

RIVERSIDE COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT
Riverside, California

MASTER DRAINAGE PLAN
FOR THE
CITY OF MORENO VALLEY
WEST END

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PURPOSE

The purpose of this report is to investigate and evaluate the drainage problems of the West End area of the City of Moreno Valley and to develop an economical drainage plan which provides flood protection for areas of both existing and future development.

The study area is generally located between Fredrick Street on the east, State Route 215 (Old Highway 395) and Morton Road on the west, Cactus Avenue on the south and the ridge line of the box Springs mountains on the north.

The City of Moreno Valley in general, and the west end in particular, is a rapidly developing section of Riverside County. All areas adjacent to this one have been included in previous master drainage plans prepared by the Riverside County Flood Control and Water Conservation District. However, no comprehensive plan for drainage facilities throughout this area had yet been undertaken. A master plan of drainage titled "Report on Master Plan for Flood Control and Drainage for Edgemont, California" was prepared by this District in June of 1963, this plan was for a "backbone" facility only and did not anticipate the heavy urbanization that has taken place in recent years. Due to the accelerated pace of development, the City of Moreno Valley contracted with Wildan Associates to prepare a detailed Master Plan of Drainage for this area. This plan was completed and submitted to the City in June of 1990. The guidelines and procedures of the RCFC&WCD were followed in the preparation of the master plan. The District and the City of Moreno Valley have had various meetings pertaining to the plan since its completion by Wildan. Several facility changes have been made to the plan which best meets the needs of the District and the City. This report is that as prepared by Wildan Associates and subsequently amended by this District.

The plan presented herein will provide flood protection to the area when implemented, and will be used as a guide for the long term construction scheduling of the primary drainage facilities. The plan will also act as a planning guide for locating and sizing local drainage facilities to be constructed by developers and others within the area.

It should be noted by the reader that this report is a master plan and, therefore, should be read and used with this in mind. Simply stated, this plan is an overview; a study of the drainage problems that exist in a specific geographical areas, and a conceptual solution to those problems. As stated elsewhere in this report, the selection of the facilities presented in this plan is based on engineering and economic considerations and is

by no means the only solution.

The alignment and location of the facilities proposed in this Master Drainage Plan are general; precise facility locations will be dictated by conditions and other factors existing at the time of design. Similarly, the sizing information shown on the enclosed map is preliminary. A more detailed analysis performed at the design stage will determine final sizing.

SCOPE

In order to achieve the previously stated objectives, this master plan study included the following elements:

1. Preparation of a drainage area map.
2. Determination of the quantity and points of concentration of storm runoff in the area.
3. Determination of the location, size and capacity of the proposed drainage facilities.
4. Investigation of alternative routes and methods as a means for selecting a plan which is sound on both an engineering and economic basis.
5. Preparation of preliminary plans and supporting cost estimates.

GENERAL DISCUSSION

As discussed previously in this report, the area of study for this master plan is generally bounded by Fredrick Street, the west Moreno Valley City limits, Cactus Avenue and the Box Springs Mountains. Essentially, this study covers all the currently incorporated area at the western most edge of Moreno Valley which is not within the Sunnymead Area Master Drainage Plan limits. See Plate 1.

This drainage area consists of approximately 3.2 square miles (2,461 acres). Of this, appropriately 76 acres lie within the City of Riverside and approximately 170 acres in unincorporated County area (Box Springs Mountain Park vicinity).

Topography of the study area ranges from moderately flat valley terrain to foothills with steep slopes (along the northerly limits). Storm flows from this master plan area contribute to two major watercourses: Box Springs Canyon and Sycamore Canyon. These discharge into Box Springs reservoir and sycamore Canyon reservoir, respectively, to the west, both of which are part of the greater Santa Ana River watershed.

This report provides a Master Drainage Plan for the west end of the City of Moreno Valley. The plan consists of a detention basin and a system of open channels and underground storm drains. The proposed facilities will carry storm runoff through this area, outletting into Sycamore Canyon and Box Springs Canyon.

During periods of runoff, flood waters, silt and other debris impact the developing community causing property damage in some locations, leaving roads and streets impassable. As development continues to increase in the northern and central portion of the watershed, these problems are expected to intensify, thus requiring a greater need for flood protection. This will especially impact the currently (although sparsely) developed Edgemont area. Being at the downstream end of the study area's largest drainage system, the Edgemont neighborhood is subject to the greatest flooding potential. Currently, only a partially complete, 10-year storm capacity network of improvements is in place here. Large scale development/construction projects which will have a major impact on this area, such as the Riverside Raceway property and relocation of State Highway Route 215, are currently in the preliminary design stage. As a result, special analysis and consideration of detention basin construction and existing drainage system improvement upgrading combinations was undertaken for the Edgemont system.

The master drainage plan presented herein provide a reasonable and economical method of collecting and conveying storm runoff through the study area with the least interruption to public services while providing an adequate level of flood protection.

The proposed drainage system will also provide an outlet for local drainage facilities built by developers and others as growth occurs in the area. When completed, the facilities will provide the area with improved drainage and protection from the once in 100 year flood.

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APPROACH

The facilities proposed in this plan are intended primarily to collect and control storm flows emanating from the steep, rocky foothills and convey them safely through the low valley area where local urbanized runoff is added before outletting at the City/study limits.

All underground storm drains proposed in this plan are intended to collect local urban runoff. Runoff for a 10-year frequency storm is allowed to accumulate in the streets until it reaches the top of an 8-inch curb. At this point, the plan proposes the initiation of an underground drain which intercepts and conveys the entire 10-year storm runoff to an outlet downstream. During a 100-year storm event, the excess flow is expected to be carried in the street section above the facility. In some cases where this is not possible, or where dictated by other reasons, underground facilities are sized to convey the 100-year storm runoff. Where possible, the underground storm drains proposed in this plan are located in existing or future street rights-of-way.

The City of Moreno Valley has adopted promoting the use of closed drainage structure in lieu of open channels wherever possible. This approach has been incorporated into this study and is reflected in the facility recommendations. Therefore, open channels are only proposed when the discharge is large and the construction and right-of-way cost for a channel prove to be less than the costs of an underground storm drain. Where open channels are provided, they are designed to carry the runoff from a 100-year frequency storm.

The alignments of all channels, underground storm drains and other facilities are based on hydraulic efficiency, engineering judgement, and economics.

HYDROLOGY

Introduction:

The hydrology for this master plan of drainage is based on both the rational method and the synthetic unit hydrograph method as outlined in the Riverside County Flood Control and Water Conservation District (R.C.F.C.&W.C.D.) Hydrology Manual dated April 1978.

The synthetic unit hydrograph method was employed to develop the 100-year frequency design flows for those areas discharging into the existing Edgemont area channel system. The basin contributing flows to this facility occupies approximately 1.9 square miles and accounts for more than half the overall study area. The Edgemont area is currently the most developed area within this study's boundary. However, the existing backbone storm drain system there is only designed with 10-year frequency discharge capacity. Consequently, it was desirable to analyze several detention basin alternatives in order to evaluate the merits of either preserving or augmenting portions of the existing system. Therefore, the synthetic unit hydrograph method was utilized. The rational method was used to determine the 100-year frequency design discharge for all other basins within the study area.

Criteria:

Per the R.C.F.C.&W.C.D. Hydrology Manual, 100-year storm hydrology was developed under both methods. For the unit hydrograph analysis, 3-hour, 6-hour, and 24-hour storm patterns were analyzed to determine the controlling peak discharges and storage volume requirements for the pipe-channel network and detention basins respectively. In addition, the 1-hour storm pattern was also analyzed at the direction of the R.C.F.C.&W.C.D.

Point rainfall data found in the Hydrology Manual for use in the unit hydrograph method were compared with recent precipitation values provided by the District. Following analysis, rain gauge rainfall values were selected for use with the 1-hour, 3-hour, and 6-hour storms. The 24-hour storm point precipitation value was selected from the Manual.

Drainage Basin Physical Characteristics:

The development of the actual basin and sub-basin limits and internal parameters used in analysis were determined from numerous sources. These included the following: Master Plan for Flood Control and Drainage for Edgemont, California, June 1963; Master Plan for the City of Riverside - University Area, May 1970; Master Drainage Plan for the City of Riverside - Box Springs Area, May 1970; Master Drainage Plan for the Perris Valley Area, April 1987; F.E.M.A. Flood Insurance Study for the City of Moreno Valley, CA; R.C.F.C.&W.C.D. 200 scale topographic mapping dated October 1968; 400 scale City of Moreno Valley aerial photography dated July 1986; as-built improvement plans from CALTRANS (Routes 60 and 395/215), City of Moreno Valley, City of Riverside, County of Riverside; and proposed and tentative private land development maps from the City of Moreno Valley. In addition, preliminary utility system and preliminary grading studies for the development of the Riverside Raceway property were utilized.

A 200 scale mylar base map mosaic was prepared from the R.C.F.C.&W.C.D. topo maps. This was then modified to show current and proposed roadways, existing and proposed drainage facilities, land uses, soil types, and basin and sub-basin boundaries.

Numerous field reconnaissance outings were used to verify the above data including area boundaries, existing facilities, and street flow patterns.

Land Use:

Land Use was determined from the current City of Moreno Valley Zoning Map, June 1987 and the Specific Land Use Plan for the Riverside Raceway property development. The correlation established between the Moreno Valley Zoning Map and R.C.F.C.&W.C.D. Hydrology Manual land use is shown in the technical addendum to this report.

EXISTING FACILITIES

There are several District-operated drainage facilities existing within the City of Moreno Valley West End Master Drainage Plan area. These facilities consist of the Edgemont Flood Control Channel, the Eucalyptus Avenue Detention Basin, and several minor storm drains which primarily route storm drainage beneath existing streets. A brief description of the major existing facilities is as follows:

Edgemont Flood Control Channel See Plate II. This storm drainage system consists primarily of a rectangular concrete-lined channel which is approximately 4,000 feet long. The existing channel ranges in depth from 3½ to 5 feet and extends from U.S. Highway 395 on the downstream end to Eucalyptus Avenue at the upstream end. There are two major storm drain laterals which extend easterly from the main flood control channels. The lateral located along Cottonwood Avenue is made up primarily of approximately 500 lineal feet of 83-inch x 53-inch elliptical RCP pipe and approximately 1,300 lineal feet of 48-inch RCP pipe. A major drainage inlet is located at the upstream end of this lateral at the intersection of Cottonwood Avenue and Day Street. The other major storm drain lateral from the Edgemont Channel is located on Dracaea Street and is comprised of approximately 1,000 lineal feet of 48-inch RCP storm drain. These facilities were constructed by the R.C.F.C.&W.C.D. during the years 1965 and 1966. The primary purpose of the facilities was to relieve flood hazards from the Edgemont area of Moreno Valley by providing the above facilities with a capacity to carry the runoff from a 10-year frequency design storm event.

Eucalyptus Avenue Detention Basin. This storm water detention facility was constructed in 1987 and is operated by the R.C.F.C.&W.C.D. The detention basin was constructed as part of the Canyon Springs subdivision located northwesterly of the Eucalyptus Avenue and Day Street intersection. The detention basin is located at the upstream end of the Edgemont flood Control Channel and was constructed in an effort to reduce peak flows as a result of the Canyon Springs subdivision. The basin has a storage volume of approximately 14 acre-feet and holds the 100-year maximum outflow release at 160 cubic feet per second. This maximum release value matches the 10-year design storm capacity of the northerly leg of the Edgemont Flood Control Channel system.

RECOMMENDED IMPROVEMENTS

The improvements proposed in this Master Plan are shown on the enclosed map found in the back of this report. Supporting data for all proposed facilities is found in the Technical Addendum prepared by Wildan Associates. Estimated costs shown on the enclosed map include right-of-way construction and 31 percent for engineering administration and contingencies. The report also shows preliminary plan and profile information at a scale of 1 inch = 200 for all proposed storm drains and facilities. The open channels proposed in this plan are trapezoidal shaped facilities with concrete paving on the sides and bottom. The sides slope upward from the bottom at a rate of 1 foot vertically for every 1.5 feet horizontally. The channels in this plan range in size from a bottom width of 3 feet to 4½ feet and in depth from three feet to 4 feet.

The proposed underground storm drains consist of reinforced concrete pipe ranging in size from 33 inches to 69 inches in diameter. The plan also shows the installation of two 9 foot x 5 foot reinforced concrete boxes. The cost estimates for the storm drains include manholes, catch basins and junction structures within the cost of the pipe to be installed.

The reader should be aware that during preparation of preliminary plan and profile drawings, a detailed utility search was not completed. A more thorough search will be required prior to final design and may necessitate minor alignment, facility size changes, or utility relocations.

ALTERNATIVE STUDIES

In developing this Master Drainage Plan Wildan Associates studies a number of alternatives. The alternative, studies included line V-1 (a relief facility) and the entire existing Edgemont Flood Control Channel System area. The relief facility for Line V-1 which required placing a parallel storm drain under the Highway 60 and 215 Interchange has since been determined not be practical and has been eliminated from the master plan.

Analysis of potential options for improvements to the Edgemont System included combinations of detention and no detention scenarios for both the northerly and easterly (Cottonwood legs, Numerous basin sites were evaluated generally along the Cottonwood Avenue corridor as well as at other locations.

The Wildan report recommended a detention basin on the south side of Cottonwood Avenue between Edgemont and Day Streets. Another site investigated by Wildan was at the northeast quadrant of the Cottonwood and Day Street intersection. They determined that this site appeared feasible but that additional analysis was required. The District has studied this site and that recommended by Wildan in detail. Both sites are suited hydraulically however this site recommended in the Wildan report has existing dwellings on it while the site at the northeast quadrant of Cottonwood and Day Streets is vacant. It is, therefore, the District's recommendation that the site at the intersection of Cottonwood and Day Street become the master plan site.

Several other alternatives were reviewed with respect to the adequacy of the existing storm drain facilities. With increased development within the drainage basin, cost estimates were prepared to upgrade the existing facilities or, in some areas construct entirely new facilities. Due to the extensive right-of-way and construction costs required for these new facilities it was determined that an area-wide detention basin such as those described would be more economically justified.

CONCLUSIONS

Based on the studies and investigations conducted for this report, it is concluded that:

1. The west end area of the City of Moreno Valley has experienced flooding problems in the past. As this area continues to urbanize, these problems are expected to increase. With the construction of the proposed facilities, future growth may safely occur within the drainage basin.
2. The proposed Master Plan can be achieved in phases as area wide development occurs. This allows the master drainage facilities to be constructed and financed in an orderly manner. The total cost of the recommended improvements, including construction, right-of-way, engineering, administration, and contingencies, is estimated to be \$7,962,000.

RECOMMENDATIONS

It is recommended that:

1. The Master Drainage Plan be adopted by the Riverside County Flood Control and Water Conservation District's Board of Supervisors part of the overall Master Plan for the County.
2. The right-of-way required for the proposed Master Plan Improvements be protected from encroachment.
3. The Master Drainage Plan should be used as a drainage guide for all future developments within the study area.

TABLE I
CITY OF MORENO VALLEY
WEST END MASTER DRAINAGE PLAN
COST SUMMARY

<u>FACILITY</u>	<u>CONSTRUCTION*</u>	<u>RIGHT-OF-WAY</u>	<u>TOTAL COST</u>
Line B	\$ 37,000	\$ 15,000	\$ 52,000
Line HH	640,000	32,000	672,000
Line GG	185,000	0	185,000
Line KK	138,000	0	138,000
Line LL	219,000	69,000	288,000
Line V-1	1,338,000	23,000	1,361,000
Line V-3	260,000	60,000	320,000
Detention Basin	1,324,000	1,191,000	2,515,000
Line AA	\$1,481,000	- - -	\$1,481,000
Line BB	416,000	- - -	416,000
Line CC	<u>534,000</u>	<u>- - -</u>	<u>534,000</u>
TOTAL	<u>\$6,572,000</u>	<u>\$1,390,000</u>	<u>\$7,962,000</u>

* Includes 31% for engineering, administration and contingencies

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