,000
Little Lake (VI)	13,310,000
Valle Vista (VII)	4,581,000
Northwest Hemet (VIII)	4,513,000
TOTAL	$111,052,000

* Includes construction and, right-of-way costs, and 30% for engineering, administration, and contingencies

A detailed cost summary for each subarea follows in Tables 6-3 through 6-10.

TABLE 6-3 [1/]

CENTRAL HEMET - AREA I

COST SUMMARY

(ENR INDEX 4934)

Facility	Construction Cost*	Right-Of-Way	Master Plan Cost
Line A (Hemet Channel)	$ 6,430,000	-0-	$ 6,430,000
Line A (Florida Avenue)	425,000	-0-	425,000
Line A-2	424,000	-0-	424,000
Line A-3	1,634,000	$33,000	1,667,000
Line A-3a	124,000	-0-	124,000
Line A-3b	227,000	-0-	227,000
Line A-6	340,000	-0-	340,000
Line A-7	92,000	-0-	92,000
Line B	1,951,000	-0-	1,951,000
Line B-1	191,000	-0-	191,000
Line B-2	291,000	-0-	291,000
Line C	3,369,000	-0-	3,369,000
Line C-1	362,000	-0-	362,000
Line C-2	231,000	-0-	231,000
Line C-3	192,000	-0-	192,000
Line D	5,128,000	-0-	5,128,000
Line D-1	948,000	-0-	948,000
Line D-2	96,000	-0-	96,000
Line D-3	123,000	-0-	123,000
Line D-4	176,000	-0-	176,000
Line D-5	209,000	-0-	209,000
Line D-6	202,000	-0-	202,000
Line D-9	141,000	-0-	141,000
TOTAL	$23,306,000	$33,000	$23,339,000

[1/] See Figure 6-1 on page 6-3

* Includes 30% for engineering, administration, and contingencies

TABLE 6-4 [1/]

WEST HEMET - AREA II

COST SUMMARY

(ENR INDEX 4934)

Facility	Construction Cost*	Right-Of-Way	Master Plan Cost
Line A	$ 1,235,000	$ 230,000	$ 1,465,000
Line A-1	273,000	-0-	273,000
Line C	1,719,000	136,000	1,855,000
Line C-1	1,316,000	-0-	1,316,000
Line C-2	424,000	-0-	424,000
Line C-3	1,813,000	-0-	1,813,000
Line C-4	85,000	-0-	85,000
Line C-5	82,000	-0-	82,000
Line C-6	107,000	-0-	107,000
Line C-7	412,000	-0-	412,000
Line C-8	268,000	10,000	278,000
Line D	1,142,000	58,000	1,200,000
Line E	1,866,000	276,000	2,142,000
Line E-1	487,000	-0-	487,000
Devonshire Basin	1,890,000	600,000	2,490,000
TOTAL	$13,119,000	$1,310,000	$14,429,000

[1/] See Figure 6-2 on page 6-7

* Includes 30% for engineering, administration, and contingencies

TABLE 6-5 [1]

SOUTHWEST HEMET - AREA III

COST SUMMARY

(ENR INDEX 4934)

Facility	Construction Cost*	Right-Of-Way	Master Plan Cost
Line A	$1,262,000	$ 38,000	$1,300,000
Line A-1	522,000	12,000	534,000
Line A-2	46,000	2,000	48,000
Line A-3	70,000	3,000	73,000
Line A-4	69,000	3,000	72,000
Line B	1,429,000	73,000	1,502,000
Line B-1	263,000	10,000	273,000
Line B-1A	127,000	3,000	130,000
Line B-2	320,000	10,000	330,000
Line B-2A	72,000	4,000	76,000
Line B-3	73,000	4,000	77,000
Line B-4	73,000	4,000	77,000
Line B-5	103,000	6,000	109,000
Line B-6	90,000	5,000	95,000
Line C	680,000	15,000	695,000
Line D	449,000	11,000	460,000
Line E	155,000	2,000	157,000
Line F	48,000	1,000	49,000
Line G	7,000	-0-	7,000
Line H	72,000	2,000	74,000
Line I	236,000	10,000	246,000
Line J	88,000	3,000	91,000
Line K	434,000	18,000	452,000
Line L	619,000	26,000	645,000
Line M	552,000	20,000	572,000
Line N	262,000	13,000	275,000
Line O	130,000	4,000	134,000
Line P	544,000	18,000	562,000
Line P-1	69,000	3,000	72,000
TOTAL	$8,864,000	$323,000	$9,187,000

[1] See Figure 6-3 on page 6-11

*Includes 30% for engineering, administration and contingencies

TABLE 6-6 1/

SOUTH HEMET - AREA IV

COST SUMMARY

(ENR INDEX 4934)

Facility	Construction 2/ Cost	Right-Of-Way	Master Plan Cost
Salt Creek Patterson Ave. to Lyon Ave.			
(Ultimate)	$9,700,000	$2,400,000	$12,100,000
(Interim) 4/	1,289,000	1,707,000	2,996,000
Salt Creek Lyon Ave. to Newport Ave. 3/	8,500,000	328,000	8,828,000
Line A (Cactus Valley)	2,600,000	100,000	2,700,000
Line B (Avery Canyon) 3/	4,050,000	204,000	4,254,000
Line C (Pepper Creek)			
(Ultimate)	4,500,000	268,000	4,768,000
(Interim) 4/	4,288,000	1,326,000	5,614,000
TOTAL Ultimate	$29,350,000	$3,300,000	$32,650,000
Interim	$5,577,000	$3,033,000	$8,610,000

1/ See Figure 6-4 on Page 6-19

2/ Includes 30% for engineering, administration and contingencies. Also includes costs first stage bridges at State Street, Lyon Avenue, Sanderson Avenue and Simpson Street

3/ Portions of Interim construction and R/W costs for these areas included in Line C (Pepper Creek)

4/ Interim project includes interim facilities currently proposed by the Hemet Redevelopment Agency.

TABLE 6-7 1/

SOUTH HEMET - AREA IV

COST SUMMARY

Greenbelt Alternative (Lyon Avenue to State Street)

(ENR INDEX 4934)

Facility	Construction 2/ Cost	Right-Of-Way	Master Plan Cost
Lyon Ave. Recreational 3/ Lake & Lake Oriented Recreational Park	$2,817,100	$ 833,000	$3,650,100
Grasslined Swale 4/	1,097,200	492,800	1,590,000
Golf Course 5/	2,080,000	Incl. above	2,080,000
Palm Ave. Bridge 6/ (2-lane)	464,100	N/A	464,100
State Street Bridges 6/			
Pepper (4-lane)	521,000	N/A	521,000
Avery (4-lane)	338,000	N/A	338,000
Lyon Ave. Bridge 6/ (2+2 lane)	714,000	N/A	714,000
Lyon Ave. Drop 6/ Structure	455,000	N/A	455,000
TOTAL	$8,486,400	$1,325,800	$9,812,200

1/ See Figures 6-5A and 6-5B, pages 6-21 and 6-23

2/ Includes 30% for engineering, administration and contingencies.

3/ Expanded version of the interim retention basin above Lyon Avenue, for which costs are included in Table 6-6.

4/ Would replace the riprap and concrete-lined channels assumed for Pepper Creek/Avery Canyon in Table 6-6, and includes all associated rights-of-way costs.

5/ Not included in Table 6-6. Rights-of-way costs included with grasslined swale costs.

6/ Included with associated features listed in Table 6-6, but listed herein for purposes of planning a staged construction program.

TABLE 6-8 [1/]

SAN JACINTO AREA - AREA V

COST SUMMARY

(ENR INDEX 4934)

Facility	Construction Cost*	Right-Of-Way	Master Plan Cost
Line A	$1,674,000	$ 72,000	$1,746,000
Line A-1	177,000	-0-	177,000
Line A-2	204,000	-0-	204,000
Line A-3	135,000	-0-	135,000
Line B	736,000	32,000	768,000
Line B-1	365,000	-0-	365,000
Line C	2,539,000	105,000	2,644,000
Line C-1	630,000	-0-	630,000
Line C-2	111,000	-0-	111,000
Line C-3	35,000	-0-	35,000
Line C-4	911,000	-0-	911,000
Line C-5	93,000	-0-	93,000
Line E-2	973,000	-0-	973,000
Line F	128,000	-0-	128,000
Line F-1	123,000	-0-	123,000
TOTAL	$8,834,000	$209,000	$9,043,000

[1/] See Figure 6-6 on page 6-29

* Includes 30% for engineering, administration, and contingencies

TABLE 6-9 [1]

LITTLE LAKE - AREA VI

COST SUMMARY

(ENR INDEX 4934)

Facility	Construction Cost*	Right-Of-Way	Master Plan Cost
Line A	$ 1,674,000	-0-	$ 1,674,000
Line B	3,990,000	-0-	3,990,000
Line C	785,000	-0-	785,000
Line D	839,000	-0-	839,000
Line E	529,000	-0-	529,000
Line F	542,000	-0-	542,000
Line G	1,008,000	-0-	1,008,000
Line H	471,000	-0-	471,000
Line J	254,000	-0-	254,000
Line K	119,000	-0-	119,000
Line L	442,000	-0-	442,000
Bautista Wash	-	$316,000	316,000
Meridian St. Channel	1,810,000	146,000	1,956,000
Little Lake Basin	320,000	65,000	385,000
TOTAL	$12,783,000	$527,000	$13,310,000

[1] See Figure 6-7 on page 6-33

* Includes 30% for engineering, administration and contingencies

TABLE 6-10 [1/]

VALLE VISTA - AREA VII

COST SUMMARY

(ENR INDEX 4934)

Facility	Construction Cost*	Right-Of-Way	Master Plan Cost
Line A-1	$ 579,000	$ 59,000	$ 638,000
Line A-2	132,000	10,000	142,000
Line B	930,000	76,000	1,006,000
Line B-1	604,000	-0-	604,000
Line B-2	171,000	-0-	171,000
Line B-3	88,000	-0-	88,000
Line B-4	294,000	-0-	294,000
Line C-1	770,000	-0-	770,000
Line C-2	378,000	-0-	378,000
Line C-3	310,000	-0-	310,000
Line C-4	180,000	-0-	180,000
TOTAL	$4,436,000	$145,000	$4,581,000

[1/] See Figure 6-8 on page 6-37

* Includes 30% for engineering, administration, and contingencies

TABLE 6-11 [1/]

NORTHWEST HEMET - AREA VIII

COST SUMMARY

(ENR INDEX 4934)

Facility	Construction Cost*	Right-Of-Way	Master Plan Cost
Line B-1	$1,528,000	$18,000	$1,546,000
Line B-2	472,000	-0-	472,000
Line B-3	443,000	-0-	443,000
Line B-4	200,000	-0-	200,000
Line B-5	196,000	-0-	196,000
Line B-6	130,000	-0-	130,000
Eaton Retention Basin	1,210,000	$316,000	1,526,000
TOTAL	$4,179,000	$334,000	$4,513,000

[1/] See Figure 6-9 on page 6-41

*Includes 30% for engineering, administration, and contingencies

Construction Staging Program

A well-developed construction program must address the short- and long- term drainage needs of the city. Due to the nature of flood control facilities it is normally prudent to construct downstream facilities prior to the upstream facilities. The recommended plan follows that requirement and also maximizes the benefits to existing flood-prone property within the existing city limits. This section will outline a priority for construction of the ultimate drainage plan within the study area.

Priority rankings presented herein are not intended to suggest that the need for drainage facilities in a flood-prone, developed area within unincorporated territory is less than the need for such facilities within the corporate city limits. Rather, the ranking system discussed in the following paragraphs is intended to suggest a priority of expenditure of city financial resources as a rational means of reducing the monumental costs of the accumulated need for drainage facilities. As will be discussed in Chapter VII, financial resources from the RCFC&WCD and other sources will be required to complete the construction program recommended herein. As will be discussed, however, the city's financial resources are extremely limited, and should be expended outside the city limits in only those instances where such an expenditure can be shown to be in the public interest of the City of Hemet. The priority rankings presented in Table 6-12 should be revised only after careful consultation with the RCFC&WCD so as to maintain a ranking system that best meets the needs of the city's entire Sphere of Influence.

The overall objective of the program is to first construct downstream facilities that are needed to receive flows from within the city limits. The program has been divided into the two watersheds, the Salt Creek and the San Jacinto. The program for the Salt Creek Watershed must have the extension of the Salt Creek Channel from Lindenberger Road to Patterson Avenue as a prerequisite for its successful completion. Table 6-12 provides

TABLE 6-12

CONSTRUCTION STAGING PROGRAM

SALT CREEK WATERSHED

Priority No.	Facility	Limits, Subarea
1	Salt Creek Channel	Patterson Ave. - Lyon Ave., IV
2	Salt Creek Channel	Lyon Ave. - Newport Rd., IV
3	Line 4A,B	Complete, IV
4	Line 4C	Line 4B - State St., IV
5	Line 1A	Patterson Rd. - Cawston Ave., I
6	Line 1D	Line 1A - Cawston Ave., I
7	Line 1A-3	Complete, I
8	Line 1A-3 a & b	Complete, I
9	Line 1C & Laterals	Complete, I
10	Line 1D & Laterals	Complete, I
11	Line 1B & Laterals	Complete, I
12	Line 1A	San Jacinto St. - Yale St., I
13	Line 2A	Complete, II
14	Devonshire Retention Basin	Complete, II
15	Line 2C	Complete, II
16	Line 2C-1 & Laterals	Complete, II
17	Line 2C-3 & Laterals	Complete, II
18	Line 2D	Complete, II
19	Line 3E	Complete, III

Priority	Facility	Limits, Subarea
20	Line 3A & Laterals	Complete, III
21	Line 3C	Complete, III
22	Line 3B & Laterals	Complete, III
23	Line 2E & Laterals	Complete, II
24	Line 4C	State St. - Pleasant St., IV
25	Line 3D, G, H, I, J, K, L, M, N, O, & P	Complete, III

a ranking and/or relative priority of facilities based on the principles stated above for the Salt Creek Watershed. The priorities only consider ultimate facilities. Interim facilities have not been considered. Priorities presented in Table 6-12 should be subject to review on an annual basis.

The San Jacinto Watershed within the subject study area is such that the four subareas noted are somewhat independent of each other as far as drainage is concerned. The Valle Vista area (VII) has no drainage impact on the property within the existing city limits and would therefore have a lower priority in this analysis. Facilities generally north of the Bautista Wash which are in the Little Lake Area (VI) also have very little impact on the City and would also have a lower priority. The facilities within the San Jacinto Area (V) require extensive downstream facilities outside of the study area. For this analysis, those are facilities considered a prerequisite for construction of the San Jacinto facilities. The priorities have been developed assuming these downstream facilities are in place. Their priority should be adjusted if that is not the actual case. Table 6-13 provides a ranking of all major facilities within the San Jacinto watershed for the established study area which are of immediate concern to the area within the existing city limits.

TABLE 6-13

CONSTRUCTION STAGING PROGRAM

SAN JACINTO WATERSHED [1]

Priority	Facility	Limits, Subarea
1	Meridian St. Channel	Complete, VI
2	Line 6B	Complete, VI
3	Line 5C	Study limit - San Jacinto, V
4	Line 5C-4	Complete, V
5	Line 5E-2	Complete, V
6	Line 5B, 5B-1	Complete, V
7	Line 5A & Laterals	Complete, V
8	Eaton Retention Basin	Complete, VIII
9	Line 8B-1 & Laterals	Complete, VIII
10	Line 6B-1, 2, 3 & 4	Complete, VI
11	Line 6G	Complete, VI
12	Little Lake Retention Basin & Line 6K	Complete, VI
13	Line 6H & L	Complete, VI

[1] All area V facilities require downstream facilities to be in-place prior to its construction except Line 5A & Laterals.

HEMET7

CHAPTER VII
FUNDING AND IMPLEMENTATION

Presented and discussed in this chapter are various financing and institutional alternatives available for implementation of the component features of the recommended flood control and drainage plan. In addition to conventional and modified pay-as-you-go approaches to capital funding, the chapter analyzes currently viable longer-term financing vehicles most likely of success. Included in the latter section is a discussion of various assessment programs based on the calculation of assessment of definable benefits accruing to a particular area or group of properties as a result of construction of a project. Finally, the chapter presents recommendations on the use of financial and institutional vehicles considered most likely to be successful.

Sources of Funding

Traditionally several revenue sources have been utilized for funding or financing the construction and installation of flood control and drainage facilities. While some of the following methods may not be appropriate for funding the Hemet Master Flood Control and Drainage Project, an attempt has been made initially to identify all alternatives:

Developer/Subdivision Fees and Contributions - Developer/subdivision fees, as well as in lieu developer contributions, have become even more popular with the advent of Proposition 13. With the reduced reliance on ad valorem taxes, public agencies are shifting responsibility for financing public facilities to developers and subdividers who create the need for these facilities and/or share in the benefit of those facilities already installed. However, the public agencies must create an equitable basis for determining the financial burden to be imposed on the developer/subdivider. If the fees are properly structured and are based upon a reasonable improvement plan, this

method is particularly useful where varying degrees of flood control benefit may exist. In many cases, the establishment of multiple zones of benefit may be appropriate. Developer fees can be used to fund pay-as-you-go programs or to mitigate assessment levies as a result of financing improvements through the issuance of improvement bonds. However, because of the uncertainty of future development timing and level of development, developer fees cannot be used as a single revenue source for the repayment of long-term municipal debt.

Developers "buy-ins" or payment for facilities necessary to be constructed may be in the form of cash, in lieu construction, rights-of-way, or agreements to maintain facilities for a specified time (or any combination thereof). Agreements can be established which provide for the developers to advance or incur the full cost of facilities but to be reimbursed, in part or in whole, over a stated period of time by others who will ultimately benefit in the use of the facilities. Additionally, public agencies can agree to contribute a portion of the cost of the facilities from other sources of funds which are available to them. However, the public agency's participation should be based upon some equitable formula.

Special Assessments - Another method for funding the cost of construction and installation of flood control and drainage facilities is through the use of special assessments. A determination is made of the benefit that lands will receive from the construction and installation of the improvements. Property assessments are made based upon this determination and result in liens placed against properties (unless cash payment is made) which are used as security for payment of the assessments. Certain procedural acts permit annual assessments (one year) while other acts permit assessments to be levied and collected over a period of years resulting in the financing of the improvements. As in the case of developer fees, it is extremely important to determine the actual benefit that each parcel will

receive from the improvement or improvements and be assessed the proportionate fair share of the cost.

Some general law special district enabling acts as well as several individual special district acts currently contain powers permitting the levy of assessments on either a land area or land use basis. The County Service Area Law (California Government Code, Sections 25210.1 through 25211.33) enables the use of special assessments for financing the maintenance of drainage improvements, and several of the special act agencies now permit assessment levies on the basis of land area for various project purposes.

Tax Increment - In areas where a redevelopment agency has been formed, tax increment has been used to finance and pay for the construction of flood control and drainage facilities (Section 33670 of California Health and Safety Code). Tax increment can be used as a pay-as-you-go basis or as security in the issuance by the public agency of tax allocation bonds resulting in long-term financing of the improvements.

Other Revenue Sources - Historically, many flood control and drainage facilities were financed and paid for by imposing ad valorem taxes. Proposition 13 has put a virtual halt to this revenue source in the State of California. However, revenue received by public agencies representing their share of ad valorem taxes can be used to pay for flood control and drainage facilities. Similarly, any and all lawful revenue sources can be used and directed to pay for the construction, installation, and maintenance of flood control and drainage facilities.

Funds could also be pooled with other public agencies (i.e., Riverside County Flood Control and Water Conservation District) which have the responsibility of flood control. Additionally, grants and loans from the federal and state goverments (U.S. Corps of Engineers, Soil Conservation Service, Housing and

Community Development Block Grants, Hemet Redevelopment Agency; etc.) may become available for Hemet flood control and drainage facilities. However, no reliance can be placed on these sources of funds since future funding or assistance is uncertain unless funds are committed by enforceable agreements.

While the funding vehicles presented above were discussed separately, in many cases these revenue sources can be combined and/or phased to allow for a combination of revenue sources which permit public agencies to pay for facilities as needed. The decision to construct facilities on a pay-as-you-go basis versus a long-term financing, bears a direct relationship to the time constraints for construction of the facilities and the projected revenue stream. In many cases, a combination of pay-as-you-go and long-term financing is utilized, particularly where development pressures exist.

Financing Vehicles

The following is a description of the financing vehicles which could be used to fund the construction and installation of some or all of the flood control and drainage facilities under the Master Flood Control and Drainage Program:

Developer/Subdivision Fees and Contributions - Developer/-subdivision fees are included as a financing vehicle inasmuch as they may be used on a pay-as-you-go basis as well as supplemental revenue source to mitigate the annual costs associated with the use of other financing vehicles. Developer/Subdivision Fees and Contributions:

1. Have always been popular - more so since Proposition 13.

2. May be in form of cash, in lieu construction, rights-of-way, or agreements to maintain for specified periods of time.

3. Require an improvement plan or equitable basis for determining burden to be imposed on developer/subdivider.

4. Can provide for cost-sharing among several developers/property owners.

5. By agreement, can provide for developer to incur full cost of facility, but be reimbursed, in part or in whole, over stated period of time.

6. City can agree to contribute to cost of facility or facilities, from any lawful source of funds. The basis for the City's participation should be formulated on some rational or uniform approach.

Benefit/Fee Districts - The Benefit Assessment Act of 1982 (Chapter 487, Stats 1982) authorizes cities and counties, special districts or other municipal corporations or districts to levy an assessment under specified circumstances to finance "drainage services, including the installation, improvement, operation, and maintenance of drainage facilities" and "flood control services, including operation and maintenance of facilities". The Act requires that the assessment imposed on any parcel of property shall be related to the benefit to the parcel which will be derived from the provision of the service. In addition, the annual aggregate amount of the assessment shall not exceed the estimated annual cost of providing the service and the revenue derived from the assessment shall not be used to pay the cost of any service other than the service for which the assessment was levied.

The legislative body of a local agency may by ordinance, adopted after notice and public hearing, determine and propose for adoption an annual assessment on each parcel of real property

within the jurisdiction of the local agency except that the governing body shall not impose an assessment upon a federal or state governmental agency or another local agency.

The legislative body may restrict the imposition of the assessment to areas lying within one or more zones or areas of benefit established within the local agency.

The benefit assessment shall be levied on a parcel, class of improvement to property, or use of property basis, or a combination thereof, within the boundaries of the local agency, zone, or area of benefit.

The assessment may be levied against any parcel, improvement, or use of property to which such services may be made available, whether or not such service is actually used.

Whenever a railroad, gas, water, or electric utility right-of-way or electric line right-of-way is included within an area proposed to be assessed, the railroad, gas, water, or electric utility right-of-way or electric line right-of-way shall be subject to the assessment only if, and to the extent that, it is found that it will benefit from the service, and the railroad, gas, water, or electric line right-of-way shall be subject to the same penalties, and the same procedure and sale, in the event of delinquencies, as other parcels in the assessment area. In determining whether or not the railroad, gas, water, or electric utility right-of-way or electric line right-of-way benefits from the services provided, its use as a right-of-way for a railroad, gas, water, or electric utility shall be presumed to be permanent.

For the first fiscal year in which a benefit assessment is proposed to be imposed, the legislative body shall cause a written report to be prepared and filed with the clerk of the local agency which shall contain:

1. A description of the service proposed to be financed through the revenue derived from the assessment.

2. A description of each lot or parcel of property proposed to be subject to the benefit assessment.

3. The amount of the proposed assessment for each parcel.

4. The basis and schedule of the assessment.

The clerk shall cause notice of the filing of the report and of a time, date, and place of hearing thereon to be published pursuant to California Government Code, Section 6066 and posted in at least three public places within the jurisdiction of the local agency.

At the hearing, the legislative body shall hear and consider all protests. At the conclusions of the hearing, the legislative body may adopt, revise, change, reduce, or modify the proposed assessment. The legislative body shall make a determination upon the assessment as described in the report or as determined at the hearing and shall, by ordinance, determine the proposed assessment.

The proposition shall be submitted to the eligible voters within the jurisdiction of the affected local agency, zone, or area of benefit established by the local agency, and shall take effect upon approval of a majority of the voters voting on the proposition. The legislative body may annually thereafter determine the cost of the service which is financed by the assessment and, by ordinance, determine and impose the assessment.

If the assessments are collected by the county, the county may deduct its reasonable costs incurred for the service before remittal of the balance to the local agency's treasury.

Notwithstanding, the Benefit Assessment Act of 1982, as amended, the levying of benefit assessments for flood control services by counties was authorized by Chapter 10 (commencing with Section 60400) Division II, Title 10, California Government Code. This Chapter was added to the statutes by AB 549 (Frazee), and was signed by the Governor on July 16, 1979.

The following are some of the impacts and factors to be considered when using benefit assessment districts:

1. The cost to landowners is usually based on one or more of the following;
   a. Land area;
   b. Flood hazard; and
   c. Contribution to downstream flood problems.

2. Increased attractiveness since adoption of Proposition 13. Cost not based on value of improvements.

3. More difficult to implement in developed areas.

4. Very useful for pay-as-you-go programs.

5. Not suitable for support of bonding programs.

6. Offers convenient and inexpensive means of apportioning costs. Requires separate assessment role.

7. Requires a majority vote of electors voting at the required election.

Special Assessment Districts - Special Assessment Districts are a popular method of financing drainage facilities, where the costs can be equitably apportioned according to the degree of benefit received. Special Assessment Districts are used either as a sole method of drainage facility financing or in combination with a pay-as-you-go program. Bonds issued pursuant to the Improvement Act of 1911 or the Improvement Bond Act of 1915 do not require voter approval, but rather involve notice and public hearings. Except under certain conditions, a majority of property owners protesting the assessment would negate the proceedings.

Basically, the method involves an allocation of the costs of a project on the land to be benefited by the proposed improvements. After the assessment is confirmed by the City Council, the property owner has 30 days during which he may pay all or part of his assessment in cash. Unpaid assessments of more than $150 then go to bond. According to law, the bonds may be prepaid on any interest payment date by paying 105 percent of the then outstanding principal balance plus accrued interest.

The statutory maximum interest rate permitted on assessment bonds issued by the City is 12 percent. No constraints, other than economics, apply to the amount of discount which can be bid.

Special assessment districts have proven to be the most successful where the benefits are clearly defined and where there is a common economic interest in providing the proposed facilities. Accordingly, such programs become increasingly difficult to use with larger geographic areas of diverse economic interests.

Flood Control District Zones - The Riverside County Flood Control and Water Conservation District was formed in 1945. Since that time, the County Flood Control District has constructed about $60,000,000 in flood control facilities which it now operates and maintains. In addition, the County Flood Control District has identified in their Master Plan approximately $215,000,000 of

flood control facilities that will be required in existing Zone 4 which covers Perris Valley, Moreno Valley and the entire San Jacinto Valley.

Zone 4 of the County Flood Control District is:

1. Governed by the Board of Supervisors;

2. Served by an advisory Zone Commission appointed by the Board of Supervisors;

3. Administered as a unit of the Riverside County Flood Control and Water Conservation District;

4. Staffed with trained personnel;

5. Coordinates local programs with federal programs; and the RCFC&WCD Act permits the use of improvement districts, with boundaries independent of zone boundaries.

In a report on the subject, "Benefit Assessment for Flood Control", dated February, 1982, the RCFC&WCD identified a total revenue available in constant 1982 dollars for Zone 4 of $21,200,000. As a result of their analysis of priority projects, the report concluded that the financial resources of the District are adequate to operate and maintain the existing flood control system but that there are insufficient revenues available for the construction of needed flood control facilities for the next 15 years. As a result, the report concludes that a solution to the short-fall is to establish a Flood Control Benefit Assessment Program and that the assessments on Zone 4 be on a zone-wide basis. The Report also recommended that the County Board of Supervisors consider continuing the allocation of Special District Augmentation Funds "to needed projects in the zones to the extent such funds are available to the Board for distribution thereby closing the gap between funds available through the

Benefit Assessment Program and the actual needs for flood control improvements".

Based on further discussion with community leaders throughout the Zone 4 area, the Board of Supervisors subsequently concluded that the benefit assessment program would have a greater chance for success if the benefit assessment funds were collected and allocated within these principal watersheds of Zone 4. At the Boards' direction, a second report entitled, "Zone 4 Benefit Assessment for Flood Control", dated October 1982, was prepared which identified a 15-year expenditure of approximately $33,680,000 within the combined Salt Creek - San Jacinto River watersheds, or approximatley $125,052,000 total master plan cost between the two watersheds, as detailed below.

	Salt Creek Watershed	San Jacinto River Watershed	Total for Zone 4
15 year Income from Assessments	13,600,000	12,590,000	40,180,000
15 year Capital Tax Incrememt	4,280,000	3,210,000	11,900,000
15 year Total Program	17,880,000	15,800,000	52,080,000
Master Plan Costs	68,018,000	57,033,000	215,343,000

Even with the 15-year income from the benefit assessment program noted above, together with ad valorem tax increment funds, area drainage charges and interest income, in the report concluded there would still have been a short-fall of some $56,700,000 within Zone 4 as a whole over the 15-year period.

As noted in Chapter 1, steps were subsequently taken by the County Board of Supervisors to implement a Benefit Assessment

Program within the three principal watersheds of Zone 4 of the RCFC&WCD, including separate zones encompassing the San Jacinto and Salt Creek watersheds. Although the proposition to implement the benefit assessment failed to receive a favorable majority vote at the special election held on March 8, 1983, the rejected vehicle is still considered as one of the most efficient means of financing the cost of correcting the large backlog of drainage problems facing the City of Hemet and environs. However, until a more favorable political climate exists, use of the benefit assessment program must be deferred in favor of other more viable and currently implementable approaches.

Community Services Districts - Community Services Districts are formed pursuant to Government Code, Title 6, Division 2, comprising Sections 61000-61802. A "CSD" may be formed pursuant to this authority. However, the purposes which may be exercised by a CSD do not specifically include flood control. However, CSD's are permitted to provide services related to flood control.

County Service Areas - County Service Areas are formed pursuant to Government Code Sections 25210.1 through 25211.33. As noted in a March 31, 1982 letter from Patrick Conkey, Deputy County Counsel, County of Riverside, to Mr. Ken Edwards, Chief Engineer, Riverside County Flood Control and Water Conservation District, the County Counsel's Office has rendered an opinion that the County Service Area Act "does not specifically authorize the formation of a County Service Area for the operation and maintenance of flood control improvements. The authorized miscellaneous extended service of Soil Conservation and Drainage Control (Government Code Section 25210.4a(10)) does not specifically contemplate the formation of a County Service Area for flood control services".

Although other California counties have employed County Service Areas for such purposes in the past, it appears that the County Counsel's opinion would effectively deny the use of such a

vehicle in Riverside County until the Act could be amended to specifically authorize the provision of flood control services to be financed through both ad valorem taxes and assessments.

Redevelopment Authorities - The California Community Redevelopment Law (pursuant to California Health and Safety Code commencing with Section S33000) provides that any city can establish a redevelopment agency by independent action of the City Council. The "Agency's" purpose is to "eliminate and prevent the spread of blight and deterioration in the Project Area". And, is empowered to use "all the powers provided in the Redevelopment plan and all the powers how or hereinafter permitted by law". Redevelopment Agencies have the capacity to fund and finance Capital Improvement Projects within the project area with the proceeds of tax increments, the issuance of bonds and notes, loans or grants, which are all subject to the financing limitations of the Community Redevelopment Law.

Joint Exercise of Power Agreements (JPA) - Joint Exercise of Power Agreements are authorized under Joint Exercise of Powers Act (Government Code Sections 6000 et seq.). A JPA could provide a vehicle for joint city/county flood control district administration of the flood control plan in concert with one or more of the above programs. This is in addition to general powers of the participants. A JPA is relatively easy to implement and requires only the agreement of the parties. Participants cannot achieve through a JPA what they cannot do individually, but they can merge their efforts to do more effectively what they can do separately. JPA financing programs require separate procedures as with most other vehicles.

Under existing statutes, JPA financing for flood control purposes is applicable only to counties having a population of between 1,000,000 - 1,070,000. Section 6546.6 of the Government Code would have to be amended to permit its use in Riverside County.

Other Institutional Alternatives - With reference to the previously noted correspondence dated March 31, 1982, from Patrick Conkey, Deputy County Counsel, to Mr. Ken Edwards, Chief Engineer, Riverside County Flood Control and Water Conservation District, the City might investigate the possibility of funding operation and maintenance costs of flood control improvements through the formation of a Special Municipal Tax District as formed pursuant to Chapter VI (commencing with Section 6000) of Article 1, Division 2, of the Government Code, or a maintenance area formed pursuant to Chapter 4.5 (commencing with Section 12878) of Part 6 of Division 6 of the Water Code.

The City might also consider sponsoring an amendment to the CSA Act whereby the specific objections of the County Counsel concerning the use of the CSA Act for the installation or maintenance of flood control facilities could be overcome. Such a proposed amendment could generate both support and opposition throughout the State of California.

Summary - Based upon the foregoing analysis, it appears that none of the funding or financing vehicles can, in themselves, provide the needed capital and financing of the construction and maintenance of the needed flood control improvements. It appears likely that the best interest of the City of Hemet will be served if the vehicle(s) chosen for implementing the Master Flood Control and Drainage Plan within the City and in the tributary and downstream unincorporated areas has the assurance of perpetual succession unless agreed upon by both the City and the County. It is not necessary that the vehicle be a single entity, since both the City and the County have adequate powers and financial resources that could be employed to implement the plan in their separate areas. Thus, the vehicle could be a Joint Powers Agreement or any other simple agreement between the City and the County whereunder they jointly agree to accomplish a specified series of tasks in a specified manner and within a specified time frame and in a manner such that they are able to

achieve a superior project or objective that could be the case if they acted independently.

Recommended Priorities for Project Funding

As noted previously the combination of the tremendous backlog of needed flood control and drainage facilities and the restraints imposed on local California agencies with respect to the acquisition of capital funds for public works projects require that a combination of funding sources be utilized for implementation of the recommended Master Flood Control and Drainage Plan. Notwithstanding, there is no reasonable prospect of reducing the backlog of needed projects for at least the next two decades. It therefore is obvious that the financial resources of the City of Hemet and the RCFC&WCD cannot be effectively and efficiently utilized without the complete cooperation of all city and county agencies under the policy guidance of the City Council and the County Board of Supervisors.

Potential sources of funding have been identified in the previous section. Set forth following are the recommended priorities for the utilization of the more viable of those sources, with comments on how they may be best used and some of the more important constraints on their use.

Developer/Subdivision Fees and Contributions - The use of developer/subdivision fees and in lieu contributions has been and is anticipated to be one of the most popular and logical means for public agencies to fund the cost of flood control and drainage facilities repaired to carry runoff directly associated with the construction of the development. The fees can be assessed (or in lieu) facilities can be constructed when and as needed, with no burden on other property owners except where the capacities of facilities are larger than those that are required to only serve the development. Such a condition would exist where a major channel is planned on the property which would serve upstream areas as well, or where a major downstream facility is

required whose capacity would serve other areas and tributary facilities. Accordingly, some sharing of costs for such joint-use facilities should be devised on the most equitable basis possible.

Complete equity is not possible when, as is the case with Hemet, where previous developers were not assessed their fair share of the cost of both in-tract as well as off-tract (downstream) drainage facilities, and where only a part of a particular watershed is developed.

The recent vote on the benefit assessment program on March 8, 1983, illustrates both the lack of appreciation of the community-wide impact of floods and the unwillingness of the subsequent purchasers and renters of property to contribute to the cost of protecting their own property from flooding as well as to contribute to the protection of downstream property owners from flooding.

Notwithstanding, it is recommended that developer/subdivision fees and/or in lieu construction be considered as a prime source of funds for implementation of the recommended plan, when politically acceptable. In general, the fees should be assessed on an acreage basis, in the proportion that the area of the proposed development bears to the total undeveloped average.

It a is further recommended that a single acreage charge be levied within the corporate limits of the City of Hemet for all flood control and drainage purposes, with separate and uniform acreage charges being levied in unincorporated portions of each of the following master plan subareas:

1. Central Hemet
2. West Hemet
3. Southwest Hemet
4. South Hemet
5. San Jacinto
6. Little Lake
7. Valle Vista
8. Northwest Hemet

Finally, it is recommended that such subdivider fees be reviewed on an annual basis to reflect changes in the estimated cost of facilities, including bridges and associated rights-of-way costs, as a result of inflation.

Developer/subdivision flood control and drainage fees should be used for the construction of flood control and drainage facilities and related budgets, as well as the acquisition of necessary rights-of-ways.

Dedications of rights-of-ways for master plan facilities should usually be made to, and accepted by, the RCFC&WCD, except for interim retention basins and other interim facilities which should be maintained by the City of Hemet. Both the City and the RCFC&WCD should attempt to aquire the full right-of-way for the ultimate configuration of a particular facility, even if an interim-capacity facility is to be constructed initially.

The value of in lieu construction and dedications of rights-of-way by developers should be credited against the total acreage charge to be paid by the developer.

Ad Valorem Property Taxes - Pending the acceptance by the electorate of a comprehensive benefit assessment program as presently authorized by Government Code Section 60400 et seg, it is recommended that both the City and RCFC&WCD continue to rely on ad valorem property taxes derived from Zone 4 of the RCFC&WCD for a significant portion of capital outlay funds plus all of the maintenance and operation costs for master plan facilities, except where the City of Hemet assumes the responsibility of operation and maintenance of interim retention basins and other interim facilities.

It is understood that the RCFC&WCD attempts to fund the construction and rights-of-way costs from Zone 4 funds, to the extent

such funds are not needed for maintenance of federally constructed or District-constructed facilities. Accordingly, it is to be anticipated that construction funds available from Zone 4 will diminish over time due to the constitutional limitation on property taxes which may be collected, as a result of Proposition 13, as well as increasing demands for operation and maintenance activities. It is not anticipated that future increases in property taxes as authorized by Proposition 13, will keep pace with future escalation in construction costs. Accordingly, the expenditure of capital funds from the Zone 4 budget should require close coordination and cooperation between the City of Hemet and the RCFC&WCD to ensure that priorities established by the capital outlay program are responsive to the needs of the City.

In this regard, completion of construction of the Salt Creek Channel between Lindenberger Road and the westerly city limits should receive the highest of priorities.

Special Assessment Districts - The use of Special Assessment Districts to finance specific features or groups of features can be helpful where the property owners within the area of benefit appreciate the need for the project, and where the method of spreading the cost is simple and easy to administer. Accordingly, the use of assessment district financing can best be implemented to finance projects to serve groups of property owners where one or more property owners may desire to develop or otherwise subdivide their land but have found the cost of installing the required flood control facility or bridge is too great for them to bear the entire cost. The use of the Special Assessment District vehicle is especially suited for such situations, particularly where other undeveloped properties potentially benefitting from the improvement can be identified and where there is a common desire to proceed with the project even through some of the properties are not yet ready to develop.

It is recommended that Special Assessment District proceedings be used in such instances wherever possible in order to avoid the inequity of either assigning too high a cost to the property owner ready for development or assigning to high a cost to the general city taxpayer where sufficient public interest cannot be shown.

Special care should be taken to avoid the use of too large an assessment district where the method of assessment spread may not be clearly understood or widely supported. A majority of the property owners could protest the project and thus bring about its abandonment. Under some cases the governing body can elect to override a majority protest, but the justification for such action is not to often present or understood by those being overruled.

Many of the existing bridge and channel deficiencies, both inside and outside of the City of Hemet, can be overcome by use of Special Assessment District proceedings. In unincorporated areas, either the County Board of Supervisors, or the City Council, with approval of the Board of Supervisors, could administer such proceedings.

County Service Areas - The County Service Area has been used by several central California counties as a means of financing a variety of flood control and surface water drainage maintenance projects, particularly in the earlier years following the enactment of the general enabling statute in the Government Code. The objective of the statute was to provide a means for property owners in both incorporated and unincorporated areas to avail themselves of one or more selected, so-called extended services which are not provided on a county wide basis, and so that they would not have to incorporate or form a municipal-type district such as a Community Services District.

Although the present form of the County Service Area enabling statute does not, in the opinion of the Riverside County Counsel, permit the use of CSA's for flood control maintenance purposes, the powers granted to CSA's for the use of assessments for drainage maintenance purposes are felt to be particularly useful for maintenance of the Salt Creek Channel. In time, those costs will be quite high, and neither Zone 4 of the RCFC&WCD nor the City of Hemet can easily finance these costs in the future through their general property tax revenues.

It is proposed that the City of Hemet and the County of Riverside jointly sponsor an amendment to the County Service Area enabling statutes (Government Code Sections 25210.1 through 25211.33) whereby the use of both property taxes and assessments for financing the cost of maintenance of flood control and surface drainage projects would be permitted beyond the specific extent now permitted. Upon approval, it is proposed that a County Service Area be created in the manner provided by law, covering the entire 100-year flood plain area of the Salt Creek and that at least 50 percent of the operation and maintenance cost of the Salt Creek channel system be financed from assessments levied within said county service area on the basis of land area.

Hemet Redevelopment Agency - Pursuant to the State's Community Redevelopment Law (Law), the Hemet City Council created the Hemet Redevelopment Agency for the purpose of implementing the Hemet Redevelopment Project as outlined in a special report adopted by the City Council.

The authorized project consists of activities which would be undertaken within three separate parcels pursuant to the Law, and will include street extensions, the relocation of a junior high school and the relocation of a stock farm, the replacement of low and moderate income housing, and the construction of interim segments of the Salt Creek Channel from State Street to Patterson

Avenue. The use of Hemet Redevelopment Agency funds for flood control was adopted prior to legislation to the contrary.

Parcel 4 of the Hemet Redevelopment Project, as shown in Figure 7-1 would be the focus of the flood control activities along Salt Creek, although construction work on the interim channel would take place upstream as far east as State Street and downstream as far west as Patterson Avenue. At Patterson Avenue the interim channel would connect with the interim channel being planned by the RCFC&WCD between Patterson Avenue and Lindenberger Road.

As noted in the approved Redevelopment Plan report, "The area (Parcel 4) is severly impacted by the lack of adequate flood control facilities, and other public improvements, the costs of which are extraordinary and burdensome to any single development".

The proposed interim Salt Creek channel and four associated bridges would be financed in zoned segments as follows:

		Cost
Zone 1	Patterson Avenue to westerly city limits	$5,222,750
Zone 2	Westerly city limits to westerly boundary Seven-Hills development	$7,854,625
Zone 3	Seven Hills Development Area	1/
Zone 4	Lyon Avenue to State Street	$10,986,375
Total estimated cost, including administration, engineering, and supervision		$24,063,750

1/ To be paid for by Seven Hills Development

Bridges at the Avery Canyon and Pepper Creek crossings of State Street would be constructed to their ultimate capacity of 4

lanes. Interim bridges of two lanes, expandable to four lanes at a later date, would be constructed at Lyon and Sanderson Avenue. A preliminary financial analysis prepared by the city Finance Director, indicates that a total annual incremental tax resource of $62,123 would be available for the project beginning in 1984, increasing to as much as $10,000,000 per year for the period 1997-2007, with an accumulated total of approximately $158,510,500 for the entire period 1984-2007.

The Hemet Redevelopment Agency proposes to set aside 20% of the available incremental tax proceeds, for low and moderate income housing needs, and to enter into agreements with four of the major taxing authorities in the area providing for the pass-through of 49 percent of the increment tax proceeds to them to offset their separate losses of property tax revenues as a result of the implementation of the redevelopment project. Pass through percentages, as provided for under the proposed agreements, would be as follows:

	Tax Increment Percent Pass-Through
County of Riverside	10
Eastern Municipal Water District	6
RCFC&WCD	2
Schools	31
Total	49

According to preliminary calculations of the City Finance Director, up to $4 million per year would be available for debt service on a redevelopment bond issue, which could support a maximum debt of nearly $38 million. Debt instruments would only be sold on a schedule consistent with available revenues and development requirements.

The interim Salt Creek Channel should be sized to at least the capacity required to convey incremental runoff created by development activities, and would not be enlarged to its ultimate capacity until adjacent land development projects within the 100-year flood plain are constructed. Developers benefitting from the interim channel would then be expected to contribute funds to the City of Hemet or the County of Riverside depending on the jurisdiction, which could be passed on to the Hemet Redevelopment Agency for use in retiring its bonded indebteness. Additional fees would be paid by benefitting developers at a later date to upgrade the Salt Creek Channel and bridges to their ultimate 100-year capacity, although they could finance the entire ultimate capacities of facilities at the time of their initial development. Additional fees would be collected by both the City and County for such purposes beyond the needs of the interim redevelopment agency project.

Based on the review of the flood control features of the proposed Hemet Redevelopment Project conducted as part of this Master Flood Control and Drainage Plan investigation, it is concluded that the Hemet Redevelopment Project is soundly conceived, and should be pursued on a cooperative basis by all of the agencies proposed to be involved. Failure of the electorate to approve the benefit assessment proposal in March, 1983, leaves the proposed redevelopment project as the most likely and viable source of major construction funds at this time for the proposed Master Flood Control and Drainage Plan.

Potential Impacts of Funding Alternatives

From Chapter VI it is obvious that the costs of correcting accumulated flood control and drainage deficiencies in the Hemet area are substantial and will not be easily financed under the best of circumstances.

Some of the most popular tools formerly available to fund large capital expenditures over a number of years are no longer

available, necessitating heavy reliance on modified pay-as-you-go methods to reduce the backlog of projects. Of necessity, the effect of future inflation on these costs will cause them to rise above the values presented in Chapter VI.

Community appreciation of the nature of the flood problem and support of efforts of the City Council and County Board of Supervisors to develop and implement economical solutions will be essential ingredients of a successful flood control program.

A total ultimate capital cost for recommended features of the Hemet Master Plan within the Sphere of Influence of the City of Hemet is estimated to be approximately $111.1 million, as summarized in Table 6-2. Of that cost, approximately $41.8 million or 38 percent would cover the cost of facilities in the South and Southwest Hemet Areas. The major component of the cost of facilities in those areas is represented by the cost of the Salt Creek Channel, the essential backbone feature of the entire Salt Creek watershed system.

The degree to which various available funding sources may be utilized is largely a policy decision although unavoidable restrictions on the amount of funding from some sources may limit the availability of funds from those sources.

For example, the available tax revenues from Zone 4 have been limited by the State Constitution since enactment of Proposition 13. If all of the future RCFC&WCD facilities within Zone 4 are to be maintained from those tax revenues, it is obvious that future property tax funds available for capital improvements will diminish over time.

The RCFC&WCD has estimated that the master plan cost of present and future facilities required to serve the entire Zone 4 area is about $215.3 million, with over one-third of which being represented by the cost of facilities in the rapidly growing

Sunnymead-Moreno Valley area. Priority projects within Zone 4 are estimated by the District to cost approximately $77.9 million, nearly half of which 3.8 million are within the Sphere of Influence of the City of Hemet, or along the downstream Salt Creek Channel. The priority of need in the Hemet area as concluded from the foregoing figures represents the current value judgement of the Board of Supervisors which hopefully will be reflected in future annual capital outlay allocations from the Zone 4 budgets.

Based on data provided by the City of Hemet and the RCFC&WCD, it is estimated that the total property tax revenues generated within the City of Hemet during the 1983-84 fiscal year will be about $254,000 or approximately 17 percent of the total for Zone 4. While the Board of Supervisors is free to use property tax receipts throughout Zone 4 depending on year-to-year circumstances, the amount expended in various portions of the zone over a relatively long period of time probably matches the tax revenues from those areas.

Revenues from developer and subdivision fees vary from year to year, and reflect the land development activity in any one year. It is obvious that such fees in the past have been quite low as compared with similar charges in other areas with comparable growth. However, the total of all such fees charged to developers could reach a point where they begin to affect the financial feasibility of the individual projects, particularly during inflationary periods when interest rates tend to be higher and the availability of affordable housing diminishes. There is therefore a limit to the infrastructure costs which can be charged to land developers for off-tract features.

In some cases, the developers must bear a significant portion of the essential off-tract costs, if downstream flooding and potential litigation is to be avoided. In other cases the City Council or the Board of Supervisors are free to select some form

of Special Assessment District financing which would spread the cost of those off-tract facilities among other property owners. The use of long-term bond financing of such costs provides the opportunity to spread the charges over a period of time unless cash payments are desired.

Recommended Funding Program

Based on preliminary data in Table 6-12 and 6-13, as well as data generated by the RCFC&WCD in preparation for the benefit assessment program proposed in early 1983, it appears that a reasonable priority project objective for the Hemet Sphere of Influence would require an expenditure of approximately $50 million over the next 15 years. Preliminary suggestions of 5- and 10-year programs are presented in Tables 7-1 and 7-2. Using the projected requirements of $50 million over the full 15-year period, without regard to price escalation, six alternative plans were examined for proportioning those cost among five funding sources, and the results are presented in Table 7-3. As noted in Table 7-1, the 5-year program would require a capital outlay of approximately $26 million, whereas the 10-year program would require an outlay of approximately $38 million.

For all six plans noted in Table 7-3, a total of $20 million was assumed to be available from the Hemet Redevelopment Agency. In like manner, it was assumed that at least $800,000 would be generated from Zone 4 over the 15-year period, which would represent an annual contribution roughly equivalent to that which will be made by the area to Zone 4 during FY 1983-84. Property taxes contributed by the City of Hemet represent approximately 17 percent of the taxes collected by Zone 4. Contributions from all other sources were varied to reflect different levels of assumed constraints.

Plan F is the only plan in which a contribution from a prospective benefit assessment program was considered. Plan F is merely shown to demonstrate the impact of a potential benefit

TABLE 7-1

SUGGESTED 5-YEAR CONSTRUCTION PROGRAM

Facility	Master Plan Cost	Location Inside/Outside City Limits
Interim Salt Creek Creek Channel (State St. to Patterson Ave.	$ 2,996,000	Inside and Outside
Line 1A	6,430,000	Inside and Outside
Line 1D Hemet Channel to Cawston Ave.	190,000	Inside
Line 1A-3 a & b	2,018,000	Inside
Line 1C and laterals	4,154,000	Inside and Outside
Line 1B	2,433,000	Inside and Outside
Line 2A, 2A-1	1,738,000	Outside
Devonshire Retention Basin	2,490,000	Outside
Line 5E-2 Oakland to Menlo	250,000	Inside
Eaton Retention Basin	1,526,000	Outside
Line 8B-1	1,240,000	Outside
Total	$25,465,000	

TABLE 7-2

SUGGESTED 10-YEAR CONSTRUCTION PROGRAM

Facility	Master Plan Cost	Location Inside/Outside City Limits
Initital 5-year Program	$25,465,000	Inside and Outside
Additional 10-year facilities		
Line 1A & Laterals	$ 7,023,000	Inside and Outside
Line 1A San Jacinto St. Yale St.	425,000	Inside
Meridian St. Channel	1,956,000	Outside
Line 2C	1,855,000	Outside
Line 2D	1,200,000	Outside
Total	$37,924,000	

TABLE 7-3

VARIATIONS IN UTILIZATION OF POTENTIAL FUNDING SOURCES FOR CAPITAL CONSTRUCTION

(Values in millions of constant dollars)

Funding Source	Plan A	B	C	D	E	F
Developer fees/ in lieu construction	19.2	21.7	24.2	16.7	14.2	4.2
Zone 4 property taxes	0.8	0.8	0.8	0.8	0.8	0.8
Hemet Redevelopment Agency	20.0	20.0	20.0	20.0	20.0	20.0
Special Assessment Districts	10.0	7.5	5.0	12.5	15.0	-
Benefit Assessment Program	-	-	-	-	-	25.0
TOTAL	50.0	50.0	50.0	50.0	50.0	50.0

assessment program, should it eventually be found to be politically attractive. Such a condition is not likely to occur within the foreseeable future.

Plan C would require the largest developer fee contribution, reflecting the lower level of the Special Assessment District financing program. Plan E, on the other hand, would reflect the highest level of Special Assessment District financing with a developer fee contribution approximately equivalent to the average of the other plans. From Table 7-3 it will be seen that the real choices will be the total level of expenditures and how best to apportion them between developer fees and Special Assessment District programs. The total level of annual expenditures must be geared to prevailing economic conditions and the need for development. Premature developments should be discouraged unless an equitable drainage infrastructure financing plan, equitable to the entire City can be developed. In no event should long-term financing plans be based on any assumed level of annual contributions from developers.

Considering the difficulty of projecting future economic conditions over even the next 5 years, it is recommend that the City Council formulate its total financing around an initial subdivider fee charge of $3,000 per acre of undeveloped land within the city limits. Further Special Assessment District financing levels should be adjusted to reflect the capital outlay programs shown in Tables 7-1 and 7-2, with the assumption that the maximum possible levels of contributions would be obtained from Zone 4 and the Hemet Redevelopment Agency. It is further recommended that the County Board of Supervisors adopt the identical charge of $3,000 per acre for developer/subdivision fees in unincorporated portions of the Hemet Sphere of Influence.

Additional Implementation Elements

Beyond the process of planning, designing and constructing the physical features of the Flood Control and Drainage system are a

number of institutional elements which must be undertaken to properly implement the Hemet Master Flood Control and Drainage Plan. Presented in summary form below are specific recommendations affecting the administration and management of the program as contemplated herein.

1. The Hemet City Council should schedule a formal public hearing on the adequacy of the Draft Environmental Impact Report comprising Chapter VIII of this document, pursuant to State of California and City of Hemet environmental review procedures required under the California Environmental Quality Act of 1970, and thereafter, following careful review of public comments generated thereby, adopt a Final Environmental Impact Report on the Master Flood Control and Drainage Plan.

2. Following completion of the environmental review process, the Hemet City Council should adopt the Master Flood Control and Drainage Plan, including any amendments thereto arising out of said environmental review, as the Flood Control and Drainage Element of the Hemet General Plan.

3. Features of the Circulation and Land Use Elements of the Hemet General Plan and the Zoning Ordinance should be revised where necessary to achieve consistency with the Flood Control and Drainage Element. Bridges at the State Street crossings of the Pepper Creek, Avery Canyon, Cactus Valley and St. John's Canyon Channels, in Diamond Valley as well as the Palm Avenue, Avery Avenue and Sanderson Avenue crossings of Salt Creek should be designated as features of the Circulation Element. The Zoning Ordinance and Land Use Elements should be reviewed in light of the land use recommendations contained herein.

4. The Riverside County Board of Supervisors should formalize its policy with respect to the contribution of funds for the construction of bridges across authorized flood control channels. The County should specifically provide a funding strategy for the financing of bridges at all key crossings of channels within all areas wherein Master Flood Control Plans have been adopted by the County Board of Supervisors. This recommendation is consistent with the requirements of the State Fire Code wherein all subdivisions should be afforded flood free access at all times.

5. Except where specific projects outside of the city limits are authorized by the Hemet Council, the RCFC&WCD should be the prime agency to undertake the construction of facilities of the Master Flood Control and Drainage Plan.

6. Except for interim retention basins or other interim drainage facilities specifically authorized by the City Council to be constructed and operated by the City of Hemet, all flood control and drainage facilities comprising the Master Flood Control and Drainage Plan should be operated and maintained by the RCFC&WCD.

7. The Flood Control and Drainage Element of the City of Hemet should be updated at no greater than 5-year intervals. A 5-year Capital Outlay Program for flood control should be formulated as proposed herein and updated annually.

8. The Master Flood Control Plans of the RCFC&WCD should be reviewed and updated as required. The 5-year Capital Outlay Program of the District should be updated annually as at present.

9. The Hemet City Council and the Riverside County Board of Supervisors should take appropriate steps to jointly ensure that all future land development projects within the Hemet Sphere of Influence shall be reviewed in light of their contribution to the flood control problems of the watershed of the Salt Creek and San Jacinto River, and to further jointly ensure that said projects will be assessed with an equitable share of the obligation for correcting or alleviating said problems, through the adoption of appropriate conditions of approval for all tentative and final subdivisions maps, parcel maps, specific plans, building permits, grading permits, conditional use permits, special use permits and zoning changes.

10. The Hemet City Council and Riverside County Board of Supervisors should jointly provide for cooperation with state and federal agencies to secure fair and equitable treatment for the lands and inhabitants of the Salt Creek watersheds and San Jacinto River in all matters related to:

    a. Federal flood insurance program
    b. Planning and funding of federally-assisted flood control projects, where appropriate
    c. Flood disaster assistance
    d. Development and implementation of flood warning systems
    e. Collection of basic hydrologic data

11. Hemet City Council and Riverside County Board of Supervisors should jointly authorize the undertaking of a general land use survey within the Hemet Sphere of Influence in the summer of 1984 and at no greater intervals than 5 years thereafter, in order to monitor the rate of development of the flood plains therein. Such

information should be used as a basis for future updates of the Flood Control and Drainage Element of the City of Hemet General Plan and the Master Flood Control Plans of the RCFC&WCD.

12. The Riverside County Board of Supervisors should adopt the Master Flood Control Plans for the South Hemet, Valle Vista and Northwest Hemet areas as proposed herein, taking advantage of the environmental review process to be undertaken by the City of Hemet as part of the Hemet Master Flood Control and Drainage Plan.

13. The Hemet City Council and Riverside County Board of Supervisors should jointly sponsor amendments to the County Service Area statutes (Government Code Section 25210.1 et seq) whereby County Service Areas would be given the specific authority to provide flood control and surface water drainage services, to be financed by any combination of assessments or ad valorem property taxes.

14. Upon the approval of said amendment, the Hemet City Council should request that two members of the Riverside County Board of Supervisors initiate action to create a County Service Area within the entire 100-year flood plain of Salt Creek, as same as presently constituted and shown on flood insurance rate maps and flood hazard boundary maps, for the purpose of undertaking at least 50 percent of the cost of maintenance of the authorized Salt Creek Channel, including with extensions thereof proposed herein.

15. The Local Agency Formation Commission should approve said request at the earliest possible date.

16. The Hemet City Council and the Riverside County Board of Supervisors should establish at the earliest possible date an area drainage fee of $3,000 per acre of undeveloped land for all subdivision parcel maps, conditional use permits and special use permits proposed for the development of land to residential, commercial or industrial uses within the Hemet Sphere of Influence.

17. Recommended funding priorities set forth earlier in this Chapter VII should be adopted at the earliest possible date, and monitored continuously for the purpose of determining their equity for all concerned parties, and to devise future modifications when and as needed.

18. Based on historical experience during periods of relatively healthy economic growth, it appears that values of developable land within the fringe areas of the City of Hemet have increased at a greater rate than the construction cost inflation rate. This has been the case despite the existence of significant flood hazards. Accordingly, it is recommended that the City of Hemet and the RCFC&WCD consider the early acquisition of rights-of-way for features of the Master Flood Control and Drainage Plan whenever possible, including the acquisition of the rights-of-way required for ultimate facilities even when interim facilities are to be constructed. In this regard the RCFC&WCD should revise its current policy of not accepting interim dedications of flowage or flood easements or fee simple title until such time as ultimate facilities are installed.

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GLOSSARY

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cfs - The rate of flow of a material in cubic feet per second. Used for measurement of water, wastewater, or gas. One cfs equals 4.719×10^{-4} m^3/s.

design flood - (1) The largest flow which a reservoir, channel, or other works can accomodate without damage or with limited damage. (2) The flood adopted for use in determining the hydraulic proportions of a structure such as the outlet works of a dam, the height of a dam or levee, or the maximum water level in a reservoir. Also called plan flood.

design storm - (1) The storm for which a hydraulic structure such as a bridge, culvert, or dam is designed. (2) The rainfall estimate corresponding to an enveloping depth-duration curve for the selected frequency.

FEMA - Federal Emergency Management Agency

fps - The velocity of a material in feet per second. Used for measurement of water and wastewater.

flood plain - The area described by the perimeter of the probable limiting flood. That portion of a river valley which has been covered with water when the river overflowed its banks at flood stage.

floodway - A channel constructed to carry flood water in excess of the quantity that can be carried safely in the stream. Also called bypass channel, flood-relief channel.

freeboard - The vertical distance between the normal maximum level of the surface of the liquid in a conduit, reservoir, tank, canal, etc., and the top of the sides of an open conduit, the top of a dam or levee, etc., which is provided so that waves and other movements of the liquid will not overflow the confining structure.

hydrograph - A graph showing, for a given point on a stream or conduit, the discharge, stage, velocity, available power, or other property of water with respect to time.

retention basins - ponds, usually enclosed by artificial dikes, that are utilized for wastewater treatment and/or temporary storage of flood water.

riprap - Broken stone or boulders placed compactly or irregularly on dams, levees, dikes, or similar embankments for protection of earth surfaces against the action of waves or currents.

runoff coefficient - (1) The ratio of the maximum rate of the runoff to the uniform rate of rainfall with a duration equaling or exceeding the time of concentration which produced this rate of runoff. (2) The ratio of the depth of runoff from the drainage basin to the depth of rainfall.

watershed - (1) The area contained within a divide above a specific point on a stream. In water supply engineering, it is called a watershed or a catchment area; in river control engineering, it is called a drainage area, a drainage basin, or a catchment area. (2) The divide between drainage basins.

100-year flood - The "expected" runoff generated by a flood occurring with a probability of one in 100 for any given year.