# 8 Why are Floods a Threat to the City of San Dimas?

Because of its proximity to the San Gabriel River, San Dimas can be susceptible to flooding events. Not only does flooding pose a threat to life and safety, but also can cause severe damage to public and private property. San Dimas has three flood zone designations, A9, B, and C, as evident by the flood zone map. Flood Zone A9, which is subject to flooding in a hundred year storm, covers a small stretch of the San Dimas Canyon Wash south of Golden Hills Road. Areas included in Flood Zone B, which could be affected in a 100 – 500 year storm, are located along the San Dimas Canyon Wash and just south and west of the Foothill Freeway north of Arrow Highway. The balance of the City is within a Flood C designation, defined as subject to minimal flooding. Map 8-1 illustrates the flood prone areas in the City.

The City of San Dimas was most recently affected by the flooding that occurred following the Williams Fire of 2002. The Williams Fire burned over 37,000 acres of forestland and 100% of the undeveloped watershed tributary to the San Dimas reservoir, which provides flood control functions for residents downstream of the facility. This tragedy greatly increased the potential for sedimentation problems to occur at the San Dimas Reservoir for the next several years. The storms following the fire resulted in a loss of electricity, water, and phone service. Over 600,000 tons of debris, silt, and rocks invaded the local neighborhoods.

Following the Williams Fire, the City filed for federal and county assistance for both fire relief and flood mitigation efforts. Fortunately, because of the large amount of prior planning done by the City of San Dimas, effects of the floods were mitigated.

## History of Flooding in the City of San Dimas

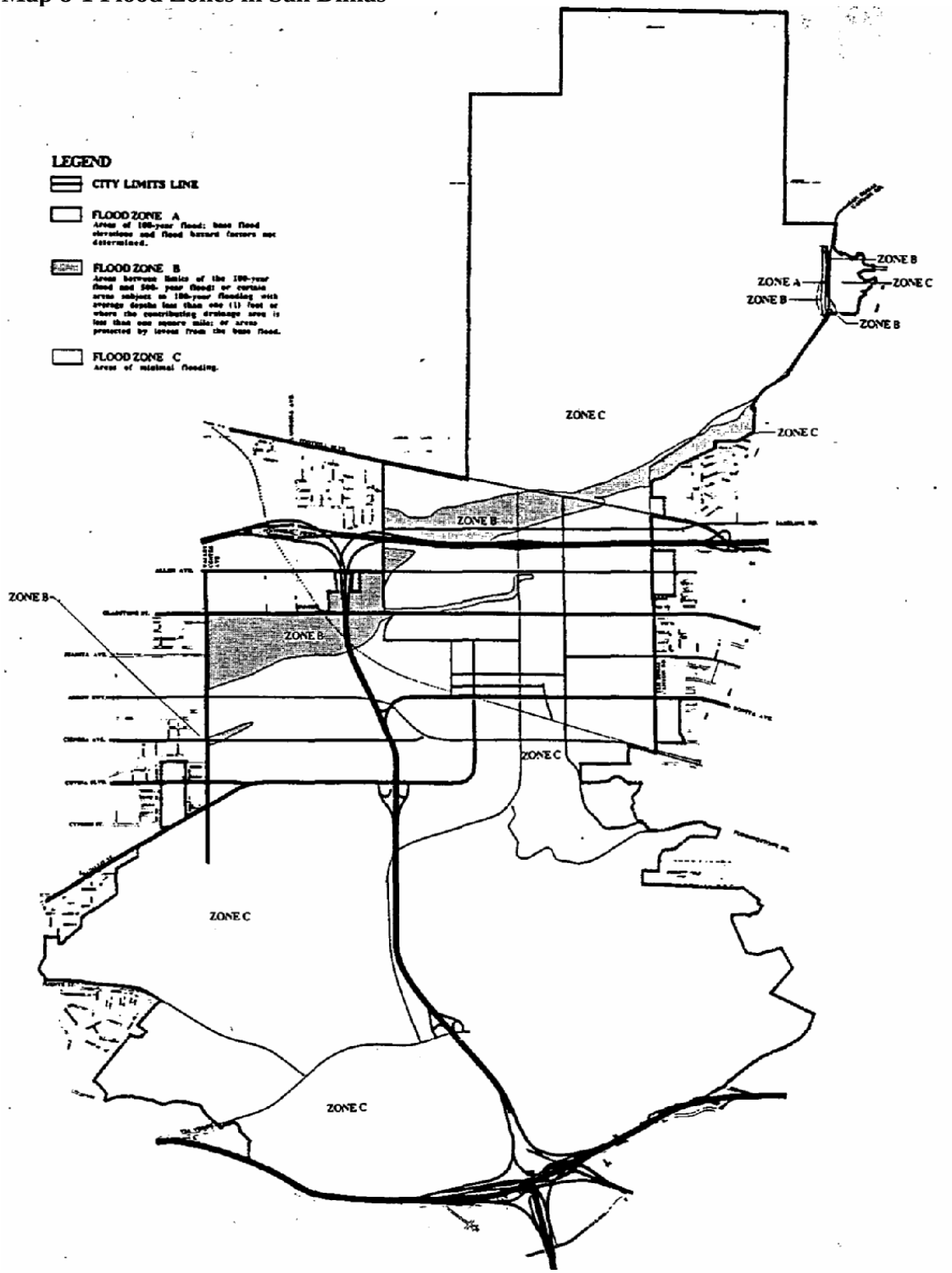
While floods have not been a tremendous problem in the City of San Dimas, the City is susceptible to flooding from the Puddingstone Diversion Dam and the San Dimas Canyon River.

There are a number of rivers in the Southern California region, but the most prominent is the Los Angeles River. The flood history of the Los Angeles River is generally indicative of the flood history of much of Southern California.

**Historic Flooding in Los Angeles County**

Records show that since 1811, the Los Angeles River has flooded 30 times, on average once every 6.1 years. However, averages are deceiving, for the Los Angeles basin goes through periods of drought and then periods of above average rainfall. Between 1889 and 1891, the River flooded annually, and from 1941 to 1945, the River flooded 5 times. Conversely, from 1896 to 1914, a period of 18 years, and again from 1944 to 1969, a period of 25 years, the river did not have any serious floods.[1] Table 8-1 lists major floods of the LA River since 1811.

**Map 8-1 Flood Zones in San Dimas**



| Table 8-1 Major Floods of the Los Angeles River[2] | |
|---|---|
| 1811 | Flooding |
| 1825 | L.A. River changed its course back from the Ballona wetlands to San Pedro |
| 1832 | Heavy flooding |
| 1861-62 | Heavy flooding, fifty inches of rain during December and January. |
| 1867 | Floods create a large, temporary lake out to Ballona Creek. |
| 1876 | The Novician Deluge |
| 1884 | Heavy flooding causes the river to change course, turning east to Vernon and then to San Pedro. |
| 1888-1891 | Annual floods |
| 1914 | Heavy flooding. Great damage to the harbor. |
| 1921 | Flooding |
| 1927 | Moderate flood |
| 1934 | Moderate flood starting January 1. Forty dead in La Canada. |
| 1938 | Great County-wide flood with 4 days of rain. Most rain on day 4. |
| 1941-44 | L.A. River floods five times. |
| 1952 | Moderate flooding |
| 1969 | One heavy flood after 9 day storm. One moderate flood. |
| 1978 | Two moderate floods |
| 1979 | Los Angeles experiences severe flooding and mudslides. |
| 1980 | Flood tops banks of river in Long Beach. Sepulveda Basin spillway almost opened. |
| 1983 | Flooding kills six people. |
| 1992 | 15 year flood. Motorists trapped in Sepulveda basin. Six people dead. |
| 1994 | Heavy flooding |

While the City of San Dimas is 25 miles east of Los Angeles, it is close enough to be affected by the heavy rains that bring flooding to the area. The towering mountains that give the Los Angeles region its spectacular views also wring heavy amounts rain out of the storm clouds that pass through. Because the mountains are so steep, the rainwater moves rapidly down the slopes and across the coastal plains on its way to the ocean.

Naturally, this rainfall moves quickly down stream, often with severe consequences for anything in its path. In extreme cases, flood-generated debris flows will roar down a canyon at speeds of 40 mph with a thick wall of mud, debris, and water. In Southern California, stories of floods, debris flows, and tragedies concerning persons swept away to their death in a river are without end. No catalog of chaos could contain all the losses suffered by man and his possessions from the regions' rivers and streams.

## What Factors Create Flood Risk?

Flooding occurs when climate, geology, and hydrology combine to create conditions where water flows outside of its usual course. In San Dimas, geography and climate combine to create chronic seasonal flooding conditions. The City is particularly susceptible to flooding each year between November and March, during the rainy reasons.

### Winter Rainfall

Over the last 125 years, the average annual rainfall in Los Angeles is 14.9 inches. However, as previously discussed, the term average means very little as the annual rainfall during this period has ranged from only 4.35 inches in 2001-2002 to 38.2 inches in 1883-1884. In fact, in only fifteen of the past 125 years, has the annual rainfall been within 10% of the 14.9-inch average. In addition, only 38 years have had annual rainfall of 20% of the 14.9-inch average. This makes the Los Angeles basin a land of extremes in terms of annual precipitation.

Annual precipitation in the cities across the region varies greatly due to the variations in mountains in the area. The Santa Monica, Santa Susana, and Verdugo Mountains that surround three sides of the valley seldom reach heights above three thousand feet. The western San Gabriel Mountains, in contrast, have elevations of more than seven thousand feet. These higher ridges often trap eastern-moving winter storms. Although downtown Los Angeles averages just fifteen inches of rain a year, some mountain peaks in the San Gabriel's receive more than forty inches of precipitation annually![3] Because San Dimas is in the southern portion of the San Gabriel Valley, there is a potential for increases in the collection of rainwater.

### Monsoons

Another relatively regular source for heavy rainfall, particularly in the mountains and adjoining cities, is from summer storms. Table 8-2 lists tropical storms that have had significant rainfall in the past century, and the affected areas. These storms usually coincide with El Niño.

**Table 8-2 Tropical cyclones that have affected Southern California during the 20th Century [4]**

| Month-Year | Dates | Areas Affected | Rainfall |
|---|---|---|---|
| July 1902 | 20th & 21st | Deserts & Southern Mountains | up to 2" |
| Aug. 1906 | 18th & 19th | Deserts & Southern Mountains | up to 5" |
| Aug. 1921 | 20th & 21st | Deserts & Southern Mountains | up to 2" |
| Sept. 1921 | 30th | Deserts | up to 4" |
| Sept. 1929 | 18th | Southern Mountains & Deserts | up to 4" |
| Sept. 1932 | 28th - Oct 1st | Mountains & Deserts, 15 Fatalities | up to 7 |
| Aug. 1935 | 25th | Southern Valleys, Mountains & Deserts | up to 2" |
| Sept. 1939 | 4th - 7th | Southern Mountains, Southern & Eastern Deserts | up to 7 |
| | 25th | Long Beach, W/ Sustained Winds of 50 Mph | 5" |
| | | Surrounding Mountains | 6 to 12" |
| Sept. 1945 | 9th & 10th | Central & Southern Mountains | up to 2" |
| Sept. 1946 | 30th - Oct 1st | Southern Mountains | up to 4" |
| Aug. 1951 | 27th - 29th | Southern Mountains & Deserts | 2 to 5" |
| Sept. 1952 | 19th - 21st | Central & Southern Mountains | up to 2" |
| July 1954 | 17th - 19th | Deserts & Southern Mountains | up to 2" |
| July 1958 | 28th & 29th | Deserts & Southern Mountains | up to 2" |

| | | | |
|---|---|---|---|
| Sept. 1963 | 17th - 19th | Central & Southern Mountains | up to 7" |
| Sept. 1976 | 10th & 11th | Central & Southern Mountains, 3 Fatalities | 6 to 12" |
| Aug. 1977 | n/a | Mountains | up to 8" |
| Sept. 1978 | 5th & 6th | Mountains | 3" |
| Sept. 1982 | 24th - 26th | Mountains | up to 4" |
| Sept. 1983 | 20th & 21st | Southern Mountains & Deserts | up to 3" |

**Geography and Geology**

The greater Los Angeles Basin is the product of rainstorms and erosion for millennia. Most of the mountains that frame the valleys and coastal plain are deeply fractured faults and, as they grow taller, their brittle slopes continually erode. Rivers and streams carried, rocks, gravel, sand, and silt down these slopes to the valleys and coastal plain. In places, these sediments are as much as twenty thousand feet thick.[5]

Much of the coastal plain rests on the ancient rock debris and sediment washed down from the mountains. This sediment can act as a sponge, absorbing vast quantities of rain in those years when heavy rains follow a dry period. Like a saturated sponge, the same soil fills up rapidly when a heavy rain follows a period of relatively wet weather. Even in years of heavy rain, flooding is minimal because the ground is relatively dry.

As we are well aware, the Los Angeles Basin is highly built out. This leaves little open land to absorb rainfall. The lack of open ground forces water to remain on the surface and rapidly accumulate. If not for the massive river control system lined with concrete, potential for flooding would greatly increase. In-fill building also leads to a higher risk of flooding. Developers may tear down an older home that typically covers up to 40% of the lot size and replace it with four town homes or apartments, which may cover 90-95% of a lot.

While uncommon, another potential source of flooding in San Dimas is asphalt creep. The street space between the curbs of a street is a part of the flood control system. As water leaves property and accumulates in the streets, it is directed towards the underground portion of the system. The carrying capacity of the street is determined by the width of the street and the height of the curbs along the street. Often, when streets are resurfaced, a one to two inch layer of asphalt is laid down over the existing materials, leading to a marginal reduction of capacity over time.

## Flood Terminology

**Floodplain**

A floodplain is a land area adjacent to a river, stream, lake, estuary, or other water body that is subject to flooding. This area, if left undisturbed, acts to store excess floodwater. The floodplain consists of the floodway and the flood fringe. Floodplain management is the overall program of corrective and preventative measures for reducing flood damage, including emergency preparedness plans, flood control works, and regulations.

**100-Year Flood**

The 100-year flooding event is the flood having a one percent chance of being equaled or

exceeded in magnitude in any given year. Contrary to popular belief, it is not a flood occurring once every 100 years. The 100-year floodplain is the area adjoining a river, stream, or watercourse covered by water in the event of a 100-year flood. Flood Zone A in Map 8-1 is the portion of the City that falls within the 100-year flood zone.

**Floodway**
The floodway is one of two main sections that make up the floodplain. Floodways are defined for regulatory purposes. Unlike floodplains, floodways do not reflect a recognizable geologic feature. According to the City's General Plan, floodways are defined as the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.. Their purpose is to carry the bulk of the floodwater downstream and is usually the area where water velocities and forces are the greatest. NFIP regulations require that they are free from development that would obstruct or divert flood flows onto other properties.

San Dimas regulations discourage development in the floodways since they are extremely hazardous areas due to the velocity of the floodwaters, which carry debris, potential projectiles, and erosion potential. Municipal Code 15.60.180 prohibits encroachments, including fill, new construction and substantial improvements, and other development unless certification by a registered professional engineer or architect is provided demonstrating that these shall not result in any increase in flood levels during the occurrence of the base flood discharge.

**Development**
For floodplain ordinance purposes, development is broadly defined by the City of San Dimas Floodplain Management Code to mean any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, or excavation located within the area of special flood hazard. The definition of development for floodplain purposes is generally broader and includes more activities than the definition of development used in other sections of local land use ordinances.

**Base Flood Elevation (BFE)**
Base Flood Elevation refers to the elevation (normally measured in feet above sea level) that the base flood is expected to reach. Base flood elevations can be set at levels other than the 100-year flood. Some communities choose to use higher frequency flood events as their base flood elevation for certain activities, while using lower frequency events for others. For example, for the purpose of storm water management, a 25-year flood event might serve as the base flood elevation, while the 500-year flood event may serve as base flood elevation for the tie down of mobile homes. The City focuses on development in the 100-year floodplain.

## Characteristics of Flooding

Four types of flooding primarily affect the City of San Dimas: riverine flooding, urban flooding, dam failure, and debris flows (see descriptions below). In addition, any low-lying area has the potential to flood. The flooding of developed areas may occur when the amount of water generated from rainfall and runoff exceeds a storm water system's capability to remove it.

**Riverine Flooding**
Riverine flooding is the over bank flooding of rivers and streams. The natural processes add sediment and nutrients to fertile floodplain areas. Flooding in river systems typically results from large-scale weather systems that generate prolonged rainfall over a wide geographic area, causing problems in hundreds of smaller streams, which then drain into major rivers.

Shallow area flooding is a special type of riverine flooding. FEMA defines shallow flood hazards as areas inundated by the 100-year flood with flood depths of only one to three feet. These areas generally flood with low velocity sheet flows of water.

**Urban Flooding**
As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization of a watershed changes the hydrologic systems of the basin. Heavy rainfall collects and flows faster on impervious concrete and asphalt surfaces. The water moves from the clouds to the ground, and into streams at a much faster rate in urban areas. Adding these elements to the hydrological systems can result in floodwaters that rise very rapidly and peak with violent force. During periods of urban flooding, streets can become swift moving rivers and basements can fill with water. Storm drains often back up with vegetative debris causing additional, localized flooding.

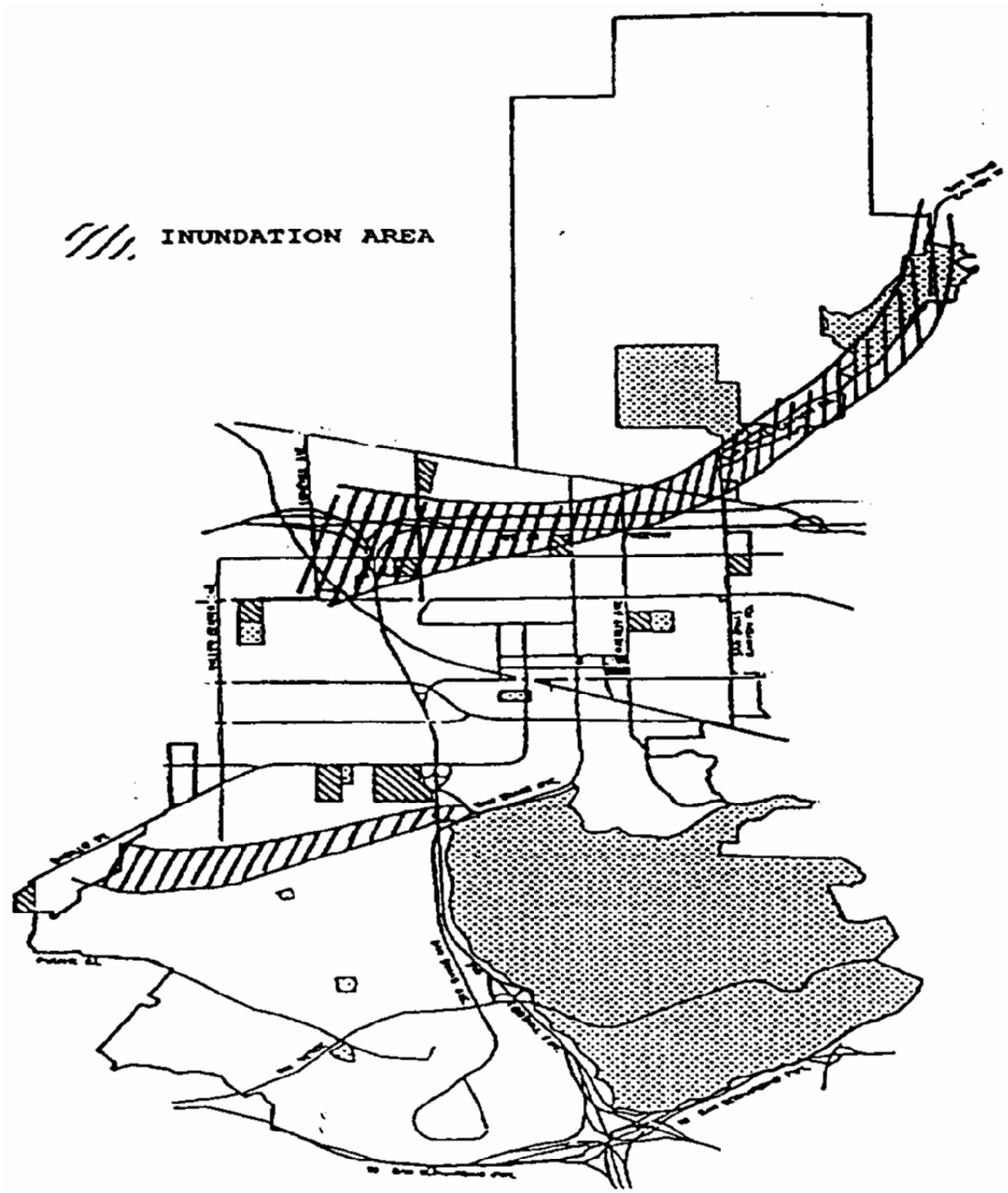
**Dam Failure Flooding**
Loss of life and damage to structures, roads, and utilities are products of dam failure. Economic losses can also result from a lowered tax base and lack of utility profits. These effects would certainly accompany the failure of one of the major dams in the City of San Dimas. There are two reservoirs in San Dimas, the San Dimas Reservoir and Puddingstone Reservoir, each holding millions of gallons of water. Because dam failure can have severe consequences, FEMA requires that all dam owners develop Emergency Action Plans (EAP) for warning, evacuation, and post-flood actions. Although there may be coordination with county officials in the development of the EAP, the responsibility for developing potential flood inundation maps and facilitation of emergency response is the responsibility of the dam owner. Map 8-2 shows the dam inundation potential in the City.

Since the 19th century, there have been 45 dam failures in California. The following table presents t he significant dam failures in Southern California.

**Table 8-3 Dam Failures in Southern California[6]**

| | | | |
|---|---|---|---|
| Sheffield | Santa Barbara | 1925 | Earthquake slide |
| Puddingstone | Pomona | 1926 | Overtopping during construction |
| Lake Hemet | Palm Springs | 1927 | Overtopping |
| Saint Francis | San Francisquito Canyon | 1928 | Sudden failure at full capacity, 426 deaths |
| Cogswell | Monrovia | 1934 | Breaching of concrete cover |
| Baldwin Hills | Los Angeles | 1963 | Leak through embankment turned into washout, 3 deaths |

**Map 8-2 Dam Inundation in San Dimas**



The two most significant dam failures are the St. Francis Dam in 1928 and the Baldwin Hills Dam in 1963. The following are accounts of the travesties, courtesy of USC archives and the *Los Angeles Times*.

The collapse of the St. Francis Dam, and the resulting loss of hundreds of lives in the path of a deluge of water, was a catastrophe that resulted in the almost complete destruction of the surround community. The dam gave way on March 12, 1928, three minutes before midnight. Its waters swept through sixty-five miles of the Santa Clara Valley toward the Pacific Ocean.

At its peak, the wall of water was 78 feet high. By the time it hit Santa Paula, 42 miles south of the dam, the water was estimated to be 25 feet deep. The flood destroyed everything in its path - livestock, structures, railways, bridges, and orchards. By the time it was over, parts of Ventura County lay buried under 70 feet of mud and debris. Over 500 people died from the catastrophe.[7]
The Baldwin Dam collapse, while not as destructive as the St. Francis Dam, sent a 50-foot wall of water down Cloverdale Avenue and slammed into homes and cars on Dec. 14, 1963. Five people were killed. Sixty-five hillside houses were destroyed, and 210 homes and apartments were damaged. The flood swept northward in a V-shaped path roughly bounded by La Brea Avenue and Jefferson and La Cienega boulevards. It took only 77 minutes for the lake to empty, but it took a generation for the neighborhood below to recover. Two decades passed before the Baldwin Hills ridge top was reborn.

The cascade caused an unexpected ripple effect that echoes in Los Angeles today. It foreshadowed the end of urban-area earthen dams as a major element of the Department of Water and Power's water storage system. It also prompted a tightening of Division of Safety of Dams control over reservoirs throughout the state.[8]

**Debris Flows**
Other flood related hazard that can affect certain parts of the Southern California region are debris flows. Typically, debris flows occur in mountain canyons and the foothills against the San Gabriel Mountains. However, any hilly or mountainous area with intense rainfall and the proper geologic conditions may experience one of these very sudden and devastating events.

Debris flows, sometimes referred to as mudslides, mudflows, or lahars, are common types of fast-moving landslides. These flows generally occur during periods of intense rainfall or rapid snowmelt. They usually start on steep hillsides as shallow landslides that liquefy and accelerate to speeds that can exceed 35 miles per hour. The consistency of debris-flows ranges from watery mud, to thick, rocky mud that carries large items such as boulders, trees, and cars.[9]

## What is the Effect of Development on Floods?

Development raises river levels by forcing the river to compensate for the flow space obstructed by the structures. When materials are added to the floodplain and no fill is removed to compensate, serious problems can arise. This forces floodwaters out of historic floodplain areas. The City requires engineer certification to ensure that proposed developments will not adversely

affect the flood carrying capacity of the Special Flood Hazard Area (SFHA). Displacement of only a few inches of water can mean the difference between no structural damage occurring in a given flood event, and the inundation of many homes, businesses, and other facilities. Careful attention should be given to development that occurs within the floodway to ensure that structures are prepared to withstand base flood events. In highly urbanized areas, increased paving can lead to an increase in volume and velocity of runoff after a rainfall event, exacerbating the potential flood hazards. The development and implementation of storm water management systems ensures these runoff waters are handled effectively.

## Identifying Flood-Prone Areas

Flood maps and Flood Insurance Studies (FIS) often delineate flood prone areas. The establishment of the NFIP in 1968 was a means of providing low-cost flood insurance to the nation's flood-prone communities. The NFIP also reduces flood losses through regulations that focus on building codes and sound floodplain management. In the City of San Dimas, the NFIP and related building code regulations went into effect in 1978. NFIP regulations (44 Code of Federal Regulations Chapter 1, Section 60, 3) require that all new construction in floodplains must be elevated at or above base flood level.

Flood Insurance Rate Maps (FIRM) and FIS Floodplain maps are the basis for implementing floodplain regulations and for delineating flood insurance purchase requirements. A FIRM is the official map produced by FEMA that delineates SFHA in communities where NFIP regulations apply. Insurance agents and mortgage lenders use FIRMs to determine if flood insurance is required and applicable rates.

Water surface elevations, combined with topographic data, develop FIRMs that illustrate areas inundated during a 100-year flood, floodway areas, as well as elevations marking the 100-year-flood level. In some cases, they also include base flood elevations (BFEs) and areas located within the 500-year floodplain. FIS and FIRMs produced for the NFIP provide assessments of the probability of flooding at a given location. FEMA conducted many Flood Insurance Studies in the late 1970s and early 1980s. These studies and maps represent flood risk at the point in time when FEMA completed the studies. While not true in every region, flood maps cover 100% of the total population in the City of San Dimas.

Although helpful, FEMA flood maps are not entirely accurate. These studies and maps represent flood risk at the point in time when FEMA completed the studies, and does not incorporate planning for floodplain changes in the future due to new development. Although FEMA is considering changing that policy, it is optional for local communities. Manmade and natural changes to the environment have changed the dynamics of storm water run-off since then.

### Flood Mapping Methods and Techniques

In order to address a lack of data, the City, as well as other jurisdictions, has taken efforts to develop more localized flood hazard maps. One method includes using high water marks from flood events or aerial photos, in conjunction with the FEMA maps to reflect the true flood risk. In other areas throughout the region, the use of GIS is becoming an important tool for flood

hazard mapping. FIRM maps can be imported directly into GIS, which allows for GIS analysis of flood hazard areas.

Communities find it particularly useful to overlay flood hazard areas on tax assessment parcel maps. This allows evaluation of the flood hazard risk for a specific parcel during review of a development request. Coordination between FEMA and local planning jurisdictions is the key to making a strong connection with GIS technology for flood hazard mapping.

FEMA and the Environmental Systems Research Institute (ESRI), a private company, have formed a partnership to provide multi-hazard maps and information to the public via the Internet. ESRI produces GIS software. The hazards maps provided by ESRI assist communities in evaluating geographic information about natural hazards.

# Hazard Assessment

## Hazard Identification

Hazard identification is the first phase of flood-hazard assessment. The intensity and overall effects of the hazard in the floodplain is estimated and mapped by using the probability of flood events. Floodplain maps provide detailed information that assist jurisdictions in making policies and land-use decisions. San Dimas adapted its flood hazard maps from FEMA.

FEMA mapped the 100-year and 500-year floodplains through the FIS in conjunction with the United States Army Corps of Engineers (USACE) in August of 1987. There were previous studies done, including a HUD study, which mapped the floodplain in June of 1978. The county has updated portions of the USACE and FEMA maps through smaller drainage studies in the county since that time.

## Vulnerability Assessment

Vulnerability assessment is the second step of flood-hazard assessment. It combines the floodplain boundary, generated through hazard identification, with an inventory of the property within the floodplain. Understanding the population and property exposed to natural hazards will assist in reducing risk and preventing loss from future events. Because site-specific inventory data and inundation levels given for a particular flood event (10-year, 25-year, 50-year, 100-year, and 500-year) are not readily available, calculating a community's vulnerability to flood events is not straightforward. With all of the necessary information, the amount of property in the floodplain, as well as the type and value of structures on those properties, can be calculated to provide a working estimate for potential flood losses.

## Risk Analysis

Risk analysis is the third phase of a hazard assessment. It builds upon the hazard identification and vulnerability assessment. A flood risk analysis for the City of San Dimas should include two components. First, it estimates the life and value of property that may incur losses from a flood event (defined through the vulnerability assessment). Secondly, it includes the number and type of flood events expected to occur over time. Within the broad components of a risk analysis, it is

possible to predict the severity of damage from a range of events. Flow velocity models can assist in predicting the amount of damage expected from different magnitudes of flood events. The hydrological analysis of landscape features form the basis of the data used to develop these models. Changes in the landscape, often associated with human development, can alter the flow velocity and the severity of damage that expected from a flood event.

It is possible to map the expected damage from flood events over time using flow velocity models. It is also feasible to pinpoint the effects of certain flood events on individual properties. At the time of publication of this plan, data was insufficient to conduct a risk analysis for flood events in the City of San Dimas. However, future mapping projects can produce better data that assist in understanding risk.

## Community Flood Issues-What is Susceptible to Damage during a Flood?

The largest impact on communities from flood events is the loss of life and property. During certain years, property losses resulting from flood damage are extensive. Development in the floodplains of San Dimas will continue to be at risk because flood damage occurs on a regular basis throughout the county. Property loss from floods strikes both private and public property.

**Property Loss Resulting from Flooding Events**

The type of property damage caused by flood events depends on the depth and velocity of the floodwaters. Faster moving floodwaters can wash buildings off their foundations and sweep cars downstream. High waters, combined with floating debris, strains the local infrastructure. Homes are particularly susceptible to basement flooding. Unexpected water levels destroy high saturation materials such as wood, fabric, wallboard, and insulation. In many cases, flood damage to homes renders them unlivable.

**Manufactured Homes**

Throughout the state of California, the 1996 floods destroyed over one hundred and fifty housing units. Of those units, sixty-one percent were mobile homes and trailers. Unfortunately, many older manufactured home parks are located in floodplain areas. Manufactured homes have a lower level of structural stability than stick-built homes, and must be anchored to provide additional structural stability during floods. Because of the confusion resulting from multiple changes in NFIP regulations in the 1980s, there are communities that do not actively enforce anchoring requirements. The lack of enforcement of manufactured home construction standards in floodplains can contribute to severe damages from flood events.

According to the City of San Dimas Planning Division, the mobile home parks listed below have some portion of their property in the 100-year floodplain. The safety of these parks and their compliance with land use planning and building codes, as well as FEMA NFIP requirements, may warrant further investigation. The following are mobile home parks located in San Dimas:

- San Dimas Royal, located on Covina Boulevard
- Mobile Land, located on Covina Boulevard
- Cienega Valley Estates, located on Cienega Avenue

- Lone Hill Manor, located on Cypress Street
- Charter Oak, located on Covina Boulevard

**Business/Industry**
While the majority of businesses in San Dimas are not in eminent danger from flooding, flood events have the potential to affect them by damaging property and by interrupting daily operations. These events can cut off customer access as well as close a firm for repairs. A quick response to the needs of industry affected by floods can help the community maintain economic vitality in the face of a disaster. Assistance to businesses can include funding to assist owners in elevating or relocating flood-prone structures.

**Public Infrastructure**
Publicly owned facilities are a key component of daily life for all citizens of the county. Damage to public water and sewer systems, transportation networks, flood control facilities, emergency facilities, and offices can hinder the ability of the government to deliver services. Government can take action to reduce risk to public infrastructure from flood events, as well as constructing public policy that reduces risk to private property from flood events.

**Roads**
During natural hazard events, or any type of emergency or disaster, dependable road connections are critical for providing emergency services. Federal, state, county, and City governments all have a stake in protecting roads from flood damage. Transportation agencies responsible for road maintenance are typically aware of roads at risk from flooding. Since road networks often traverse floodplain and floodway areas, these jurisdictions must coordinate operations during a natural hazard.

**Bridges**
Observing bridges during flood events is essential because they are important links in road networks, however, they can be obstructions inhibiting the flow of water. The bridges in San Dimas are City owned. A state-designated inspector must inspect these bridges every two years. The inspections are rigorous, looking at everything from seismic capability to erosion and scour. The seven bridges in the City of San Dimas are at the following locations:

- San Dimas Avenue at the San Dimas Wash
- Foothill Blvd. at the San Dimas Wash
- San Dimas Canyon Road at the San Dimas Wash
- Cataract Avenue at the San Dimas Wash
- Via Verde CC at Monte Vista
- Via Verde CC at Via Esperanza
- Valley Center Ave at an unnamed wash

**Storm Water Systems**
Local drainage problems are common in particular sections of San Dimas, specifically near Washes and Reservoirs. A predicament arises when storm water runoff enters culverts or goes

underground into storm sewers. Inadequate maintenance can also contribute to the flood hazard in urban areas. While this occurrence is rare, the City has taken numerous steps to mitigate additional damage from drainage problems.

**Water/Wastewater Treatment Facilities**[10]

There are twenty-five sanitary districts that' serve Los Angeles County. There are no wastewater treatment facilities directly in San Dimas, but there are ten located within LA County serving the City. The Districts operate a comprehensive solid waste management system serving the needs of a large portion of the County.

The Sanitation Districts construct, operate, and maintain facilities to collect, treat, recycle, and dispose of sewage and industrial wastes and provide for the management of solid wastes, including disposal, transfer operations, and materials recovery. Local sewers and laterals that connect to the Sanitation Districts' trunk sewer lines are the responsibility of the local jurisdictions, as is the collection of solid wastes.

The agency's 1,300 miles of main trunk sewers and eleven wastewater treatment plants convey and treat approximately 530 million gallons per day (MGD), 190 MGD of which are available for reuse in the dry Southern California climate. Three active sanitary landfills handle approximately 22,000 tons per day (TPD) of trash (approximately 40% of the countywide disposal capacity), of which 14,000 TPD are disposed and 8,000 TPD are recycled.

**Water Quality**[11]

The Southern California Water Company provides water to San Dimas and the surrounding area. Water delivered to customers in the San Dimas system is a blend of water from Three Valleys Municipal Water District and the Covina Irrigating Company, and ground water pumped from the Pomona, and the Main San Gabriel groundwater basins.

Drinking water, including bottle water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily mean water may be a health risk.

All ten wells sources are vulnerable to one or more of the following possible contaminating activities. Contaminants associated with these activities have not been detected in the water supply: dry cleaners, above ground storage tanks, drinking water treatment plants, managed forests, transportation corridors, freeways, state highways, high-density housing, gas stations, confirmed leaking underground storage tanks.

The Southern California Water Company routinely tests the water for substances and shows that the water meets all existing federal and state standards for safety. During flood events, these wells are subject to contamination. SCWC takes extra precaution after such an event to secure the quality of our water.

## Existing Flood Mitigation Activities[12]

Flood mitigation activities listed here include current mitigation programs and activities

implemented by the City of San Dimas agencies or organizations.

The San Gabriel River is highly engineered for flood protection and water conservation. Approximately ten miles of the mainstream have levees and concrete bottoms, and more than 30 miles have levees and soft bottoms. LA County Department of Public Works operates three detention reservoirs and is responsible for all channel operations. The US Army Corp of Engineers maintains two large flood control structures the Santa Fe and Whittier Narrows Dams.

Like the San Gabriel River, the Los Angeles River is managed for flood control. The USACE maintains two large flood control structures in the San Fernando Valley – Hansen Dam on Tujunga Wash and Sepulveda Basin at the LA River. The LACDPW maintains all channels, except for the Glendale Narrows soft-bottom reach.

There are four major surface drainage courses in the city. They include Wildwood Canyon Wash, Sycamore Canyon Wash, San Dimas Canyon Wash, and Walnut Creek Wash. The Los Angeles County Flood Control System maintains these drainage courses. In the northern sections of the San Dimas Canyon wash, the flood control channels are not paved, but have levees with natural bottoms that eventually become paved channels.

**The City of San Dimas Codes**

San Dimas uses building codes, zoning codes, and various planning strategies to address the goals that aim at restricting development in areas of known hazards, and applying the appropriate safeguards. Chapter 15.60 of the City's Municipal Code addresses flood plain management. The purpose of the chapter is to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by various provisions. These provisions are designed to:

- Protect human life and health
- Minimize expenditure of public money for costly flood control projects
- Minimize the need for rescue and relief efforts associated with flooding at the expense of the public
- Minimize prolonged business interruptions
- Minimize damage to public facilities and utilities Help maintain a stable tax base by providing for the second use and development of areas of special flood hazard so as to minimize future flood blight areas
- Ensure that potential buyers are notified that property is in an areas of special flood hazard
- Ensure that those who occupy the areas of special flood hazards assume responsibility for their actions

In order to accomplish these goals, this particular chapter also includes:

- Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging

increases in erosion or flood heights or velocities

- Requiring the uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction
- Controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters
- Controlling filling, grading dredging, and other development which may increase flood damage
- Preventing or regulating the construction of flood barriers which will divert floodwaters or which may increase flood hazards in other area

Specific codes dealing with the construction of developments in the floodplain include:

§ 15.60.060 Basis for establishing the areas of special flood hazard
§ 15.60.070 Compliance
§ 15.60.080 Abrogation and greater restrictions
§ 15.60.090 Interpretation
§ 15.60.110 Establishment of development permit
§ 15.60.120 Designation of floodplain administrator
§ 15.60.140 Standards of construction
§ 15.60.150 Standards for utilities
§ 15.60.160 Standards for subdivisions
§ 15.60.170 Standards for manufactured homes
§ 15.60.180 Floodways

**Acquisition and Protection of Open Space in the Floodplain**

Current efforts to increase public open space in the San Dimas have been paired with the need to restore and preserve natural systems that provide wildlife habitat and help to mitigate flood events. Public parks and publicly owned open spaces can provide a buffer between flood hazards and private property.

**Wetlands**[13]

Many floodplain and stream-associated wetlands absorb and store storm water flows, which reduces flood velocities and stream bank erosion. Preserving these wetlands reduces flood damage and the need for expensive flood control devices such as levees. When the storms are over, many wetlands augment summer stream flows by slowly releasing the stored water back to the stream system. Wetlands are highly effective at removing nitrogen, phosphorous, heavy metals, and other pollutants from water. For this reason, artificial wetlands are often constructed for cleaning storm water runoff and for tertiary treatment (polishing) of wastewater.

The Los Angeles County Department of Public Works, Watershed Division is in its third year of devising a San Gabriel River Master Plan to address habitat restoration, preservation, recreation, and open space conservation for the area. This proposed corridor plan will focus on areas adjacent to the mainstream, primarily outside Angeles National Forest jurisdiction.

The San Gabriel Mountains Regional Conservancy is in the process of developing a Watershed

Management Plan for the Upper San Gabriel River, above Whittier Narrows, including the Walnut Creek and San Jose Creek sub-watersheds.

**Storm Water Systems**

Water pollution from floods degrades surface waters making them unsafe for drinking, fishing, swimming, and other activities. As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or manmade ditches. Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need an NPDES permit; however, industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. In most cases, the NPDES permit program is administered by authorized states. Since its introduction in 1972, the NPDES permit program is responsible for significant improvements to our Nation's water quality. The 2001 National Pollutant Discharge Elimination System (NPDES)[14] covers an area of approximately 3,100 square miles and serves a population of about 10 million. The County of Los Angeles and 84 incorporated cities have been granted permits.

The L.A. County Storm Water Ordinance addresses provisions that apply to the discharge, deposit or disposal of any storm water and runoff to the storm drain system and receiving waters within any unincorporated area covered by the NPDES municipal storm water permit.

The Los Angeles County Municipal Storm water NPDES Permit contains a requirement for permittees to develop and implement programs for storm water management within the County of Los Angeles. The Model Programs provide guidance that permittees can follow to implement their own programs in compliance with the Permit.

## Community Issues Summary

San Dimas is working to mitigate problems regarding flood issues as they arise. However, funding, time, and labor are often unavailable, which can cause problems to go temporarily unresolved. Some low-lying areas in San Dimas are more susceptible to flooding and have incurred repetitive losses. Our flood mitigation action items specifically target these areas.

While flooding is a rare occurrence in the City of San Dimas, it is important that the NHMP address the potential and risk for the hazard by capitalizing on all available data and resources. The following mitigation action items are provided as tools to minimize the community from the risks associated with flooding.

## Flood Mitigation Action Items

The flood mitigation action items provide direction on specific activities that organizations and residents in the City of San Dimas can undertake to reduce risk and prevent loss from flood events. Each action item is followed by ideas for implementation, which can be used by the

steering committee and local decision makers in pursuing strategies for implementation.

**Action Item 3.1**: Mitigate private property losses due to floods.
**Implementation Initiatives:**

> *Implementation Initiative 3.1.1* Encourage residents to participate in the flood hazard insurance program.
>
> *Implementation Initiative 3.1.2* Continue to monitor brush clearance in open channels and debris basins on private property.
>
> *Implementation Initiative 3.1.3* Educate residents on the importance of proper brush clearance.

**Coordinating Organizations:** City Public Works Department
**Time line:** Ongoing.
**Plan Goals Addressed:** Protect life and property; Increase public awareness.

**Action Item 3.2**: Enhance data and mapping for flooding information within the City. Identify and map flood-prone areas.
**Implementation Initiatives:**

> *Implementation Initiative 3.2.1* Develop and implement GIS system to map flood zones.

**Coordinating Organizations:** City Administration Department
**Time line:** Short-term.
**Plan Goals Addressed:** Protect life and property.

**Action Item 3.3:** Educate the public on the dangers and mitigation of post-fire flooding.
**Implementation Initiatives:**

> *Implementation Initiative 3.3.1* Create a public education program on sandbag techniques and other flood protection measures.

**Coordinating Organizations:** City Public Works Department, City Administration Department
**Time line:** Ongoing.
**Plan Goals Addressed:** Increase public awareness.

# Flood Resource Directory

The following resource directory lists the resources and programs that can assist county communities and organizations. The resource directory will provide contact information for local, county, regional state and federal programs that deal with natural hazards.

**County Resources**

Los Angeles County Public Works Department
900 S. Fremont Ave.
Alhambra, CA 91803
Ph: 626-458-5100

Sanitation Districts of Los Angeles County
1955 Workman Mill Road
Whittier, CA 90607
Ph: 562-699-7411 x2301

**State Resources**

Governor's Office of Emergency Services (OES)
P.O. Box 419047
Rancho Cordova, CA 95741-9047
Ph: 916 845- 8911

California Resources Agency
1416 Ninth Street, Suite 1311
Sacramento, CA 95814
Ph: 916-653-5656

California Department of Water Resources (DWR)
1416 9th Street
Sacramento, CA 95814
Ph: 916-653-6192

California Department of Conservation: Southern California Regional Office
655 S. Hope Street, #700
Los Angeles, CA 90017-2321
Ph: 213-239-0878

**Federal Resources and Programs**

Federal Emergency Management Agency (FEMA)
FEMA provides maps of flood hazard areas, various publications related to flood mitigation,

funding for flood mitigation projects, and technical assistance, FEMA also operates the National Flood Insurance Program. FEMA' s mission is to reduce loss of life and property and protect the nation's critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery.

Federal Emergency Management Agency, Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607
Ph: 510-627-7100

Federal Emergency Management Agency, Mitigation Division
500 C Street, S.W.
Washington, D.C. 20472
Ph: 202-566-1600

**List of Flood Related Websites**

This site contains a long list of flood related Internet sites from "American Heritage Rivers" to "The Weather Channel" and is a good starting point for flood information on the Internet.

Federal Emergency Management Agency
Phone: (800) 480-2520
http://www.fema.gov/nfip/related.htm

National Flood Insurance Program (NFIP)
In Southern California many cities lie within flood zones as defined in FEMA Flood Maps. The City of San Dimas is (or is not) a community within a designated flood zone. Flood insurance is available to citizens in communities that adopt and implement NFIP building standards. The standards are applied to development that occurs within a delineated floodplain, a drainage hazard area, and properties' within 250 feet of a floodplain boundary. These areas are depicted on federal Flood Insurance Rate Maps available through the county.

National Floodplain Insurance Program (NFIP)
500 C Street, S.W.
Washington, D.C. 20472
Ph: 202-566-1600

The Floodplain Management Association
The Floodplain Management website was established by the Floodplain Management Association (FMA) to serve the entire floodplain management community. It includes full-text articles, a calendar of upcoming events, a list of positions available, an index of publications available free or at nominal cost, a list of associations, a list of firms and consultants in floodplain management, an index of newsletters dealing with flood issues (with hypertext links if available), a section on the basics of floodplain management, a list of frequently asked questions (FAQs) about the Website, and a catalog of Web links.

Floodplain Management Association
P.O. Box 50891
Sparks, NV 89435-0891
Ph: 775-626-6389

The Association of State Floodplain Managers
The Association of State Floodplain Managers is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, and flood preparedness, warning, and recovery. ASFPM fosters communication among those responsible for flood hazard activities, provides technical advice to governments and other entities about proposed actions or policies that will affect flood hazards, and encourages flood hazard research, education, and training. The ASFPM Web site includes information on how to become a member, the organization's constitution and bylaws, directories of officers and committees, a publications list, information on upcoming conferences, a history of the association, and other useful information and Internet links.

The Association of State Floodplain Managers
2809 Fish Hatchery Road
Madison, WI 53713
Ph: (608) 274-0123
http://www.floods.org

National Weather Service
The National Weather Service provides flood watches, warnings, and informational statements for rivers in the City of San Dimas.

National Weather Service
520 North Elevar Street
Oxnard, CA 93030
Ph: 805-988- 6615

Office of Hydrology, National Weather Service
The National Weather Service's Office of Hydrology (OH) and its Hydrological Information Center offer information on floods and other aquatic disasters. This site offers current and historical data including an archive of past flood summaries, information on current hydrologic conditions, water supply outlooks, an Automated Local Flood Warning Systems Handbook, Natural Disaster Survey Reports, and other scientific publications on hydrology and flooding.

National Weather Service, Office of Hydrologic Development
1325 East West Highway, SSMC2
Silver Spring, MD 20910
Ph: 301-713-1658

National Resources Conservation Service (NRCS), US Department of Agriculture
NRCS provides a suite of federal programs designed to assist state and local governments and landowners in mitigating the impacts of flood events. The Watershed Surveys and Planning Program and the Small Watershed Program provide technical and financial assistance to help participants solve natural resource and related economic problems on a watershed basis. The Wetlands Reserve Program and the Flood Risk Reduction Program provide financial incentives to landowners to put aside land that is either a wetland resource, or that experiences frequent flooding. The Emergency Watershed Protection Program (EWP) provides technical and financial assistance to clear debris from clogged waterways, restore vegetation, and stabilizing riverbanks. The measures taken under EWP must be environmentally and economically sound and generally benefit more that one property.

National Resources Conservation Service
14th and Independence Ave., SW, Room 5105-A
Washington, DC 20250
Ph: 202-720-7246

USGS Water Resources
This web page offers current US water news; extensive current (including real-time) and historical water data; numerous fact sheets and other publications; various technical resources; descriptions of ongoing water survey programs; local water information; and connections to other sources of water information.

USGS Water Resources
6000 J Street
Placer Hall
Sacramento, CA 95819-6129
Ph: 916-278-3000

Bureau of Reclamation
The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. The Bureau provides leadership and technical expertise in water resources development and in the efficient use of water through initiatives including conservation, reuse, and research. It protects the public and the environment through the adequate maintenance and appropriate operation of Reclamation's facilities and manages Reclamation's facilities to fulfill water user contracts and protect and/or enhance conditions for fish, wildlife, land, and cultural resources.

Mid Pacific Regional Office
Federal Office Building
2800 Cottage Way
Sacramento CA 95825-1898
Ph: 916- 978-5000
http://www.usbr.gov/

Army Corps of Engineers
The Corps of Engineers administers a permit program to ensure that the nation's waterways are used in the public interest. Any person, firm, or agency planning to work in waters of the United States must first obtain a permit from the Army Corps of Engineers. The Corps is responsible for the protection and development of the nation's water resources, including navigation, flood control, energy production through hydropower management, water supply storage, and recreation.

US Army Corps of Engineers
P.O. Box 532711
Los Angeles CA 90053- 2325
Ph: 213-452- 3921

American Public Works Association
2345 Grand Boulevard, Suite 500
Kansas City, MO 64108-2641
Ph: 816-472-6100

**Publications**

*NFlP Community Rating System Coordinator's Manual*. This informative brochure explains how the Community Rating System works and what the benefits are to communities. It explains in detail the CRS point system, and what activities communities can pursue to earn points. These points then add up to the "rating" for the community, and flood insurance premium discounts are calculated based upon that "rating " The brochure also provides a table on the percent discount realized for each rating (1-10).

NFIP Community Rating System
(800) 480-2520 or (317) 848-2898
http://www.fema.gov/nfip/crs

*Floodplain Management: A Local Floodplain Administrator's Guide to the NFlP*.
This document discusses floodplain processes and terminology. It contains floodplain management and mitigation strategies, as well as information on the NFIP, CRS, Community Assistance Visits, and floodplain development standards.

National Flood Insurance Program Phone:
(800) 480-2520
http://www.fema,gov/nfip/

*Flood Hazard Mitigation Planning: A Community Guide*, (June 1997).
Massachusetts Department of Environmental Management. This informative guide offers a 10-step process for successful flood hazard mitigation. Steps include: map hazards, determine potential damage areas, take an inventory of facilities in the flood zone, determine what is or is not being done about flooding, identify gaps in protection, brainstorm alternatives and actions,

determine feasible actions, coordinate with others, prioritize actions, develop strategies for implementation, and adopt and monitor the plan.

Massachusetts Flood Hazard Management Program Phone
(617) 626-1250
http://www.magnetstate.ma.us/dem/programs/mitigate

*Reducing Losses in High Risk Flood Hazard Areas: A Guidebook for Local Officials*, (February 1987), FEMA-116. This guidebook offers a table on actions that communities can take to reduce flood losses. There is information on various types of flood hazards with regard to existing mitigation efforts and options for action (policy and programs, mapping, regulatory, non-regulatory). Types of flooding which are covered include alluvial fan, areas behind levees, areas below unsafe dams, coastal flooding, flash floods, fluctuating lake level floods, ground failure triggered by earthquakes, ice jam flooding, and mudslides.

Federal Emergency Management Agency Phone:
(800) 480-2520
http://www.fema,gov

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1.http://www.lalc.k12.ca.us/target/units/river/tour/hist.html
[2] http://www.lalc.k12.ca.us/target/units/river/tour/hist.html
http://www.losangelesalmanac.com/topics/History/hi01i.htm

3.Gumprecht, Blake, 1999, Johns Hopkins University Press, Baltimore, MD.
[4] http://www.fema.gov/nwz97/eln_scal.shtm

5.Ibid
[6] http://cee.engr.ucdavis.edu/faculty/lund/dams/Dam_History_Page/Failures.htm

7.http://www.usc.edu/isd/archives/la/scandals/st_francis_dam.html

8.http://www.latimes.com/news/local/surroundings/la-me-surround11dec11,0,1754871.story?coll=la-adelphia-right-rail

9.http://www.fema.gov/rrr/talkdiz/landslide.shtm#what
[10] http://www.lacsd.org/csdinfo.htm
[11] http://www.aswater.com
[12] http://www.lasgrwc.org/WRP/Documents/GapsReport/GaprptLAC.pdf and the City of San Dimas General Plan
[13] http://www.lasgrwc.org/WRP/Documents/GapsReport/GaprptLAC.pdf
[14] Permit issued by the California Regional Water Quality Control Board (CRWQCB) under Order No. 01-182, NPDES No. CAS004001