

STORM DRAINAGE & FLOOD CONTROL MASTER PLAN



Rancho Murieta Community Services District



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RANCHO MURIETA COMMUNITY SERVICES DISTRICT

STORM DRAINAGE

&

FLOOD CONTROL

MASTER PLAN

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1. EXECUTIVE SUMMARY

In August, 1987, the District Board of Directors established a Drainage Committee. The Committee was directed to work with Staff in the preparation of a Storm Drainage and Flood Control Master Plan and a Drainage Ordinance. This Master Plan document is the result of the Drainage Committee's work over the last several months.

This Master Plan document evaluates many important aspects of drainage and flood control. The key principles that have guided this work are as follows:

1. The major functions of a storm drainage system are to protect life and property and to minimize inconvenience to the public.
2. The District should create a realistic balance between elimination of inconvenience and protection against hazard.
3. The storm drainage system should include adequate measures to protect the natural resources within the community.
4. The community's drinking water supplies should be protected against urban runoff contamination.
5. The storm drainage system should be properly maintained to provide the desired level of service.

6. Public and private responsibilities for operation and maintenance of the drainage system should be clearly delineated.
7. The restricted access rights of the community's private streets should not be violated.
8. The District should adopt minimum design and construction standards for future drainage and flood control improvement.

The annual cost to operate and maintain the existing public drainage system is estimated at \$76,000. This annual cost does not include allowances for depreciation and replacement of facilities which are estimated to be an additional \$35,000-53,000 per year. The Master Plan includes a preliminary rate structure to pay for the annual maintenance of the existing system. The District will need to develop a capital reserves funding program for depreciation and replacement of the system.

The existing drainage system shows signs of deferred maintenance. In addition, some remedial repairs are needed. The costs of these repairs have been estimated at \$46,000. The District will need to develop a funding program for remedial repairs.

Finally, the Master Plan discusses the merits of various programs to fund the extension of the drainage system. The District will need to develop a program for funding of future extensions of the drainage system.

2. INTRODUCTION

A. HYDROLOGIC SETTING:

Rancho Murieta is located on the east side of the Sacramento Valley at the general area where the foothills of the Sierra Nevada range begin. The 3,500-acre community is divided by the Cosumnes River, which flows from east to west with a slight southerly trend.

The Storm Drainage and Flood Control Master Plan exhibit (Exhibit No. 1) indicates the major hydrologic features within the community. This exhibit also shows the major components of the drainage system. This system includes natural streams and man-made drainage and flood control facilities.

The Community varies in elevation from about 110-feet to about 330-feet above sea level. Slopes within the foothill region range from 8-25%. The soils within the community have a moderate to high potential for erosion. Natural vegetation within the community includes grasslands, oak woodlands, and riparian woodlands.

The Cosumnes River is a virtual wild river in that only about 4% of the 536-square-mile watershed upstream of Rancho Murieta is controlled by a dam and reservoir. As a result, the vast majority of the watershed's 38 inches of mean seasonal precipitation flows through Rancho Murieta uncontrolled. Previous hydrologic studies have estimated the 1% change peak flow (100 year peak flow) of the Cosumnes River at Rancho Murieta is 62,000 cubic feet per second (CFS).

The U.S.G.S. stream gage at Michigan Bar has recorded the peak flows in the Cosumnes River since the early 1900's. This gaging station is located one mile upstream of Rancho Murieta. The peak flow recorded to date occurred February, 1986 when the Cosumnes River reached 45,100 CFS. It appears that this peak flow may have been exceeded to some degree by the March, 1907 flood, but accurate flow data is not available to estimate the peak flow in that year.

The stream gage records indicate that significant river flows have occurred in recent history. These peak flows are shown below:

<u>DATE</u>	<u>PEAK FLOW</u>
December, 1955	42,000 CFS
January, 1969	18,800 CFS
January, 1980	19,000 CFS
February, 1982	25,400 CFS
March 1983	18,400 CFS
December, 1984	19,800 CFS

The January, 1980 flood inundated portions of the South Golf Course. As a result of the damage to Fairway Numbers 10 and 11, the developer constructed a dike around these fairways to protect them from the 25-year design flow of the river.

The mean seasonal precipitation at Rancho Murieta is 20 inches. The relatively steep slopes of the foothills and this amount of precipitation result in a medium to very rapid runoff potential. The community is transversed by a series of naturally occurring streams, tributaries and swales which, acting together, comprise the area's natural surface water drainage system.

The significant hydrologic features within the community include:

- * Primary natural drainage courses which convey seasonal runoff.
- * The 100-year floodplain limits of the Cosumnes River.
- * Perennial water bodies, both man-made and natural, such as reservoirs, lakes and rivers.
- * Marsh and wetland areas.
- * Seasonal transient water such as areas where persistent runoff ponding occurs.

B. DRAINAGE & FLOOD CONTROL SERVICE:

Of the 3,500 acres within Rancho Murieta, approximately one-half of the area has undergone urbanization of one degree or another. The areas that have not been urbanized are more or less still in their natural state. Those areas of the community that have been urbanized include:

- * Residential subdivisions (a total of 1,775 dwelling units in Units 1, 2, 3, 3B, 4, Murieta Village, and Murieta Lodge)
- * Man-made lakes and reservoirs
- * Golf courses and Country Club
- * Agricultural lands
- * Water & wastewater treatment facilities
- * Commercial lands, including Murieta Plaza, RMTTC, airport and Equestrian Center.

Drainage and flood control facilities have been developed in the urbanized areas. These facilities include:

- * Drainage channels (improved and unimproved)
- * Drainage pipelines, culverts, etc.
- * Flood control levees
- * Drainage flood control structures

In the past, storm drainage and flood control jurisdiction has been the overlapping responsibility of property owners, homeowner associations, Sacramento County and the District. The respective areas of responsibility between these entities were not well defined. Collectively, the effort of these entities in providing these services has been minimal. There is a large need to provide this service in an organized manner to benefit the present and future residents of Rancho Murieta.

The District has voter-approved latent authority to provide drainage and flood control service. In addition to the latent authority, the District's 1983 de-annexation from Sacramento County's Metropolitan Storm Drainage Maintenance District ("Metro") obligated the District to provide drainage service to those areas that had been previously annexed to Metro, principally Unit No. 1 and Murieta Village.

In August, 1987, the District Board of Directors established a Drainage Committee to work with staff in the preparation of a Drainage Master Plan and Drainage Ordinance that could be adopted by the District. This Master Plan document is the result of the Drainage Committee's work over the last several months.

3. DRAINAGE & FLOOD CONTROL

A. STORM DRAINAGE SYSTEMS:

In an undeveloped area, the storm drainage system is provided by nature. Some storm water stands where it falls and some percolates into the ground. The remainder gradually or quickly collects in quantity and speed as it hurries down the watershed through swales and streams to its ultimate destination - the river and then the sea. This simple yet complex natural system is constantly undergoing change to accommodate severe storms.

As urbanization occurs, new drainage systems are required due to the increased runoff rates that result from the placement of large, impervious surfaces over natural areas that were relatively pervious. The problem faced by man as a result of urbanization is an increasing level of inconvenience and/or loss of life or property from increased runoff flows.

Ideally, an urban storm drainage system should remove runoff as quickly as possible to minimize inconvenience and the loss of life or property. These two objectives are not mutually achievable without extremely high "cost". The need is obvious - to strike a realistic balance between elimination of inconvenience and protection against hazard.

The existing storm drainage and flood control system within Rancho Murieta has been developed in an attempt to achieve such a balance. The system is composed of both natural and man-made elements. The system has major and minor functions. The major

function of the system is to minimize loss of life or property during an infrequent storm. The minor function is to minimize inconvenience that results from more frequently occurring, less significant storms.

The planning of new developments should make maximum use of existing open channels and natural streams as a part of the drainage system. In addition to the resulting lower total system costs, the stream corridors are preserved as open space and recreational areas.

Within the system there are facilities that are designed to avoid inconvenience to the public in the smaller sections of the system during a minor storm, for example, a street intersection. During a major storm, the capacity of many of these convenience-oriented facilities will be exceeded, while major components of the system are designed to provide safety and to minimize loss of life or property. It must be recognized and emphasized that a total storm drainage system subject to an infrequent major storm cannot be expected to totally prevent inconvenience and minor property damage.

The provision of drainage and flood control service comes with an inherent liability. Flooding, minor or major in nature, can result in property damage and loss of life. The prediction of peak storm runoff quantities is as much an art as it is a science. Even the peak runoff from a 1% chance (100-year) design storm will be exceeded at some point in time. The resulting loss of property and life can be significant.

While the utilization of generally accepted engineering standards in the design of the drainage and flood control facilities should minimize the probability of flooding during the design storm, there is always the chance that some flooding will occur.

It is for this reason that the drainage purveyor has a liability. Proper levels of insurance should be carried by the purveyor to protect against this liability.

B. NATURAL STREAMS:

One major component of Rancho Murieta's storm drainage system is the extensive amount of natural swales, streams and tributaries. These natural components are made up of floodplains and floodways. The floodway is the main channel portion of the stream that carries floodwaters away. The floodplain is that portion of the stream adjoining the floodway that may be periodically submerged by floodwaters.

A major function of the stream floodways is to provide the necessary drainage of storm water runoff in the area. During the wet winter season, the often-dry floodplains are filled by rainwater as it drains from higher ground to stream channels. Once every hundred years on the average, a major storm will occur which will fill the floodplain out to a line defined as the one hundred-year floodplain. Any development within the hundred year floodplain will be subject to flooding and harm by the one hundred year storm. Storms of lesser intensity will result in less severe flooding on a periodic basis.

The drainage capacity and natural character of the streams are being significantly changed by urban development in the area. The impervious surfaces, drainage alterations, and land filling activities associated with development can cause some serious alterations in the hydrology of the natural streams. This results in an increase in runoff and stream flows, and in many instances a decrease in the carrying capacity of the waterways. Flood hazards are increased by these hydrologic changes. Although the

impact of higher and faster flows may not be damaging at a point of origin upstream, the flows can be damaging to property as they accumulate at a downstream location.

The development of residential lots in natural settings can result in building envelopes that are separated from the adjoining street by a drainage swale or channel. In this case, it is important that the District consider the establishment of control mechanisms over the construction of driveway culverts. Improperly designed or constructed culverts can create severe upstream flooding.

The development of urban areas should be directed away from the one hundred year floodplain of natural streams and other significant hydrologic features within Rancho Murieta for the following reasons:

1. To minimize loss of life and property.
2. To minimize environmental disruption.
3. To preserve or enhance the aesthetic qualities of natural drainage courses in their natural state.
4. To prevent encroachment of fills and structures into the floodplain.

Exhibit No. 1 indicates the extent of the significant natural streams that make up the natural drainage system within Rancho Murieta. The natural system has been extensively incorporated into the drainage system in urbanized areas.

C. WATER QUALITY:

The quality of storm drainage runoff is a function of the level of natural and man-made pollutants that exist within the watershed. The cleansing action of a storm washes these pollutants from the watershed and transports them through the drainage system

to the lakes and rivers.

The quality of water in the drainage system changes as urbanization occurs. The urban storm water draining from streets, roofs and storm drains into the system has higher levels of organic and inorganic pollutants than natural storm water. The dumping of trash and refuse into the system degrades the quality of the water when the dumpings are carried off by storm waters. Erosion and sedimentation are also increased by development activities which disturb the natural protective covers of the land and add loosely compacted fills.

Pollutants are frequently generated throughout a watershed, a process known as "non-point source discharges." A second source of pollutants known as "point source discharges" are specific properties or individuals within a watershed. These sources can be any business storage yards, industrial sites, or residences where pollutants are stored or used in large quantities.

Pollution loads are the result of:

- * soil erosion and dissolving of minerals in the natural ground cover;
- * overland flow which picks up fertilizer, animal droppings, and organic material;
- * flow on parking lots, roofs and streets which carries petroleum products, trash, dust fall and debris from cars and trucks into the drainage system, and;
- * accidental or willful discharge of toxics or pollutants from storage areas or transportation modes.

Three basic methods of treatment can be used:

- * The first controls pollution loads at their source. For example, proper erosion control and sediment control will

reduce the suspended solids levels. Also, periodic street cleaning will reduce pollution loads.

- * Storm water runoff can be treated at the source. Temporary storage of runoff to allow suspended solids to settle out is one example. The fact that most runoff pollution results from the "first flush" of runoff should be considered when planning source treatment facilities.

- * Treatment of storm water runoff at a centralized plant downstream is the third alternative. This is usually the most costly method because of the vast volume of water requiring treatment. Consideration may be given to storage facilities enabling storm water to be released to treatment plants at a gradual rate after the runoff peak has passed.

It is quite obvious that the least costly method of treatment is to control pollution at its source. Treatment of runoff pollution loads is probably unnecessary for most low-density residential development. It also seems obvious that the cost of such treatment will be high, so it follows that treatment should not be considered unless there is documentation of the need and a demonstration that the benefits from treatment will be consistent with its costs.

The U. S. Environmental Protection Agency (EPA) is in the process of requiring small communities such as Rancho Murieta to obtain drainage discharge permits. These drainage discharge permits may require compliance with discharge requirements, including quality standards. Small communities will have to have the necessary permits in place by 1992. The State Central Valley Regional Water Quality Control Board will be administering the

permit process for EPA. It is too early to determine what discharge requirements, if any, will be set for Rancho Murieta.

The District should consider creating a permit procedure to monitor and control large users of chemicals, pesticides, fertilizers, etc. Enforcement mechanisms could be adopted that will discourage willful or accidental discharge of pollutants into the storm drainage system.

D. PROTECTION OF DOMESTIC WATER SUPPLY RESERVOIRS:

Rancho Murieta's domestic water supply reservoirs, Lakes Chesbro, Calero and Clementia, are surrounded by small, medium and large watersheds, respectively. Runoff from these watersheds enters the reservoirs and mixes with stored water. As urbanization of these watersheds occurs, the potential for contamination of the community's water supply increases.

As explained earlier, runoff from developed areas can contain high levels of pollutants. Potentially, these pollutants can enter the community's domestic water supply undetected. It is important that proper steps be taken in the handling of runoff from developed areas to minimize the potential for contamination of the community's drinking water supply.

1) Lake Chesbro:

Lake Chesbro is one of the community's two primary drinking water storage reservoirs. The water stored in this reservoir is delivered directly to the District's water treatment plant in order to meet the consumption demands of the community. Contamination of this lake would have an immediate and adverse effect on the quality of the water consumed by the District's customers.