RIVERSIDE COUNTY FLOOD CONTROL AND
WATER CONSERVATION DISTRICT
RIVERSIDE, CALIFORNIA

REPORT ON

MASTER DRAINAGE PLAN

FOR THE

MEAD VALLEY AREA

ZONE FOUR

MAY 1982

KENNETH L. EDWARDS
CHIEF ENGINEER

RIVERSIDE COUNTY FLOOD CONTROL

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PURPOSE

The purpose of this report is to investigate and evaluate the drainage problems of the Mead Valley area and to develop an economical drainage plan which provides flood protection for the most seriously impacted portion of the community, considering both existing and future development.

The Mead Valley area is located northwest of the City of Perris; and west of March Air Force Base and is roughly bisected by Cajalco Road. The study area is bounded by Nandina Avenue on the north, Day Street on the east, the natural divide southerly of Orange Street on the south and Barton Street on the west. All storm runoff within this area is naturally tributary to Cajalco Creek.

The plan presented herein along with the preservation of select natural watercourses, will provide adequate flood protection to the community. The plan will also act as a planning guide for the location and sizing of local drainage facilities to be constructed by developers and others within the area.

It should be noted by the reader that the cover of this report clearly states it 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 area, 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 facilites 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

The drainage area covered by this plan is approximately 9.0 square miles in size. The terrain ranges from the moderate slopes of the surrounding foothills to the gently sloping valley. The extent of the studies establishing this master plan includes:

1. Determination of the quantity and points of concentration of storm runoff in the area.

2. Preparation of a drainage boundary map. (page 6)

3. Determination of the location and size of the proposed drainage structures.

4. Investigation of alternate routes and methods as a basis for selecting the most economically and engineeringly sound plan.

5. Preparation of a flood plain map.

6. Preparation of preliminary plan and profile drawings, and supporting cost estimates.

GENERAL DISCUSSION

This report provides a Master Drainage Plan for the Mead Valley area. The key elements of the plan include collector levees at numerous locations, open channels and storm drains. An extensive analysis of road culverts is also provided along with a flood plain map for a selected portion of Cajalco Creek.

At present, during periods of runoff, flood waters, silt and other debris impact the developing community, causing property damage and leaving roads impassable. Continued development of the area will only serve to worsen the situation and necessitate a greater need for flood protection.

The Master Drainage Plan presented herein provides an economical method of collecting and conveying storm runoff through the most severly affected portion of the community and enhances access throughout the entire area during periods of runoff.

Recognizing that access is a major concern to the residents of Mead Valley, this report addresses the problem by providing adequate culvert capacity at major street crossings. Responsibility for implementation of the recommended culvert improvements lies with the Riverside County Road Department.

CRITERIA

All underground storm drains proposed in this plan are intended to collect local urban runoff and, with few exceptions, are located either in existing or proposed street rights of way. Open channels are proposed when the discharge is large and the construction and right of way costs for a channel prove to be less than the cost of an

underground storm drain. Where open channels are provided, they are designed to carry the runoff from a 100 year frequency storm.

In most cases, the road culverts proposed in this plan are sized to pass the runoff from a 10 year frequency storm and in all cases have contributing drainage areas greater than 50 acres. The plan only addresses the culvert needs at major roadways on an approximate one half mile grid. At present, many of the more local streets are not County maintained and are too numerous to be addressed at this time. Further discussion of the criteria used in the road culvert study can be found under "Recommended Improvements - Road Culverts" on page 12.

The alignment and location of all drainage facilities proposed in this plan is based on hydraulic efficiency, the ability to drain tributary areas, and economics.

HYDROLOGY

Two methods of hydrology were used in this plan to determine design discharges. For smaller tributary areas, up to 500 acres in size, the Rational Hydrology Method was used. The Synthetic Unit Hydrograph Method was used for larger areas. The design discharges used in sizing all future facilities in the study area should be determined by one of these two methods.

Methodology and supportive data for the rational and synthetic hydrology can be found in "The Riverside County Flood Control and Water Conservation District Hydrology Manual" dated April 1978.

Usually, future land use assumptions used in District prepared master drainage plans are based on County and/or local general land use plans. In the Mead Valley area, however, the only adopted land use plan currently in use is the "General Plan - Riverside County Land Use, Recreation, Major Transportation Routes" dated 1966, and this plan shows land use designations that are far too general for our purpose. Therefore, it became necessary to generate a more defined land use plan. The map on page 5 of this report shows the future land use patterns that were used throughout this plan. Derivation of the map was based upon the following available data and was corroborated by the staff of the Riverside County Planning Department.

1. Woodcrest - Mead Valley Area, Lot Cut Map
2. District Aerial Photos dated April 10, 1980
3. Woodcrest - Mead Valley Planning Area
   Existing Land Use, 1977
4. County Assessors Books

Generally, existing land use was the primary factor considered in making land use assumptions for the future. For example, if an area is currently, predominatly 5 acre single family residential with a few 2 1/2 acres lots, future land use was assumed to be 2 1/2 acre single family residential. In most cases conservative densities were selected. If future development varies substantially from the indicated assumptions, revisions of the drainage plan may become necessary. If, however, development continues as predicted, with only minor deviations from the assumptions made by this report, the runoff quantities and facility sizing should be adequate.

EXISTING FACILITIES

Currently, the District does not operate or maintain any flood control facilities within the study area. The only drainage facilities currently existing, are those road culverts and roadside ditches which have been installed and are maintained by the Riverside County Road Department. Pertinent culvert data can be found on Table I on page 12.

RECOMMENDED IMPROVEMENTS

The recommended improvements discussed briefly below are shown on the enclosed map found at the back of this report. Preliminary plan and profile drawings for the proposed open channels, storm drains and a few select culvert and dip crossings can be found following the text of this report.

Supporting data for all proposed facilities is available at the Riverside County Flood Control and Water Conservation District office. Costs shown on the enclosed map include right of way and 30% for engineering, administration and contingencies (see Table II, Cost Summary, page 16).

Before any design is undertaken it should be noted that during preparation of preliminary plan and profile drawings, a detailed utility search was not undertaken. Such a search may discover utilities that will necessitate minor alignment or size changes, or utility relocation.

OPEN CHANNELS

The open channels proposed in this plan are concrete lined, and with rare exception, trapezoidally shaped. The right of way required for the channels will generally be of sufficient width to accommodate the channel and one or two maintenance roads with appropriate fencing. Channel sizing varies from an 8 foot bottom, 5 foot deep section to a 28 foot bottom, 8 foot deep section. Flow rates range from 710 cubic feet per second (cfs) to 2780 cfs.

UNDERGROUND STORM DRAINS

The underground drains proposed in the plan are precast reinforced concrete pipe (RCP) ranging in size from 51 inches to 78 inches in diameter. Storm drains are generally used where flow rates are not too high; in undulating terrain; or where the alignment can take advantage of an existing or proposed street, thus eliminating right of way aquisition costs.

COLLECTOR LEVEES

These compacted fill levees are used to direct natural flows into downstream channels or storm drains. They are generally 6 feet or less in height and are not intended to store flood flows for any period of time.

ROAD CULVERTS

The terrain in Mead Valley is very hilly and traversed by many small watercourses, all of which ultimately discharge into Cajalco Creek. The road system in the area, layed out in a typical grid pattern, is subject to many watercourse crossings. The Riverside County Road Department has installed pipe culverts at many of these crossings. The District has, with the encouragement and cooperation of the Road Department, attempted to analyze the adequacy of the existing culverts and the need for additional culverts. The criteria listed below was the basis for the analysis.

1. No culverts are proposed for drainage areas less than 50 acres.

2. Only those roads on an approximate 1/2 mile grid were considered. The exclusion of all other roads does not suggest that they are free from culvert needs, but due to the limited funding available at this time it was felt that only the major County maintained roads could be addressed.

3. Culverts are sized to convey the 10 year frequency flow under the roadway. The balance of flow in the 100 year storm is assumed to pass over the roadway and continue in the same watercourse.

   Exceptions:

   a. At three locations, culverts were sized to convey the 100 year flow because of the high rate of flow. The flow rate exceeds 1800 cfs at each of these locations.

   b. At several locations, a culvert application could not be made because of physical constraints, therefore a dip crossing is proposed. A small culvert will be provided under the dip to deal with nuisance flows.

4. Sizing of culverts is based upon maximizing available head and the assumption of inlet control.

5. Culverts are assumed to extend to the ultimate right of way width of the road.

6. In many cases, credit is given to the flow capacity of the existing culverts, with the assumption that they will remain in service.

The outcome of the culvert study is summarized in Table I and on the map found at the rear of the report.

FLOOD PLAIN

One alternative to the structural approach to flood control, i.e., improved channels, storm drains and dams, is the identification, preservation and management of natural flood plains. Under this proposed plan much of Mead Valley will be left in its natural state. In the upper portions of the various subwatersheds, watercourses are easily recognized and are avoided by builders and developers. However, in the lower portions of the valley where the accumulated flows are quite large and the watercourse - flood plain is wide and shallow, it has not been as easily recognized, and development has encroached into the flood plain and at various times been seriously damaged by flood flows. A case in point is the area along Cajalco Road between Clark Street and Alexander Street.

One area that currently is not developed but has a major flood plain passing through it, is that branch of

Cajalco Creek that crosses Alexander Street and then extends northerly to Markham Street. It would seem that at some future time development pressures will be exerted on this land. In an attempt to identify and protect the flood plain it has been mapped (see envelope at the rear of the report). This map depicts the flood plain resulting from a 100 year frequency storm assuming existing conditions and future ultimate development. At this time the map is only informational. At some point in the future, additional study may be done to extend the mapping upstream and downstream, parallel to Cajalco Road. Inclusion of the mapping into County Ordinance No. 458, the County Flood Plain Ordinance, may also become a reality in the future.

ALTERNATES

This proposed plan, as with all District master drainage plans is the cumulation of the best alternatives explored. This section will attempt to briefly discuss the alternatives that were studied and eventually disregarded in favor of the facilities shown on the enclosed map.

One of the most difficult decisions that had to be made in the development of the Master Plan was to determine the upstream limits of the structural proposals. After a careful study of the area, it was felt that most of the storm runoff from watersheds south of Cajalco Road safely reaches Rider Street in the natural watercourses. This fact, coupled with the assumption that most of the development south of Rider Street will be 1 acre and larger, led to the conclusion that the channel and storm drain system need not extend into this area and that the focus should be soley on culvert crossings. It seemed prudent to initiate the structural flood control facilities in the area of Rider Street, where runoff from four main watercourses can be intercepted and conveyed safely through the heart of the community.

In the watershed north of Cajalco Road, there are two main watercourses, the larger being the subject of the flood plain mapping. (See envelope at rear of report.) The other watercourse is well defined to Haines Street just north of Cajalco Road. A good collection point was found at Shortridge Avenue, with the option to extend the system upstream toward Martin Street should it be deemed necessary in the future.

One alternative that was investigated was extending a storm drain up Brown Street from Cajalco Road to Mack Street. This underground drain would have to be of 100 year design north of Souder Street and quite costly. A parallel system would still be needed on Haines Street to deal with flows at Rider Street. It was ultimately deemed more cost effective to enlarge the system up Haines to

Rider Street and extend it to a collector dike behind the new community center. Flow will continue to be delivered to this point by the natural watercourse.

An unlined trapezoidal channel was considered for Line A from Alexander Street upstream to Haines Street. Pursuing this alternative would have required increasing the channel bottom width from 25 feet to 60 feet and the channel right of way from 84 feet to 140 feet. This unlined section would require several drop structures to reduce the channel gradient sufficiently to lower the velocity to an acceptable 6 feet per second. The substantial increase in road crossing costs attendant with this alternative and the difficulty in accommodating such a wide right of way through a populated area, led to its exclusion.

In short, the Master Drainage Plan for the Mead Valley Area as presented herein is the coalescence of the best alternatives explored.

CONCLUSIONS

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

1. The Mead Valley Area has experienced serious flooding problems in the past. As this area continues to develop, these damages are expected to increase. A more orderly growth pattern can safely occur with the construction of these proposed facilities.

2. A drainage system is required to safely convey storm runoff through the area with the least interruption to public services. The Master Drainage Plan presented in this report is such a system and is the most economical of the alternatives studied.

3. The proposed plan lends itself to stage construction as funds become available.

4. The total cost of the recommended improvements, including construction, right of way, engineering, contingencies, and administration is estimated to be $ 5,879,000.

RECOMMENDATIONS

It is recommended that:

1. The Master Drainage Plan as set forth herein be approved by the Riverside County Flood Control and Water Conservation District's Board of Supervisors as part of the overall master plan for the County.

2. The Master Drainage Plan as set forth herein be used as a guide for all future developments in the study area and that such developments be required to conform to the plan insofar as possible.

3. The right of way required for the plan be protected from encroachment.

TABLE I

Master Drainage Plan for the Mead Valley Area

CULVERT SUMMARY

Culvert Number	Drainage Area	10 Year Peak Flow Rate	100 Year Peak Flow Rate	Existing Facility	Recommended Improvement	°Total Cost
(1)	80 Ac.	60 cfs	Δ105 cfs	1-22"x13" CMPA	4-29"x18" CMPA Remove ex. 22"x13" CMPA	$ 13,000
(2)	289	245	430	1-21" Steel	7-43"x27" CMPA Remove ex. 21" Steel	31,000
(3)	171	120	Δ205	1-18" CMP	2-50"x31" CMPA Remove ex. 18" CMP	10,000
(4)	83	65	Δ115	1-18" CMP	4-29"x18" CMPA Remove ex. 18" CMP	13,000
(5)	50	40	Δ 90	1-15" CMP	1-36"x22" CMPA Extend ex. 15" CMP	5,000
(6)	192	140	Δ 245	1-18" CMP	2-50"x31" CMPA Remove ex. 18" CMP	10,000
[7]	60	45	Δ 80	-	25' wide Concrete Dip Crossing	7,000
(8)	140	135	Δ 240	-	4-43"x27" CMPA Elevate ex. Road Surface	31,000
(9)	527	355	Δ 620	1-30" CMP	3-65"x40" CMPA Remove ex. 30" CMP	28,000

TABLE I (Cont.)

Culvert Number	Drainage Area	10 Year Peak Flow Rate	100 Year Peak Flow Rate	Existing Facility	Recommended Improvement	°Total Cost
(10)	324	235	415	1-36" CMP	2-65"x40" CMPA Extend ex. 36" CMP	$ 22,000
(11)	233	200	350	2-36"x22" CMPA	4-50"x31" CMPA Remove ex. 36"x22" CMPA's	23,000
[12]	80	70	Δ 125	-	30' wide Concrete Dip Crossing	8,000
*[13]	104	90	Δ 160	-	35' Wide Concrete Dip Crossing Elevate ex. Road Surface	37,000
(14)	154	135	Δ 240	-	3-65"x40" CMPA	31,000
(15)	102	85	Δ 150	1-18" CMP	1-58"x36" CMPA Extend ex. 18" CMP	7,000
*(16)	77	65	115	-	Storm Drain, 39" RCP	110,000
*⟨17⟩	1754	1055	1890	1-12" CMP	Triple 10.5'Wx6'H RCB Elevate ex. Road Surface Remove ex. 12" CMP	190,000
(18)	248	190	Δ 335	1-18" CMP	5-43"x27" CMPA Remove ex. 18" CMP	22,000
(19)	144	150	Δ 265	1-22"x13" CMPA	5-36"x22" CMPA Remove ex. 22"x13" CMPA	20,000

TABLE I (Cont.)

Culvert Number	Drainage Area	10 Year Peak Flow Rate	100 Year Peak Flow Rate	Existing Facility	Recommended Improvement	°Total Cost
(20)	210	205	Δ 360	2-36"x22" CMPA	5-43"x27" CMPA Extend one ex. 36"x22" CMPA	$ 23,000
(21)	2494	1070	1950	-	6 cell 10.5'Wx4.5'H RCB Elevate ex. Road Surface	247,000
*(22)	81	70	Δ 125	-	Storm Drain, 39" RCP	56,000
(23)	421	385	655	1-24" CMP	3-72"x44" CMPA Elevate ex. Road Surface	33,000
(24)	114	110	Δ 195	1-36" CMP	1-58"x36" CMPA Extend ex. 36" CMP	9,000
(25)	101	100	Δ 180	1-36" CMP	1-36" CMP Extend ex. 36" CMP	7,000
(26)	5215	Δ 2580	4790	1-84" CMP 1-60" CMP	Triple 12.5'Wx10'H RCB Remove ex. 84" CMP Remove ex. 60" CMP	248,000
(27)	91	90	165	1-43"x27" CMPA	1-36" CMP Extend ex. 43"x27" CMPA	7,000
*(28)	316	235	435	1-15" CMP	Storm Drain, 10'Wx3.5'H RCB Elevate ex. Road Surface Remove ex. 15" CMP	157,000
(29)	497	485	845	2-42" CMP	3-60" CMP Extend one ex. 42" CMP	28,000

TABLE I (Cont.)

Culvert Number	Drainage Area	10 Year Peak Flow Rate	100 Year Peak Flow Rate	Existing Facility	Recommended Improvement	°Total Cost
*(30)	192	160	295	-	Storm Drain, 66" RCP Elevate ex. Road Surface	$ 47,000
(31)	161	140	255	-	2-58"x36" CMPA Elevate ex. Road Surface	20,000
[32]	62	65	115	-	30' wide Concrete Dip Crossing	8,000
						$1,508,000

° Total Cost includes 30% for Engineering and Administration.

(○) Culvert Designed for 10 Year capacity.

⬡ Culvert Designed for 100 Year capacity.

[□] Concrete Dip Crossing designed for 10 Year capacity. It is assumed that the ultimate road profile will be designed to provide 100 Year capacity. Nuisance flows are to be conveyed under the dip in a small slotted drain.

△ Flow rates were estimated from an adjusted yield curve.

* See Plates 11 through 16 in report.

TABLE II

MASTER DRAINAGE PLAN

for the

MEAD VALLEY AREA

COST SUMMARY

FACILITY	CONSTRUCTION COST*	RIGHT OF WAY	MASTER PLAN COST
Line A	$2,771,000	$ 278,000	$ 3,049,000
Lateral A0	44,000	1,000	45,000
Lateral A1	211,000	-0-	211,000
Lateral A2	178,000	50,000	228,000
Lateral A3	298,000	57,000	355,000
Lateral A4	150,000	10,000	160,000
Lateral A5	293,000	30,000	323,000
Subtotal	$3,945,000	$ 426,000	$4,371,000
Culverts	$1,508,000	-0-	$1,508,000
Total	$5,453,000	$ 426,000	$5,879,000

* Includes 30% for engineering, administration and contingencies

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