

**RIVERSIDE COUNTY FLOOD CONTROL AND
WATER CONSERVATION DISTRICT
RIVERSIDE, CALIFORNIA**

**(AMENDED)
REPORT ON**

**LAKEVIEW—NUEVO
MASTER DRAINAGE PLAN**

ZONE FOUR

FEB. 1981

**KENNETH L. EDWARDS
CHIEF ENGINEER**

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AND WATER CONSERVATION DISTRICT
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PURPOSE

The purpose of this report is to amend the "Lakeview-Nuevo Area Master Flood Control Plan" that was developed by the Riverside County Flood Control and Water Conservation District in 1978. An expanded restudy of the area was requested by the residents of the Lakeview-Nuevo community in the form of signed petitions addressed to: the Riverside County Planning Commission, County Supervisor Norton Younglove, and to the Chief Engineer of this District, Kenneth L. Edwards. The petitions detailed problem areas and encouraged the expansion of the Master Drainage Plan to offer flood protection to a wider area.

This report is the culmination of the restudy requested. It presents a current evaluation of the drainage problems in the Lakeview-Nuevo area and provides a drainage plan that considers the ultimate land use and economy of the area.

The cover of this report clearly states that it is a Master Plan, and it should be read and used with this in mind. Simply stated, this report is an overview; a study of the drainage problems that exist in a specific geographic area and a conceptual solution to these problems. The selection of the facilities presented in this plan was based on engineering and economic considerations and is by no means the only solution. The location and alignment of the facilities are general; precise facility location will be dictated by conditions existing at the time of design. Similarly, the sizing information shown on the plates and enclosed map is preliminary. A more detailed analysis performed at the design stage will determine final sizing. When implemented, the plan presented herein will provide the community with adequate protection from the 100 year frequency storm and serve as a guide for the long term construction scheduling of the primary drainage facilities. 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.

SCOPE

The drainage area covered by this plan is bounded roughly by the San Jacinto River to the north and west, and the Lakeview Mountains to the south and east. Consisting of approximately 17 square miles, the watershed ranges from relatively flat valley terrain to brush covered foothills with moderate to steep slopes.

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 area map.
3. Determination of the location, size and capacity of the proposed drainage structures.
4. Investigation of alternatives as a basis for selecting the most economical plan.
5. Preparation of preliminary plan and profile drawings and supporting cost estimates.

GENERAL DISCUSSION

This report provides an Amended Master Drainage Plan for the Lakeview-Nuevo area. The plan consists of a flood control/debris basin, a system of open channels and a network of storm drains that will safely intercept and convey storm runoff through the area to the San Jacinto River.

Presently, during periods of runoff, the floodwaters, silt, and other debris produced in the foothills impact a wide area of prime agricultural land and developing community, causing property damage and leaving roads impassible. The drainage problems are being compounded by the dramatic increase in subdivision activity that the area is experiencing. In order to avoid interruption of community services and decrease property damage, a means of collecting and conveying storm runoff is needed.

The Master Drainage Plan presented herein provides a method of collecting and conveying storm runoff through the study area to the San Jacinto River. The proposed drainage structures will 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 adequate protection from the 100 year frequency storm.

DESCRIPTION OF PROBLEM

The rapidly developing Lakeview-Nuevo area is situated on a series of broad alluvial cones that emanate from the surrounding Lakeview Mountains.

A major portion of the populated area is located downstream of a canyon having a watershed in excess of seven (7) square miles. This watershed extends several miles upstream from the canyon mouth to the Juniper Flats area. The large quantity of storm runoff from the watershed flows northwesterly through the community of Lakeview to the San Jacinto River.

The smaller watersheds within the plan boundary do not generate the volume of storm runoff that the larger area does. However, due to extensive farming adjacent to the local foothills, the potential for debris production is increased.

Due to the nature of the topography throughout the area, the direction of flood flows is unpredictable. The flow velocities decrease as the slope of the terrain decreases, resulting in deposition of silt and debris. The build up of the deposits alter the direction of flood flows. The unpredictability of these floodwaters create the potential for widespread flood and debris damage.

The most predominant hydrologic feature of the Lakeview-Nuevo area is the San Jacinto River, which runs along the northerly and westerly plan boundary. Though the river itself is a major concern to the community, it's ultimate control is not a part of this study. Recommended improvements for the San Jacinto River are, however, presented in the District's report of March 1975, entitled "Flood Control Master Plan for the Lower San Jacinto River Basin".

STORMS AND FLOODS OF RECORD

Numerous major winter storms have occurred in the Lakeview-Nuevo area; the most recent storms in 1965, 1966, 1969, 1976, 1978 and 1980. Although readers familiar with the area are well aware of the property damage and traffic disruptions caused by the resulting floods, the intensities associated with these storms were relatively minor by comparison with historical recordings.

The most severe storm of recent occurrence was recorded on October 22, 1976. The high intensity storm centered over the hills to the south and east of Nuevo, but only the very local areas received flood damage. The concentrated showers were so confined that the major watershed to the southeast did not receive enough rain to cause more than minor downstream flooding.

Had this watershed received the same high intensities throughout, severe flood damage would have resulted.

Aerial photographs showing flows from this storm and the February 1969 storm are included as Figures 1 through 4 in this report.

CRITERIA

The underground storm drains proposed in this plan are intended to collect local urban runoff. In a few instances, the underground facilities are proposed to convey runoff from substantially larger drainage areas as well. In the former case, where the storm drains are intended for local runoff only, the facilities are sized to carry the discharge generated in a 10 year frequency storm. However, in the latter case, the 100 year discharge was used in sizing the drains. In all cases, storm drains are located either in existing or proposed street rights of way.

Open channels, for the most part, are 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 storm.

The alignments of all storm drains and channels as well as the location of the dam are based on hydraulic efficiency, the ability to drain tributary areas, future land use, and economics.

HYDROLOGY

The hydrology required for the development of this plan was generated by two methods: the Modified Rational method and the Synthetic Unit Hydrograph method. As a general rule, the Synthetic Unit Hydrograph method is used when the watershed is in excess of 300 to 500 acres, and the Modified Rational method is used for the smaller watersheds. Methodology and supportive data for the hydrology can be found in "The Riverside County Flood Control and Water Conservation District Hydrology Manual" dated April 1978.

The synthetic unit hydrographs developed for this study were of 3 hour, 6 hour and 24 hour duration. Each was tested to determine the most critical storm for design purposes.

A map showing the entire watershed boundary is included as Figure 5 of this report.

EXISTING FACILITIES

There are no major flood control facilities existing in the study area. The communities of Lakeview and Nuevo presently rely on the existing street system and a few small ditches for flood protection. Aside from the lack of capacity for major flood flows, the concept of water carrying streets presents a problem for this growing area because of the large quantity of debris that is generated in the contributing watersheds. This debris creates a hazard for the ever increasing traffic flow throughout the area. The existing ditches also suffer from a tremendous lack of capacity for containment of major flood flows.

A large wash, originating near the intersection of Contour Avenue and Eleventh Street, drains a sizable area and empties it's flows into Eleventh Street near Yucca Avenue. Eleventh Street, currently a water carrying facility, routes floodwaters to Lakeview Avenue where an inadequate culvert conveys the flows into an earth ditch that leads to the San Jacinto River.

Hansen Avenue, North Drive and Nuevo Road also carry substantial quantities of flood flows. Hansen Avenue routes flows generated both locally and in the large Juniper Hills watershed toward Lakeview, where the water crosses the Ramona Expressway and outlets into the San Jacinto River. North Drive delivers flows from the local foothills to a small ditch that empties into the earth ditch below Eleventh Street. Nuevo Road carries storm runoff westerly to the San Jacinto River.

An unstable training dike exists above Nuevo Road in the vicinity of North Drive and Gibson Avenue. The intent of this dike is to direct the flows that are concentrated at this point to the historic watercourse.

RECOMMENDED IMPROVEMENTS

The recommended improvements discussed below are shown on the Master Drainage Plan map in the envelope at the rear of this report. Preliminary plan and profile drawings showing pertinent details for these facilities are presented as Plates 1 thru 27 in this report. Supporting data for all proposed facilities is available for review at the Riverside County Flood Control and Water Conservation District's office.

Cost estimates shown on the enclosed map include right of way and 30 percent for engineering, administration, and contingencies.

It should be noted that culvert and bridge lengths shown on the plates are only approximate. The structures will be built to conform to ultimate street widths at the time of construction.

The recommended improvements presented in this Master Drainage Plan are primarily located south of Eleventh Street and Water Avenue. These facilities will collect and convey major flood flows to Eleventh Street and westerly to the San Jacinto River. Local storm runoff generated in the area northerly of Eleventh Street and Water Avenue will be conveyed through the community of Lakeview in the ultimate street system.

NUEVO CHANNEL

The Nuevo Channel, as proposed in the Master Plan of 1978, will be the main collector and primary outlet channel to the San Jacinto River. The funding needed for the design and construction of the Nuevo Channel has been budgeted for in the 1980-81 fiscal year. Currently in the design stage, the channel is scheduled for construction in 1981. It will be a concrete lined trapezoidal channel beginning at the downstream terminous of Lateral A, near Yucca Avenue on Eleventh Street and continue along Eleventh Street to the approximate limits of the 100 year flood plain of the San Jacinto River. From this point downstream to the mainstream of the river, the facility will be unlined with levees along each side.

LATERAL A

Essentially the upper extension of the Nuevo Channel, Lateral A will be a major collector facility reaching from Eleventh Street near Yucca Avenue, to Tryon Avenue at Montgomery Avenue. The Master Plan of 1978 proposed a training dike to collect and direct storm runoff to the inlet of Lateral A just above Gibson Avenue. In this amended plan, the training dike is eliminated, and Lateral A is extended along Gibson Avenue to an inlet above Tryon Avenue. The inlet will collect flows directed to this point by the proposed training dike upstream of Nuevo Road. The funding needed for the design and construction of Lateral A, from the Nuevo Channel to Twelfth Street, has been budgeted for in the 1980-81 fiscal year. Along with the Nuevo Channel, this reach of Lateral A is scheduled for construction in 1981. The facility will be a concrete lined trapezoidal channel throughout it's entire length.

TRAINING DIKE

This training dike will be located approximately 1500 feet south of Nuevo Road between North Drive and Gibson Avenue. It will direct flows along the historic watercourse to the inlet of Lateral A. Not a part of the 1978 Master Plan, this facility is included in this amended plan to protect an area targeted by the aforementioned petitions.

Attempts have been made by private interests to maintain the existing dike at this location, but failures have occurred several times in the last few years. The resulting damage has been quite severe. The dike proposed in this plan will be larger in size and consist of concrete facing placed on compacted fill. The concrete facing will be extended 10 feet below the natural flowline to provide protection against scour.

LATERAL A-1

Lateral A-1, a concrete lined trapezoidal channel, will begin at Lateral A in Gibson Avenue and extend to Tryon Avenue. Small collector channels are proposed at Montgomery Avenue and at Tryon Avenue to collect and convey sheet runoff to Lateral A-1. This facility, not a part of the 1978 Master Plan, will provide protection for the problem area along Montgomery Avenue that was noted in the petitions.

LATERAL B

Beginning at Lateral A between Twelfth Street and Apricot Avenue, Lateral B will cross under Eleventh Street and follow a course parallel to Contour Avenue and some 400 feet to the south. The facility will turn south and continue along the east side of Hansen Avenue to its inlet approximately 1200 feet south of Contour Avenue. Lateral B will be a concrete lined trapezoidal channel throughout its entire length.

In the 1978 Master Plan, Lateral B was to terminate just above Eleventh Street. The extension of this proposed facility, along with the addition of Lateral B-1 in this amended master plan, will provide protection for properties along Montgomery Avenue. This area was also noted in the petitions as having serious flooding problems.

LATERAL B-1

Lateral B-1 will begin at the upper end of Lateral B and extend nearly 1500 feet south along the eastern side of Hansen Avenue. This concrete lined trapezoidal channel will intercept storm runoff that presently impacts properties along Montgomery Avenue.

LATERAL C

In the 1978 Master Plan, Lateral C was proposed as a concrete lined trapezoidal channel reaching from the Nuevo Channel to Lakeview Avenue at North Drive. In this amended plan, Lateral C is extended upstream as a storm drain facility in North Drive. The inlet, at the southeast corner of North Drive and Nuevo Road, will collect the storm runoff generated in the local foothills that has, in the past, caused damage along Nuevo Road and North Drive. Lateral C is sized to convey the runoff from a 10 year frequency storm. Flows exceeding the 10 year storm will be carried in North Drive, and the combination of both the street and underground storm drain will provide 100 year protection.

LATERAL D

In the original Master Plan, this facility was designated as the Outlet Channel for the Lakeview Dam. It was proposed to be a concrete lined trapezoidal channel from Eleventh Street to the Lakeview Dam. Eleventh Street was to have been improved as a water carrying facility to convey the flood flows to the Nuevo Channel. Ultimately, this reach was expected to be replaced with a channel adjacent to the street. This "Alternate Channel" was not included as part of the original plan.

Since the adoption of the 1978 Master Drainage Plan, this concept was found to be unpopular with local residents and incompatible with future plans for the area. Therefore, in this Amended Master Drainage Plan, the entire facility was changed to an underground storm drain. The facility was also divided into two segments: the Lakeview Dam Outlet Drain and Lateral D.

Lateral D, beginning at the Nuevo Channel near Yucca Avenue, will follow along Eleventh Street, turn onto Water Avenue and continue to Hansen Avenue. There, the facility will turn south for approximately 400 feet. The inlet for Lateral D will be located some 300 feet east of Hansen Avenue in an assumed future street. This Master Plan proposes that the street be constructed as a major water carrying facility with the inlet to Lateral D located at a low point in the street profile. Lateral D is sized to collect and convey the runoff from a 100 year frequency storm.

LATERAL E

This facility, not included in the 1978 Master Plan, will be a storm drain beginning at the intersection of Bell Avenue and Eleventh Street at Lateral D. It will continue approximately 1200 feet northeasterly in Bell Avenue and terminate at Brown Avenue. Lateral E will carry the runoff from a 10 year frequency storm.

Substantial storm runoff presently flows across Bell Avenue near Brown Avenue and the resultant damage there and downstream will continue to increase as development proceeds. Lateral E, when completed, will mitigate this flooding by cutting off these flows at Brown Avenue and providing a safe means of conveyance to Lateral D.

LINE F

Line F will begin at the mainstream of the San Jacinto River south of Nuevo Road as an earth channel. The channel will continue along the south side of Nuevo Road to Meniffee Road, the approximate eastern limit of the San Jacinto River 100 year flood plain. The facility will proceed as a storm drain in Nuevo Road to its upstream terminous at Rosary Avenue. Line F is sized to convey the runoff from a 10 year frequency storm. 100 year protection will be obtained since Nuevo Road has the capacity to carry flows in excess of the 10 year storm.

As an outlet for the storm runoff generated in the local foothills to the south of Nuevo Road, Line F will provide protection for the areas north of Nuevo Road that were noted in the petitions as having received flood damage in the past.

LAKEVIEW DAM OUTLET DRAIN

As explained in the description of Lateral D, this facility was proposed to be a concrete lined trapezoidal channel in the 1978 Master Plan. Because of the opposition encountered since the adoption of that plan, the outlet for the dam was changed to an underground facility.

The Lakeview Dam Outlet Drain will begin at Lateral D in Hansen Avenue and continue along Water Avenue some 2500 feet to the Lakeview Dam. It is sized to carry 60 cfs, the maximum 100 year release rate of the dam.

LAKEVIEW DAM

The Lakeview Dam will be located across the largest watercourse presently impacting the Lakeview-Nuevo area. As mentioned earlier in this report, the watercourse has a contributing drainage area of over 7 square miles. The peak flow rate that can be expected from this watershed is in excess of 2700 cfs during the 100 year frequency storm. An ungated outlet with a maximum release rate of 60 cfs is proposed for the dam. The basin spillway, about 250 feet wide, will be designed to safely pass the 1000 year peak flows.

The dam will be about 30 feet high and provide 35 acre feet of debris storage and 360 acre feet of flood storage. A small training dike and collector channel improvement on the easterly side of the dam will direct runoff from the drainage area to the east into the basin.

ALTERNATIVE STUDIES

Several alternates were considered for conveying flood flows around or through the study area. All studies involved similar channel and storm drain facilities as proposed in the final plan, but along differing alignments. Several configurations of flood control dams and/or debris basins were also studied. In all cases, these alternates were designed to carry the runoff from the 100 year frequency storm safely through the study area to the San Jacinto River.

One alternate studied was the construction of a channel to convey runoff from the 7 square mile drainage area without any regulation of the peak flow. Of the alternate alignments studied, one was to direct the flow in a northerly direction to an outlet in the San Jacinto River northeasterly of Lakeview. This proved impractical because of problems encountered in routing flows from other drainage areas into this one system, and the costs involved with having two separate systems were much too great. Other alternatives employing the same concept were discarded for similar reasons.

The next alternate studied made use of a dam or debris basin along the primary watercourse. Various locations, structural configurations, basin storage capacities, and the facility requirements downstream, were all analyzed. A basin with debris capacity and retention capability was selected for reasons of decreased facility sizing requirements downstream and a lower first cost than a debris dam with unregulated 100 year outflow. The Lakeview Dam, as proposed in this Master Drainage Plan, represents the optimum selection with all factors considered.

Studies were made on alternate alignments for the Nuevo Channel. Generally parallel with that selected, alignments were analyzed northerly of Eleventh Street above Lakeview Avenue, and both northerly and southerly of Eleventh Street below Lakeview Avenue. The alignment chosen is believed to provide the least disruption to local properties and is the most cost effective.

The extension of Lateral A easterly along Tryon Avenue was another alternative consideration. Lateral A, a concrete lined trapezoidal channel, was to continue along the southern side of Tryon Avenue to the point at which Lateral A-1 now is proposed to begin. The intent of this concept was to eliminate the need for the upper reach of Lateral A-1, from Montgomery Avenue to Tryon Avenue. This alternative was eliminated, however, since it proved to be the costlier approach and created potential access problems for present and future residents south of Tryon Avenue.

Another alternative considered was a retention basin about 500 feet south of Water Avenue and east of Hansen Avenue. Lateral B was realigned to empty into this basin instead of Lateral A. The intent of this alternative was to provide temporary storage of flood flows and reduce the sizing requirements of Lateral D. Also, the capacity requirements for Lateral A could be reduced since Lateral B would no longer empty into it. This alternative proved to be more expensive than the proposal presented in this Master Drainage Plan. Aside from the cost aspect, basin concept at this site was not compatible with future land use for the area.

CONCLUSIONS

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

1. The Lakeview-Nuevo area has experienced flooding problems in the past and as urbanization takes place in the future, serious property damage will result if adequate drainage facilities are not installed. A more orderly growth pattern can safely occur with the construction of these proposed facilities.
2. A system of facilities which includes several underground storm drains, open channels, and a flood control dam is required to safely convey storm runoff through the area.
3. The Master Drainage Plan proposed in this report is the most economical system of facilities studied to eliminate the flooding and drainage problems in the Lakeview-Nuevo area.
4. The proposed plan lends itself to stage construction as funds become available.
5. The total cost of the recommended improvements, including right of way, engineering, administration and contingencies (January 1981) is estimated to be \$6,899,000.

RECOMMENDATIONS

It is recommended that:

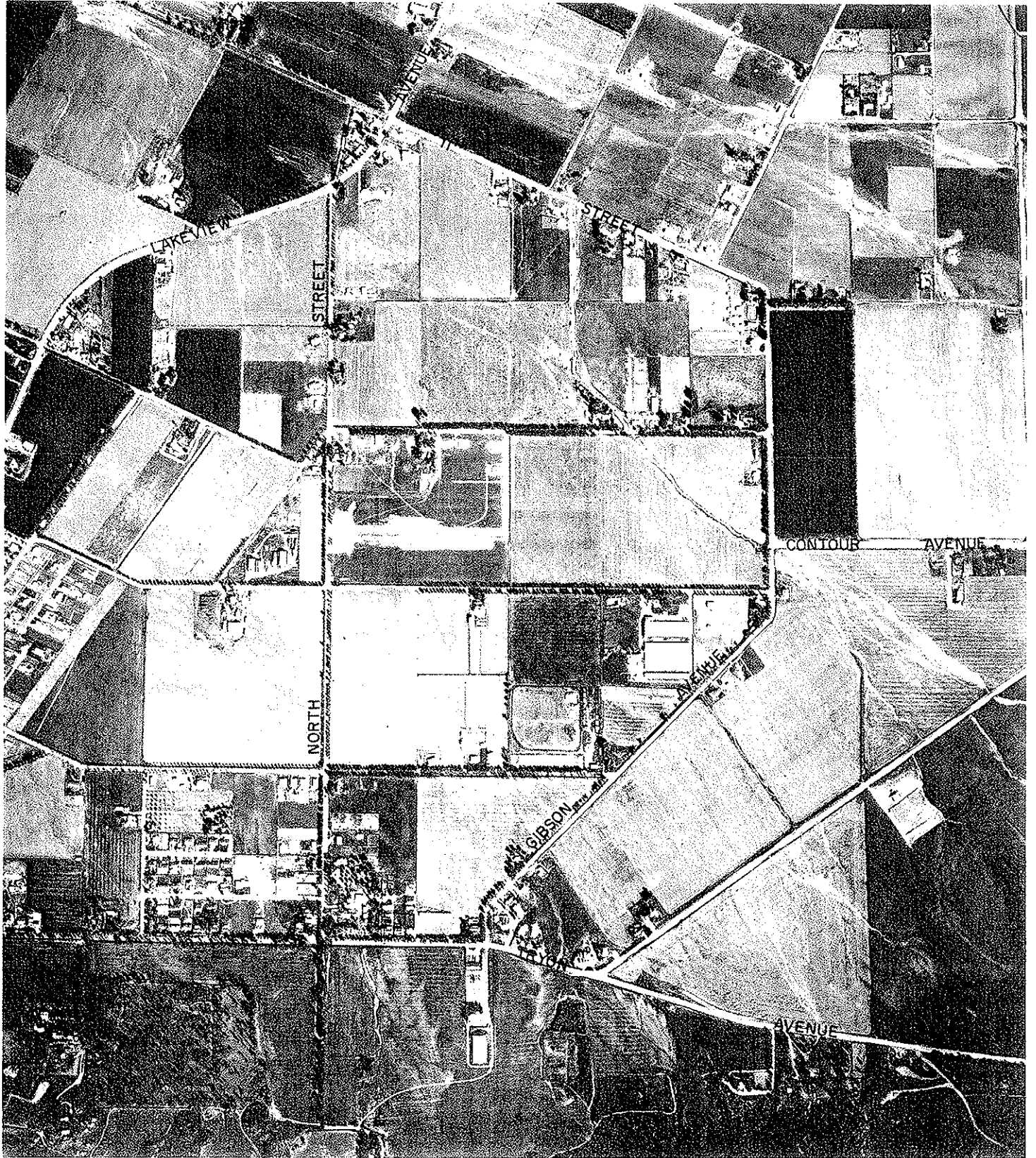
1. The Amended Master Drainage Plan as set forth herein be approved by the Riverside County Flood Control and Water Conservation District's Board of Supervisors as a part of the overall master plan for the County.
2. The Amended Master Drainage Plan as set forth herein be used as a guide for all future 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.
4. The Amended Lakeview-Nuevo Area Drainage Plan, prepared by the Riverside County Flood Control and Water Conservation District, be adopted by the Riverside County Board of Supervisors as a means through which funding may be procured for the implementation of the plan, and that other funding sources be investigated and adopted so as to complete the plan at the earliest possible date.

TABLE I
LAKEVIEW-NUEVO MASTER DRAINAGE PLAN
COST SUMMARY

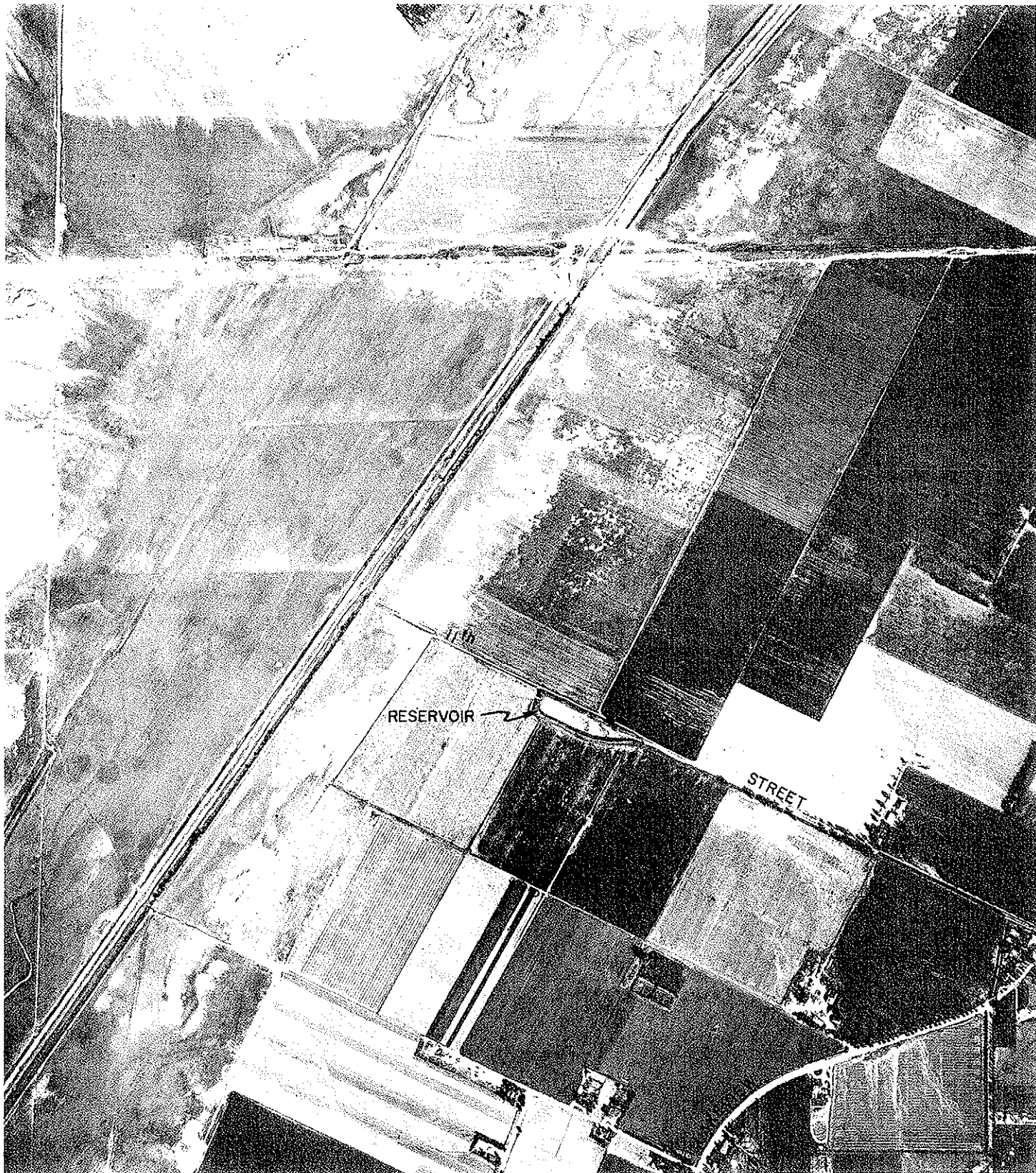
<u>FACILITY</u>	<u>CONSTRUCTION COST</u>	<u>30% ENGINEERING & ADMINISTRATION</u>	<u>RIGHT OF WAY</u>	<u>MASTER PLAN COST</u>
NUEVO CH.	\$ 655,000	\$ 197,000	\$ 151,000	\$ 1,003,000
LATERAL A	589,000	176,000	97,000	862,000
LATERAL A-1	182,000	54,000	27,000	263,000
LATERAL B	271,000	81,000	42,000	394,000
LATERAL B-1	65,000	20,000	8,000	93,000
LATERAL C	592,000	177,000	11,000	780,000
LATERAL D	699,000	210,000	-	909,000
LATERAL E	198,000	60,000	-	258,000
LINE F	580,000	174,000	11,000	765,000
LAKEVIEW DAM OUTLET DRAIN	162,000	49,000	-	211,000
TRAINING DIKE	85,000	26,000	15,000	126,000
LAKEVIEW DAM	615,000	185,000	435,000	1,235,000
TOTAL	\$4,693,000	\$1,409,000	\$ 797,000	\$ 6,899,000



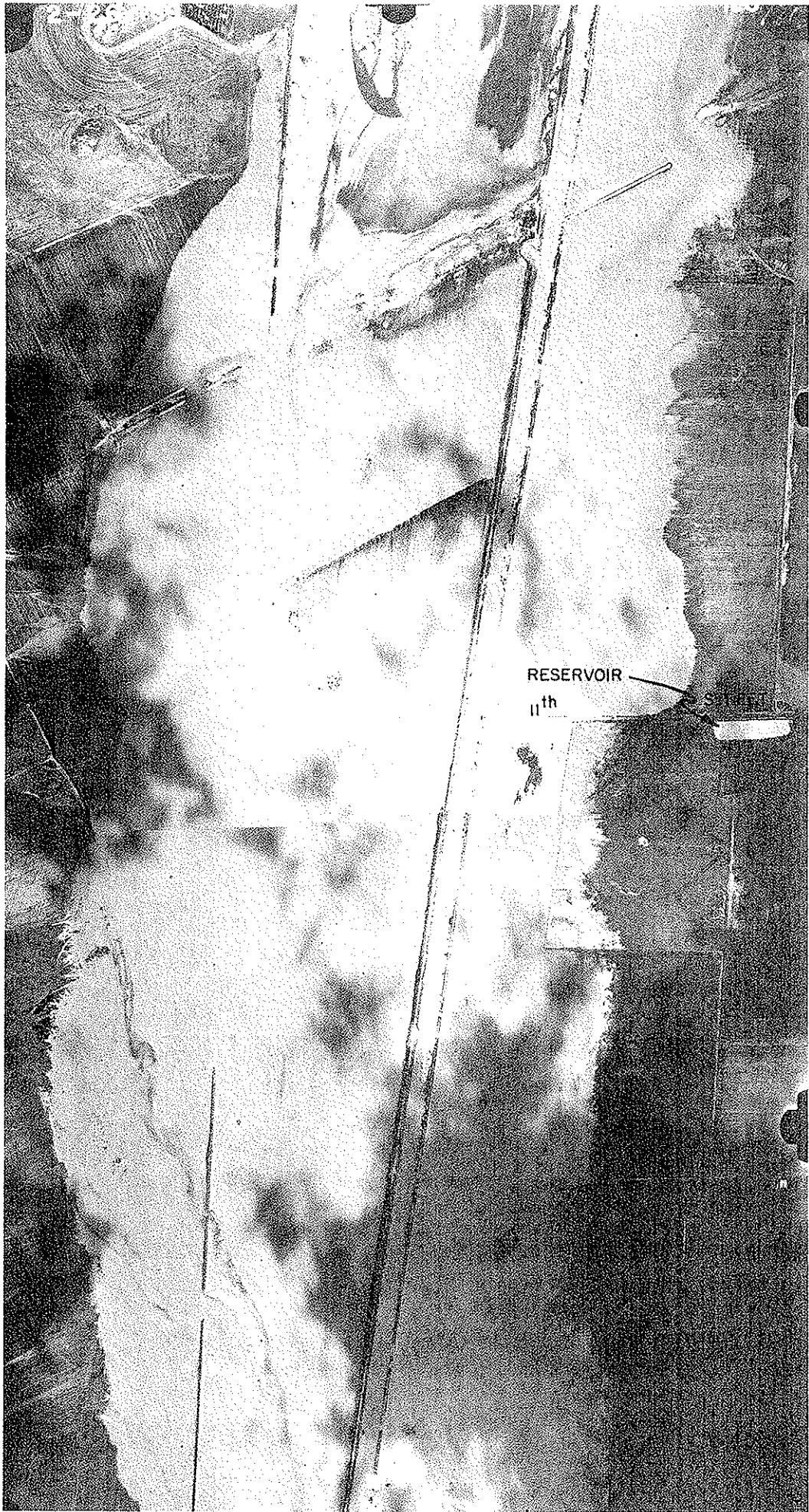
Aerial view showing paths of flood waters north and south of Contour Ave. and east of Hansen Ave. 10-22-76.



Aerial view of central portion of study area. 10-22-76



Aerial view of study area near San Jacinto River. 10-22-76



Aerial view along San Jacinto River. 2-26-69

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

LAKEVIEW - NUEVO AREA
WATERSHED BOUNDARY

APPROVED:	DRAWN BY: <i>R.C.S.</i>	SHEET NO.
CHIEF ENGINEER R.E. NO. 8882	CHECKED BY:	DR. NO.
DATE:	DATE DRAWN:	

