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I. Introduction

This Safety Element updates and combines the 1983 “Safety Element” and “Seismic Safety Element” of the City of Monrovia’s General Plan. Unlike the previous document that combined these two required elements into a single volume into a single element, this document reflects the 1984 State Planning law amendment deleting the requirement for two separate elements and instead only requires a single Safety Element to discuss all issues related to public safety.

This document identifies and evaluates natural hazards associated with seismic activity, landslides, flooding and fire within the City of Monrovia. The document provides the goals for each of the relevant City departments to provide responsible planning resulting in reduction of loss of life, injuries, damage to property and other losses associated with such disasters, and to act as a guide to prepare for possible natural or man-caused disasters.

As such, the Safety Element is to serve as a policy document of the City Council and as a reference for the Planning Commission and City staff in making decisions on public and private development. The element identifies potential hazards associated with seismic, flood, landslide, and fire issues, and provides the relevant objectives, principles, and standards to deal effectively with each.

Preparation of the Safety Element was conducted for the City’s Planning Division with consultation of the City of Monrovia’s departments of Community Development, Community Services, Public Works, Police, and Fire. Further consultation was conducted with the California State Department of Mines and Geology regarding seismic areas and activity, and the Los Angeles County’s Department of Public Works and Department of Regional Planning to identify flood inundation areas and relevant regional coordination associated with public safety.
II. Seismic Activity

1. Background

1. Geologic Setting

The City of Monrovia is located in the northern San Gabriel Valley at the southern face of the San Gabriel Mountains. During the past two decades most single family development in the City has resulted in new development being located in the geologically hazardous terrain of the foothills at the northern edge of the valley.

The San Gabriel Mountains to the north of the City, as opposed to the valley basin, consists of relatively hard, igneous, and metamorphic rocks, which support the steep slopes and major canyons. The less steep San Rafael Hills, to the northwest of the City, are composed of the same substance. It is this difference in terrain of the valley basin and surrounding hills suggesting the past uplift along the front of the San Gabriel Mountains.

The western San Gabriel Valley is underlain by Holocene and Pleistocene alluvium up to 5,000 to 6,000 feet in thickness. The valley floor, south of the Raymond Hill fault, is underlain by tertiary rocks. North of the same fault the valley floor is underlain by granite and metamorphic rocks comparable to those in the hills to the west and north.

2. The Alquist-Priolo Earthquake Fault Zone Act

The Alquist-Priolo Earthquake Fault Zone Act was passed in 1972 by the State of California to mitigate the hazard of surface faulting to structures for human occupancy. This state law was a direct result of the 1971 San Fernando Earthquake, which resulted in extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures.

The Act's main purpose is to prevent the construction of buildings used for human occupancy of the surface trace of active faults. The Act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards, such as ground shaking or liquefaction.

The law requires the State Geologist to establish regulatory zones (known as Earthquake Fault Zones) around the surface traces of active faults and issue appropriate maps. These maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. Local agencies must regulate most development projects within the zones. Projects include all land divisions and most structures for human occupancy. Single family wood-frame and steel-frame dwellings up to two stories not part of a development of four units or more are exempt. However, local agencies can be more restrictive than the state law requires.

Before a project can be permitted, cities and counties must require a geologic investigation to demonstrate the proposed buildings will not be constructed across active faults. An evaluation and written report of a specific site must be prepared by a registered geologist. If an active fault is found, a structure for human occupancy cannot be placed over the trace fault and must be set back from the fault (generally 50 feet).\(^1\)

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1. The Alquist-Priolo Earthquake Fault Zone Act, Department of Conservation, State of California, Division of Mines and Geology, 1972
The most prominent faults (see Table 1) in close proximity to the City of Monrovia are the Sierra Madre Fault Zone (includes the Duarte Fault), the San Andreas Fault, and the Raymond Hill fault. The former is located in the San Gabriel Mountains, while the Raymond Hill Fault is situated in the foothills in the northern portion of the City of Monrovia. The San Andreas Fault, which is located twenty miles to the north of the City, is also important as a major source of shaking at the base.

<table>
<thead>
<tr>
<th>Use Category</th>
<th>Approximate Recurrence Interval (Years)</th>
<th>San Andreas Fault</th>
<th>Sierra Madre Fault</th>
<th>Raymond Hill Fault</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited Occupancy</td>
<td>50-100</td>
<td>8.50</td>
<td>-</td>
<td>5.0</td>
</tr>
<tr>
<td>(warehouses, automated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>manufacturing, facilities, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal Occupancy</td>
<td>100-200</td>
<td>8.5</td>
<td>6.5</td>
<td>5.6</td>
</tr>
<tr>
<td>(residences, normally occupied factories, etc.)</td>
<td>100-200</td>
<td>8.5</td>
<td>6.5</td>
<td>5.6</td>
</tr>
<tr>
<td>Critical Facilities</td>
<td>300-800</td>
<td>8.5</td>
<td>7.5</td>
<td>6.5</td>
</tr>
<tr>
<td>(hospitals, fire and police stations, schools, critical utilities, etc.)</td>
<td>300-800</td>
<td>8.5</td>
<td>7.5</td>
<td>6.5</td>
</tr>
</tbody>
</table>

Source: Safety and Seismic Safety Element, General Plan, City of Monrovia, 1983.

Sierra Madre Fault Zone

Fault Name: SIERRA MADRE FAULT ZONE
Type Of Faulting: Reverse
Length: The zone is about 34 miles long; total length of main fault segments is about 46.5 mile, with each segment measuring roughly 9.3 miles long
Affected Communities: Monrovia, Sunland, Altadena, Sierra Madre, Duarte, and Glendora
Most Recent Surface Rupture: Holocene
Slip Rate: between 0.36 and 4 mm/yr.
Interval Between Surface Ruptures: Several thousand years
Probable Magnitudes: $M_w 6.0 - 7.0$ (?)
Other Notes: This fault zone dips to the north.

The Sierra Madre fault zone is often divided into five main segments to more easily characterize this fairly complex system. Figure 1 shows the five segments (A to E) of the zone.

These five divisions, while simpler than the entire fault zone, should not be thought of as individual faults, however -- some of these segments are themselves complex systems of parallel and branching faults. It has been suggested that differing fault geometry in this zone keep each lettered segment separate during rupture events -- thus, neighboring segments should not rupture simultaneously. Others, however, suggest that the fault zone may rupture both in single-segment and multiple-segment breaks. The most recent surface ruptures are seen on the B and D
segments. The least active segment, at least in surficial appearance, is the A segment, also known as the Vasquez Creek fault, which runs between the San Gabriel fault and the intersection of the B and C segments of the Sierra Madre fault zone. At the junction of the C and D segments, the Clamshell - Sawpit Canyon fault splays off from the fault zone, toward the northeast. One of the strands that makes up segment D is known as the Duarte fault, because of its location near that community. Segment E represents the easternmost part of this fault zone, and at its eastern end, it meets up with several other faults in a complex zone northwest of the town of Upland, near the epicenter of the 1990 Upland earthquake.

Figure 1: Sierra Madre Fault Zone

Source: http://www.scecdc.scec.org/madre.html; May 25, 2000

San Andreas Fault

While rupture on the Sierra Madre fault zone (theoretically) could be limited to one segment at a time, it has recently been suggested that a large event on the San Andreas fault to the north (like that of 1857) could cause simultaneous rupture on reverse faults south of the San Gabriel Mountains -- the Sierra Madre fault zone being a prime example of such. Whether this could rupture multiple Sierra Madre fault zone segments simultaneously is unknown.²

² Sierra Madre Fault Zone, http://www.scec.org/madre.html; May 25, 2000
Type Of Fault: right-lateral strike-slip
Length: 764 miles (340 miles south from Parkfield; 414 miles northward
Affected Communities: Parkfield, Frazier Park, Palmdale, Wrightwood, San Bernardino, Banning, and Indio.
Last Major Rupture: January 9, 1857 (Mojave segment)
April 18, 1906 (Northern segment)
Slip Rate: about 20 to 35 mm per year
Interval Between Major Ruptures: average of about 140 years on the Mojave segment; recurrence interval varies greatly -- from under 20 years (at Parkfield only) to over 300 years
Probable Magnitudes: $M_w 6.8 - 8.0$

San Andreas Fault Zone -- San Gorgonio Pass Area

The San Gorgonio Pass area is fairly complex, geologically speaking. Here the San Andreas fault interacts with other faults (most notably the San Jacinto fault zone and the Pinto Mountain fault) and thereby becomes somewhat fractured, over the distance extending from just north of San Bernardino to just north of Indio, some 70 miles. Because this deformation has been going on for well over a million years, ancient and inactive strands of the San Andreas fault can be found here. Other faults in this area have been "reawakened" recently after being dormant for hundreds of thousands of years. There is even evidence to suggest that there is no active, continuous main trace of the San Andreas fault going all the way through the pass, not even at depth -- implying that the San Andreas fault may currently be in the process of creating a new fault path through this area!

This could also mean that a single, continuous rupture from Cajon Pass to the Salton Sea (a stretch of the San Andreas that has not ruptured in historical times) is unlikely to occur. Fault rupture mechanics are still not well understood, however, and the discontinuity could prove to have little effect on tempering a major earthquake on this southern stretch of the San Andreas Fault zone.

Raymond Hill Fault Zone

Name of Fault: RAYMOND FAULT (RAYMOND HILL FAULT)
Type Of Fault: left-lateral; only minor reverse slip
Length: 16.5 miles
Affected Nearby Communities: Monrovia, San Marino, Arcadia, South Pasadena
Most Recent Surface Rupture: Holocene
Slip Rate: between 0.10 and 0.22 mm/yr
Interval Between Major Ruptures: roughly 4,500 years
Probable Magnitudes: $M_w 6.0 - 7.0$

This fault dips at about 75 degrees to the north. There is evidence that at least eight surface-rupturing events have occurred along this fault in the last 36,000 years.

The exact nature of the slip along the Raymond Hill fault has been a subject of debate for quite some time. The fault produces a very obvious south-facing scarp along much of its length, and this has made many favor reverse-slip as the predominant sense of fault motion. However, there are also places along this scarp where left-lateral stream offsets of several hundred meters can be seen.

The matter will not be conclusively resolved until the Raymond fault ruptures at the surface, but some new light was shed on the debate in late 1988, when the Pasadena Earthquake occurred.
Apparently located on the Raymond fault, the motion of this quake was predominantly left-lateral, with a reverse component only about 1/15th the size of the lateral component. Curiously enough, this corresponds very well with a scarp height of about 30 meters (reverse slip) versus a left-lateral stream offset of about 400 meters (lateral slip), which are found along the scarp of the Raymond fault south of Pasadena.

If the Raymond fault is indeed primarily a left-lateral fault, it could be responsible for transferring slip southward from the Sierra Madre fault zone to other fault systems. (See Figure 2 for specific areas affected by the Raymond Hill Fault in the City of Monrovia.) All of the area affected by the Raymond Hill Fault are all zoned R-L (Residential Low Density), R-E (Residential Estate), and R-F (Residential Foothill) and the area is predominantly developed. Table 2 identifies the streets and properties within the City of Monrovia that are in Raymond Hill Fault as defined by the Alquist-Priolo Fault Hazard Zone.

Figure 2: Raymond Hill Fault Zone

Source: Mt. Wilson Quadrangle – Special Studies Zones, January 1st, 1977, Division of Mines and Geology

Table 2:
### Properties Within the Alquist-Priolo Fault Hazard Zone

<table>
<thead>
<tr>
<th>Street Name</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alta Vista Avenue</td>
<td>North: 315 - 444, 482, 486, 498, 518, 524, 528, 534</td>
</tr>
<tr>
<td>Avocado Place</td>
<td>All</td>
</tr>
<tr>
<td>Cloverleaf Drive</td>
<td>403 - 441</td>
</tr>
<tr>
<td>Cloverleaf Way</td>
<td>All</td>
</tr>
<tr>
<td>Crescent Drive</td>
<td>All</td>
</tr>
<tr>
<td>El Nido Avenue</td>
<td>232 - 315</td>
</tr>
<tr>
<td>Fifth Avenue</td>
<td>North: 123 - 190</td>
</tr>
<tr>
<td>Franklin Place</td>
<td>All</td>
</tr>
<tr>
<td>Garfield Place</td>
<td>163 - 183</td>
</tr>
<tr>
<td>Heather Heights Court</td>
<td>303 - 449</td>
</tr>
<tr>
<td>Highland Place</td>
<td>247 - 442</td>
</tr>
<tr>
<td>Hillcrest Boulevard</td>
<td>West: 101 - 1003</td>
</tr>
<tr>
<td>Lincoln Place</td>
<td>139 - 196</td>
</tr>
<tr>
<td>Lotone Street</td>
<td>402, 408</td>
</tr>
<tr>
<td>Madison Avenue</td>
<td>North: 139 - 331</td>
</tr>
<tr>
<td>Magnolia Avenue</td>
<td>North: 306 - 347</td>
</tr>
<tr>
<td>Mayflower Avenue</td>
<td>North: 301 - 370</td>
</tr>
<tr>
<td>McKinley Place</td>
<td>176 - 217</td>
</tr>
<tr>
<td>Melrose Avenue</td>
<td>North: 329 - 368</td>
</tr>
<tr>
<td>Mesa Circle</td>
<td>All</td>
</tr>
<tr>
<td>Myrtle Avenue</td>
<td>North: 415 - 505</td>
</tr>
<tr>
<td>Patrician Way</td>
<td>All</td>
</tr>
<tr>
<td>Patterson Drive</td>
<td>All</td>
</tr>
<tr>
<td>Primrose Avenue</td>
<td>North: 411 - 460</td>
</tr>
<tr>
<td>Scenic Drive</td>
<td>West: All</td>
</tr>
<tr>
<td>Sky Way</td>
<td>All</td>
</tr>
<tr>
<td>Stedman Place</td>
<td>406 - 462</td>
</tr>
<tr>
<td>Sunset Place</td>
<td>201 - 221</td>
</tr>
<tr>
<td><strong>Gold Hills Tract</strong></td>
<td></td>
</tr>
<tr>
<td>North Alta Vista Avenue</td>
<td>536, 538</td>
</tr>
<tr>
<td>James Town</td>
<td>102, 106, 110</td>
</tr>
<tr>
<td>Mill Run</td>
<td>102, 106, 110</td>
</tr>
<tr>
<td>North Myrtle Avenue</td>
<td>508</td>
</tr>
</tbody>
</table>

*Source: Department of Community Development, Planning Division, City of Monrovia. May, 2000.*
B. Goals, Objectives and Policies - Seismic Activity

The following objectives and standards were developed to protect citizens and property from seismic hazards while taking existing and future development into consideration.

Goal 1: Reduce to a minimum the loss of life, disruption of goods and services and destruction of property associated with an earthquake

Objective 1.1: Take potential fault areas into account in the General Plan.

Policy 1.1.1 No structures for human occupancy are permitted on or across the trace of the Raymond Hill Fault. Prior to approval of development of properties within the Alquist-Priolo Geologic Studies Zone, as delineated by the California Division of Mines and Geology, an applicant shall submit a report of the geologic investigation of potential faults that may affect structures proposed at the site. The Report shall be required for parcel maps, tract maps, development on residential lots, and residential additions adding floor area for human occupancy, and shall be prepared by a Registered Geotechnical Engineer registered with the State of California.

Policy 1.1.2 Properties located within known or potential fault areas shall be required to submit a geotechnical report at the time of submittal of the parcel or tract map, or for development on residential lots with single family dwellings, or additions to dwellings that add floor area for human occupancy (see policy 1.1.4). The report shall analyze the surface and subsurface geology of the site, the degree of seismic hazard and shall include conclusions and recommendations regarding the effect of geologic conditions on the proposed development, opinions and recommended criteria to mitigate any identified geologic hazards. This investigation and report shall be performed by a professional geotechnical engineer experienced in the practice of engineering geology and registered with the State of California.

Policy 1.1.3: Modifications to the set back limits specified by the Alquist-Priolo Act may be permitted at the discretion of the City, if such modifications also comply with the Municipal Code, based on a geotechnical report prepared by an independent licensed geotechnical engineer and/or geologist, mutually agreed upon between the City and developer and paid for by the developer. The geotechnical report shall be reviewed and subject to the approval of the City Engineer or his designee and shall be maintained on file by the City. The recommendations made in the geotechnical report may be approved, modified or denied by the City. Setback modifications may be permitted only if the developer and/or owner executes and records a restrictive covenant, in a form acceptable to the City Attorney, against the title to the property. Such a restrictive covenant shall specifically define and require compliance with the permitted setbacks on the property and any applicable conditions required by the geotechnical report. Such restrictive covenant shall run with the land, be binding on successors in interest, acknowledge that the applicable setbacks have been modified at the request of the property owner in reliance on a geotechnical study, and further require that the property owner hold harmless, indemnify and defend the City, its officers, agents and employees from and against any liability or damage in any way arising out of
the construction, maintenance and use of residential structures on the property.

Policy 1.1.4: Geotechnical reports submitted in response to the standards above shall be reviewed for adequacy by a Registered Geotechnical Engineer, and a report of that review submitted to the appropriate agency of the City. All costs for the preparation of these required reports are to be borne by the developer/applicant.

Policy 1.1.5 A geotechnical report, prepared by a geologist registered with the state, shall be provided for all projects listed below.

Provide reports for the following located within an Alquist-Priolo Special Studies Zone:

1. All new buildings for human occupancy. This shall include single family dwellings, guest houses and rental units.
2. Additions to buildings discussed in Item 1 above when the area of the addition will exceed 50% of the area of the existing building.
3. Any conversion from a building not used for human occupancy into one which is. (Authority: Section 3603(c), Title 14, CCR.)

No report shall be required for accessory buildings such as garages, tool sheds, swimming pool dressing rooms, etc. since these buildings are not normally used for human occupancy more than 2,000 person-hours per year.

Objective 1.2: Implement programs to deal with hazardous areas or buildings.

Policy 1.2.1: Advocate and support state legislation that would require existing vital facilities to be brought into compliance with modern seismic design and construction standards.

Policy 1.2.2: Support legislation that provides for income tax incentives to encourage the repair of potentially hazardous buildings.

Objective 1.3: The City shall require that all development take appropriate measures to protect public health and safety.

Policy 1.3.1: Continue to adopt and implement the most recent uniform building code (with special attention to Chapter 23 and Chapter 70), and all supplements which include the latest most stringent earthquake regulations for new construction.

Policy 1.3.2: If through an EIR, or if detailed geologic investigation confirms existence of seismic hazards, the City shall require special earthquake resistant design features or use limitations, as appropriate, to protect the public health and safety and to reduce the exposure of individuals and property to seismic risks.
III. Flood Control

The Federal Emergency Management Agency (FEMA) informed the City on October 3, 2000 that:

“The entire community [City of Monrovia] has been placed in Zone D, an area of possible but undetermined flood hazard. There is no Federal requirement for the purchase of flood insurance in this zone, nor is the community required to implement any floodplain management regulations as a condition for participation in the National Flood Insurance Program (NFIP). Additionally, because the entire community has been placed in Zone D, the Federal Emergency Management Agency has not printed a Flood Insurance Rate Map for the community.

“Federally backed flood insurance is available within Monrovia at reasonable rates. While there are no identifiable flood hazards within Monrovia, we urge property owners to consider the purchase of flood insurance. Over 23 percent of all flood insurance claims are made by property owners outside of identified flood hazards.

“Although there are no specific requirements for floodplain management in Monrovia, we recommend that the community recognize the possible existence of hazards from floods, mudslides, and flood-related erosion and carefully evaluate new development that could aggravate, or be affected by, these hazards.”

A. Background

1. Setting

Flood containment usually involves preparing for the Standard Project flood. This type of flood is defined by the Corps of Engineers as follows:

“Standard Project Flood: The flood that may be expected from the most severe combination of meteorological and hydrological conditions that are considered reasonably characteristic of the geographical area in which the drainage basin is located, excluding extremely rare combinations. Peak discharges for these floods are generally about 40-60 percent of the Probably Maximum Floods for the basins. As used by the Corps of Engineers, Standard Project Floods are intended as practical expressions of the degree of protection that should be sought in the design of flood control works, the failure of which might be disastrous.”

The effect of any large flood on the City depends on the available capacity of the dams and debris basins, which are located to the north (Sawpit Debris Basin) and northwest (Santa Anita Dam) of the central business district of Monrovia. The combined capacity of the Sawpit and Santa Anita dams is 1,852 acre-feet. Therefore, the retention of some flood flow in these reservoirs could greatly reduce the flood flow into the City. The most common flood hazard is standing water resulting from blockage or inadequate capacity of storm sewers.

2. Mud and Debris Flows

The effects of a fire in the hillside areas of Monrovia would be a potential for rapid downhill movement of mud and debris flows. This would occur in hillside areas where the soil horizon is well

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4See Appendix A to this Element for a copy of the FEMA letter of October 3, 2000.
developed and the soil has poor drainage characteristics. The lack of vegetation, resulting from fire, lowers the stability of exposed soils and decreases the water-holding capacity of the local watershed.

3. Landslide Activity

A previous study of landslides in the Monrovia hillside areas (Monrovia Hillside Study, by Leighton and Associates), identifies many landslides of various sizes and types within the foothills of Monrovia. The majority of the landslides are primarily in the steep northern area, which is underlain by granite bedrock. The reasons for this activity relate with such factors as weakened bedrock by fracturing, faulting and weathering. Another major reason for this would be the abnormally high seismic forces and rapid uplift of the mountain range.

Most of the previous landslides appear to be shallow rock falls. However, several of the larger slide areas involve massive volumes of bedrock. While most of these slides may be stable at present, they are not suitable for building unless they were stabilized or removed.

4. Dam Failure Potential

There are two upstream uses, the Sawpit Debris Basin and the Santa Anita Dam, which have the potential for failure caused by seismic activity.

The first of these, the Sawpit Debris Basin, located in the foothills in northern portion of the City of Monrovia, has a capacity of 476 acre-feet. If the debris basin failed at capacity, it would require a drainage area of three square miles. The ensuing flood would last approximately 25 minutes and be confined largely within the area bounded by Santa Anita Wash and the Santa Fe Flood Control Basin. A flood of this type would inundate portions of the cities of Monrovia, Duarte, and Bradbury.

The second, the Santa Anita Dam, which was built in 1927, is located to the northwest of downtown Monrovia. This dam has a capacity of 1,376 acre-feet. If the Santa Anita Dam failed at capacity the drainage area required would be 11 square miles. Most of the flooding would occur in Sawpit Canyon between Myrtle Avenue and Santa Anita Wash north of the Foothill Freeway. The flood inundation areas from the Sawpit Debris Basin and Santa Anita Dam are shown in Figures 3 and 4.

5. Flood Aversion

The City of Monrovia is located in an area that has a potential for flooding due to surface water runoff from the San Gabriel Mountains to the immediate north. However, with the appropriate flood control measures, potential flooding can be avoided, and, as stated previously in the 2000 letter from FEMA, the flood insurance maps have been rescinded for Monrovia. The flooding potential which may have been realized has been successfully cycled through the Los Angeles County Flood Control District (LACFCD) system. In addition to the infrastructure drainage system there are other facilities which ensure the public safety in relation to flooding.

This larger scale LACFCD system consists of Sawpit Wash in the eastern section of the City and Santa Anita Wash along the westerly boundary. These major drainage courses flow generally southerly and converge at a point south of Live Oak Avenue.

Other LACFCD facilities include two temporary debris basins in the Buena Vista Canyon at the north end of Norumbega Drive, and three settling basins: Ruby Canyon Debris Basin; Oak Glade Debris Basin; and Sawpit Debris Basin.
The City of Monrovia has also installed a storm drain in the Hidden Valley area. This, combined with the LACFCD system, provides the City with adequate flood control facilities for the present level of development.

B. Goals, Objectives and Policies - Flood Aversion

Goal 2: Minimize the potential for flooding in the City of Monrovia.

Objective 2.1: Development standards shall include flood control measures.

Policy 2.1.1: Graded slopes, other than those constructed in rock, shall be planted or otherwise protected from the effects of storm runoff erosion and shall be benched or terraced as required to provide for adequate drainage. Planting shall be designed to blend with the surrounding terrain and development. Graded slopes in rock shall be provided with soil pockets to contain landscaping where appropriate. Irrigation facilities shall be provided where necessary for proper establishment and maintenance of the planted areas.

Policy 2.1.2: Provision shall be made to prevent surface waters from eroding natural and graded slopes.

Policy 2.1.3: Within six months, or such other period established by the Director of Public Works, after the commencement of grading activities, graded areas shall be stabilized as approved by the City Engineer. Slope planting shall not lag grading completion by more than six months.

Policy 2.1.4: Grading on building sites shall not occur until specific house site plans and elevations have been approved for the individual site except where, as part of a subdivision grading and public improvements, approved after a public hearing, the grading of a lot has been determined necessary for public safety (and is done in accordance with the intent and purpose of these policies.)

Policy 2.1.5: Graded slopes over three feet in vertical height and all graded slopes to be maintained by a Landscape Maintenance District, or other City approved maintenance agreement, shall be planted to protect against erosion. Planting shall be in the ratio of at least one tree per three hundred square feet of slope and one shrub per one hundred fifty square feet, with ground cover sufficient to cover the bank within one year from planting.

Policy 2.1.6: For all projects that require grading, a soils engineering report shall be required to include data regarding the nature, distribution and strengths of existing soils, conclusion and recommendations for grading procedures, design criteria for and identified corrective measures, and opinions and recommendations regarding existing conditions and proposed grading. This investigation and report shall be performed by a professional soil engineer experienced in the practice of soil mechanics and registered with the State of California.

Policy 2.1.7: For lots greater than 7,500 square feet, a hydrology report shall be submitted at the time a grading plan is submitted to the City. The hydrology report shall identify areas of possible inundation, downstream effects, natural drainage courses, conclusions and recommendations regarding the effects of
hydrologic conditions on the proposed development, opinions and recommendations regarding the adequacy of facilities proposed for the site, and design criteria to mitigate identified hydrologic hazards. This report shall account for runoff and debris from tributary areas and shall provide consideration for each lot or dwelling unit site in a development. Runoff and debris volumes shall be computed using Los Angeles County Flood Control District criteria. This investigation and report shall be prepared by a registered civil engineer experienced in hydrologic investigation.

Policy 2.1.8: Covenants, Conditions and Restrictions (CC&R's), including but not limited to development plans, common area and slope maintenance, private area landscaping and maintenance, shall be submitted and approved prior to the recordation of a final tract map.

Policy 2.1.9: Hillside development shall provide all necessary sewers, storm drains, debris basins and other flood control measures as specified in specific plans.

Objective 2.2: Monitor and adopt appropriate flood management programs.

Policy 2.2.1: Support the state-sponsored Dam Inundation Area Mapping Program and consider the proximity of dams in the site selection of vital public facilities.

Policy 2.2.2: The City Engineer will monitor the Cobey-Alquist Flood Plain Management Act for application in Monrovia.
Figure 3: Sawpit Wash and Debris Basin Flood Inundation Area

Source: Inundated Area – Sawpit Debris Basin, DWG No. 54-H2 (8/73), L.A. County Flood Control District
Figure 4: Santa Anita Wash and Dam Flood Inundation Area

Source: Inundated Area – Santa Anita Dam, DWG No. 55-H2 (8/73), L.A. County Flood Control District

IV. Fire Safety
A. Background

Fire safety in the City of Monrovia is concentrated on suppression, prevention, and emergency care. Fire prevention is addressed primarily through enforcement of the Uniform Fire and Building Codes and State and City ordinances. Additionally, several other programs concentrate primarily on avoidance or impact reduction strategies. Despite these efforts, residential, commercial, industrial, and brush fires still remain a continual threat, particularly in times of severe drought. It is the purpose of this section to evaluate the effectiveness of the existing prevention programs and their potential for improvement in dealing with fire problems.

1. Fire Hazards

Fire records maintained by the Los Angeles County Fire Department between the years 1919 and 1999 indicate that large portions of the Foothill area have been subject to wild land fires of 100 to 500 acres. The major fire threat exists in the steeper slopes of the San Gabriel Mountains to the north and their potential to sweep into the hillsides and residential foothill developments. The Bradbury fire in the summer of 1981, and the three 1999 fires known as the Azusa Canyon fire, the La Canada-Flintridge-Glendale-Rafael fire, and the Arcadia-Santa Anita fire, all attest to the extensive damage that can take place from brush fires.

Residential Fires: New wood roof coverings are prohibited throughout the City. Smoke detectors are required in all residential properties at change of ownership. While prevention efforts must be emphasized, the fire program must be aimed at suppression. With the use of residential fire sprinklers in all new housing as approved by the City Council, the staffing needs in 10-30 years may be adjusted based on the number of new homes constructed with fire sprinklers. Until then, to meet the current and near future needs, appropriate staffing and apparatus must meet the service demand.\(^5\)

Hazardous Buildings: All commercial buildings are inspected annually by fire company personnel for general hazards, including electrical. Special hazards, use of flammable liquids, and the storage and use of hazardous materials require special inspection which are technical in nature due to the complexity of the code requirements. These types of inspections require personnel with specialized inspection education.

Industrial Fire Hazards: Those occupancies classified as industrial hazards are similar in nature to the hazardous buildings above and require specialized personnel to conduct the necessary inspections.\(^6\)

Brush Fire Hazards: The greatest fire danger to the City is from Wildland Urban Interface (WUI), where homes meet the 30-50 year brush growth. Flying brands pose a danger anywhere in the City where wood shake roofs exist. An aggressive 5-10 year program to reduce the fuel hazard is critical to the safety of the public and their homes. In order to work with many owners of undeveloped property and the nearly 800 owners of homes in the brush hazard area, a year-round

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\(^6\) Ibid, page 4.
inspection and abatement program is critical.\textsuperscript{7}

Figure 5 provides data of the monetary value of both structural fires and total fire losses in the City from 1994 through 1999. Figure 6 shows the actual number of fires from Fiscal Year 1972 through 1999, although data for years 1983 through 1991 is not available.

The High Fire Hazard Zone (Figure 7) delineates the land that presents a very high fire hazard within the City as necessitated by AB337. Fire prevention and prefire suppression measures have been established to help greatly reduce the potential for disaster.

\begin{figure}[h!]
\centering
\includegraphics[width=\textwidth]{fire_loss_analysis_chart}
\caption{Fire Loss Analysis Chart, 1994 - 1999 \textsuperscript{8}}
\end{figure}

\textsuperscript{7} Ibid, page 4.

\textsuperscript{8} Ibid, page 13.
Figure 6: Structural Fires, 1972 - 1999

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Figure 7: High Fire Hazard Zone
B. Goals, Objectives and Policies - Fire Prevention

Goal 3: Concentrate on the prevention of fires in the City of Monrovia.

Objective 3.1: Hillside development policies and standards shall include fire prevention measures.

Policy 3.1.1: Fire suppression access to natural chaparral areas shall be provided and maintained.

Policy 3.1.2: Landscape materials for the coverage and stabilization of graded slopes shall be selected to be compatible with surrounding natural vegetation and shall recognize climatic, soil, exposure, and ecological characteristics of the site. Plant materials that require substantial water after becoming established shall be avoided. Native dry climate grasses and other serpentine materials shall be selected wherever feasible. (Fire Department approval required).

Policy 3.1.3: Cantilevered construction, including stairs, balconies, porches, open structure under buildings shall be fire retardant construction and shall be protected by fire sprinklers, when applicable, which have been reviewed and approved by the Fire Department.

Policy 3.1.4: Eaves shall be fully boxed in with exterior stucco or its equivalent. Vents shall be covered with one-quarter inch mesh or its equivalent.

Policy 3.1.5: New roofs shall be class "All non-flammable materials."

Policy 3.1.6: Flammable chaparral, excluding mature trees, on a lot within 200 feet of a home, shall be cleared, maintained, and replaced with vegetation to minimize fire hazard.

Policy 3.1.7: Fire hydrants shall be provided and located within 300 feet of structures except where a greater distance is allowed by the Fire Chief in conjunction with the installation of automatic fire sprinklers. All water main installations will be "looped" with no dead-end main allowed.

Policy 3.1.8: To provide adequate Fire Department access, foothill neighborhoods shall be linked with a continuous circulation system. Segments of that system may consist of emergency access roads.

Objective 3.2: Adopt and enforce ordinances promoting fire prevention.

Policy 3.2.1: Enforce installation of fire alarm systems and or sprinklers to provide protection to life and property.

Policy 3.2.2: Enforce regulations requiring smoke detectors in all structures.

Policy 3.2.3: Enforce installation of chimney spark arrestors.

Policy 3.2.4: Prohibit the use of flammable roofing materials.

Policy 3.2.5: Continue to adopt and implement the most recent uniform fire codes and
supplements.

Policy 3.2.6: To prevent life hazard and to protect the hillsides and residential, industrial and commercial areas, enforce ban on use of all fireworks.

Objective 3.3: Control hazardous or potentially dangerous operations or land uses.

Policy 3.3.1: Require a conditional use permit for industrial operations involving the compounding of radioactive materials, petroleum refining, manufacturing of explosives, or any other operation of a dangerous nature.

Policy 3.3.2: Enforce ordinances prohibiting the igniting or burning of flammable materials on public or private property.

Policy 3.3.3: Restrict and regulate devices or equipment that could create fire, explosion, or bodily injury.

Policy 3.3.4: Restrict storage of flammable liquids and explosives to manufacturing zones.

Objective 3.4: Establish fire prevention programs to educate citizens.

Policy 3.4.1: Provide programs for Monrovia’s citizens to educate them in fire safety.

Objective 3.5: Support legislation that encourages fire prevention.
V. Emergency Preparedness

A. Background

1. The Regional Office of Emergency Service System

The state’s regional Office of Emergency Service (O.E.S.), located in Pasadena, supervises large-scale disasters in southern California. By pooling resources, there is an abundance of fire service, medical supplies, and related services. In case of disaster, these assets can be systematically assembled and utilized quickly and efficiently.

The O.E.S. reacts to disaster in a range from local to regional, depending on severity (see Table 7). The organization of the system is based on geographic location. In California there are seven regions. Monrovia is located in Region 1, which includes Los Angeles, Orange, and Ventura Counties. The headquarters of Region I is the Los Angeles County Fire Department. The regions are divided further into sections, with Monrovia situated in Area D of Region I with area headquarters in Covina.

Advantages of the O.E.S. system are:

- Resources can be exercised and kept in workable order;
- Availability of Medic Alert Center (M.A.C.) to coordinate medical resources through a central facility located at UCLA Medical Center; and,
- The Red Cross has devised action programs to house the homeless.

2. City Disaster Management Plan

The City of Monrovia has a City Disaster Management Plan (see Figure 8), which serves to coordinate City departments and other responsible agencies. This Plan is totally compatible and dovetails completely with the FIRESCOPE Incident Command System Organization. The FIRESCOPE Incident Command System Organization provides technical assistance and professional recommendations to statewide mutual aid programs.

The "SCARAB" box constructed of interlocked triangles and rectangles represents the disaster management matrix delegating responsibilities of the various departments and agencies.

The primary points emphasized in the SCARAB matrix are:

- Provide a common assembly for those responsible for coping with given parts of the problem;
- Provide opportunity for participatory management decisions to emanate from a single source to the operational level; and
- To provide an incident commander who not only represents the consensus decisions reached but provides efficient implementation by virtue of his local connections and his already established local command structure.

Within this matrix specific responsibilities are assigned to each City of Monrovia department as follows:

- Administrative Services Department's responsibility is to:
  a. Prepare necessary legal documents.
  b. Provide legal services.
c. Prepare records and reports.
d. Monitor and assist other department's reports.
e. Manage and coordinate manpower needs.
f. Manage resources, including financial.
g. Serve as the primary communication line between the press, the public and central command.

- Community Development Department's responsibility is to:
  a. Conduct emergency mapping and recording.
  b. Insure structural safety.
  c. Keep apprised of housing situation and make plans for deficiencies.
  d. Evaluate information and make recommendations.

- Community Services Department's responsibility is to:
  a. Provide temporary shelter, food and registration for impacted persons.
  b. Direct and/or coordinate agencies involved in (a) above.
  c. Operate mass care centers during post-shelter phase for those so affected; including feeding, clothing, sanitation, transportation, registering, and uniting families.
  d. Set up and operate first-aid stations.

- Fire Department's responsibility is to:
  a. Prevent, control and suppress fires.
  b. Conduct rescue operations.
  c. Provide and coordinate medical aid efforts, including triage.
  d. Provide and coordinate radiological monitoring, as needed.

- Police Department's responsibility is to:
  a. Receive and disseminate warning information. The department operates a community notification system capable of generating 48 calls per minute through programming systems utilizing geo-mapping, city personnel directories, or community-wide (resident's) needs. Also, in the advent of a failure of normal communications systems, a four (4) member volunteer amateur radio system (Ham radio operators) is maintained.
  b. Direct evacuation of citizens through approved evacuation routes.
  c. Enforce laws and temporary rules.
  d. Control traffic.
  e. Provide security.
  f. Coordinate with other law enforcement agencies.

- Public Works Department's responsibility is to:
  a. Provide emergency electric power, sewer and water services (maximum water pumping capacity is 10,000 gallons a minute, amount of total storage available is 24.6 million gallons).
  b. Provide for transportation access lanes.
  c. Assist in rescue activities.
### Table 7: Regional Office of Emergency Services

**Order of Disaster Response Operations**

<table>
<thead>
<tr>
<th>Scale of Emergency/Level of Responsibility</th>
<th>Responsible Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Damage</td>
<td>City of Monrovia</td>
</tr>
</tbody>
</table>
| Moderate/Major Damage                     | Area “C”  
Verdugo Fire Agencies to assist City of Monrovia       |
| Severe Damage                             | Los Angeles County -Fire Department-Headquarters        |
|                                           | Los Angeles County, Orange County, Ventura County       |

3. **Emergency Resources**

a. **Fire Department Fire Fighting Resources**

The Fire Department for the City of Monrovia is in the "Area C" region for automatic aid resource assistance. Area C fire response is coordinated through the City of Glendale Fire Department and comprises nine communities including Monrovia, Arcadia, San Marino, Sierra Madre, Monterey Park, Pasadena, South Pasadena, Glendale, and Burbank.

Since 1990 the United States Forest Service (USFS), the Los Angeles County Fire Department and the cities of Arcadia, Sierra Madre and El Monte provide fire-fighting assistance to the City of Monrovia though a Cooperation Fire Protection Agreement, and are referred to as the Foothill Fire Departments. These fire fighting departments have defined jurisdiction areas and boundaries, initial response resources for wildfire protection, Initial Action Zones (IAZ) designate mutual areas where fire would pose a threat to adjoining jurisdictions, and Special Areas assistance, e.g., wilderness, roadless, other modified suppression action areas.

A Memorandum of Understanding (MOU) has been established between the fire departments of the City of Arcadia and the City of Monrovia. The MOU provides for fire protection, emergency medical services (EMS), and rescue services through automatic aid dispatch between the two cities. The MOU defines how communication is coordinated to responding units, that joint training exercises are to be carried out, the assignment of Incident Command when units arrive on scene, and for the sharing of information to complete reports.

Another MOU, first established on July 17, 1985, exists between the Consolidated Fire Protection District of Los Angeles County and the City of Monrovia. This MOU outlines the procedures for carrying out an automatic aid/initial action response between the District and the City. The MOU is a guide for day-to-day operations and is not intended to replace or adjust any Uniform Mutual Assistance Agreement which may be in effect. The MOU defines the methodology for communications and dispatching of response services, defined limitations of service when departments are temporarily not available, scheduling of joint training exercises, incident command
authority at the scene, cooperation in fire incident reporting, and a provision of MOU revision or amendment.

b. Paramedics

The two (2) Monrovia Paramedic Squads of twelve (12) paramedics ---the City of Monrovia has authorized a total of fifteen (15) paramedics--- work under a written mutual aid agreement with the Arcadia Paramedic Squad of two (2) rescue ambulances. Both cities share their combined four (4) squads working out of three (3) full service hospitals, Arcadia Methodist Hospital in Arcadia, Santa Teresita Hospital in Duarte, and Huntington Memorial Hospital in Pasadena as the trauma catchment area facility. 100% of all requests for emergency care for sick and injured are answered by paramedic level service through the mutual automatic air response between the cities of Monrovia and Arcadia.

Monrovia's paramedics answer the entire spectrum of requests for aid and are also firefighters who maintain journeyman skill levels in this area as well. The squad is recognized as being one of the finest in the state.

c. Paramedic and Fire Department Personnel Training

Periodic drills are conducted to ensure quality control, and urban search and rescue (USAR) procedures are coordinated, and a necessary degree of standardization is maintained between companies. There is specialized training in fire hydraulics hazardous materials, and fire tactics. In addition, special classes are conducted periodically by gas representatives, County Fire and United States Forestry officers. Personnel are also sent to outside schools in arson investigation, cryogenics, and breathing apparatus repair.

Department personnel have participated in ongoing training for citizens in CPR, fire prevention and safety. Operational safety is heavily stressed and the basic safety advisory is that the safest firefighter is one who is fully trained in his profession.

To keep mutual aid operations at maximum efficiency, multi-city (quarterly training activity is conducted with the City of Arcadia), multi-company drills were conducted to test communications and the ability of firefighters from seven different cities to function together.

d. Fire Department Inventory

The Monrovia Fire Department is staffed by forty-one full-time safety personnel ---of which ten are constantly on duty, and one clerical personnel. Major fire-fighting equipment includes three major engines and an aerial unit in reserve, and two paramedic rescue squads, plus one reserve unit. Over the past two decades emergency calls number average approximately 3,000 per year, a capacity workload for the present staff to manage.

e. Police Assistance

In addition to its everyday duties, the Police Department plays a pivotal role in public safety in emergency situations. The Department's primary concern is public safety, and to take a proactive approach to minimizing criminal activity through community policing resources. However, its main duty is responding to police calls throughout the City of Monrovia.

The Department maintains the same responsibilities in the event of disaster. The only difference is that the effectiveness of police activity in this situation is a prerequisite for efficient disaster
response. The Department, along with Fire and National Guard personnel, assumes the responsibility of crowd control, crime prevention and general recovery operations when tragedy strikes.

The Monrovia Police Department is a member of "Area-D" (with headquarters in Covina) in providing mutual aid with the following thirteen cities: Arcadia, Azusa, Baldwin Park, Claremont, Covina, El Monte, Glendora, Irwindale, La Verne, Pomona, San Marino, Sierra Madre, and West Covina.

In March of 2000 the City of Monrovia, together with the cities of Arcadia, Azusa, Covina, West Covina and Pasadena, approved the establishment of the Foothill Air Support Team (F.A.S.T.) to maintain and operate one helicopter to provide air support for the F.A.S.T. member communities.

f. Police Inventory

The Monrovia Police Department accomplishes the above responsibilities with a staff of sixty-four regular policemen and eleven reserves. The Police Department maintains a fleet of fourteen radio patrol vehicles and another seventeen support vehicles, utilized for detective, community policing and tactical response. The department has two Tactical Response Teams, each comprised of eight (8) personnel. Additionally, the department draws upon resources from the residents of Monrovia with twenty-three volunteer support personnel for citizen patrol, crowd control, and other services as needed.

g. Community Policing Programs

The Monrovia Police Department conducts twenty-four proactive community oriented programs to curb criminal activity at businesses, schools and the residential areas.

The Department's "Criminal Analysis" training program of officers enhances their abilities to identify potential suspects and problem areas.

The department has initiated a "Cost Recovery Program" when officers are required by State law to keep juvenile offenders separate from adult prisoners. This program allows the department to recover the cost of an officer's time to process and supervise the juvenile when the parent or guardian fails to respond within one hour to take custody of the juvenile.

The "High Risk Offenders Officer" program, initiated in 1998, focus is to minimize the impact of parolees living in the community.

Youth and parent and community-wide programs conducted by the Monrovia Police Department include:

- D.A.R.E. - Students are given instruction in drug and gang awareness, anger management, violence alternatives, strengthening personal values and promoting self-esteem.
- Parenting Classes - The program (in English and Spanish) promotes a healthy family environment.
- Healthy Start Program - The provision of assistance for medical and counseling services.
- Partnership programs with schools for students and parents include:
  - Safe City Safe School Steering Committee
  - Parents On Campus
  - School Attendance Review Board (SARB)
- Project C.A.R.Y. (Cooperation for At Risk Youth)
- School Security Inspection Program
- Emergency Communication System
- Daytime Curfew Program
- Boy's and Girl's Club liaison between the police and youth
- Student Art Program

Community-wide intervention to involve citizens in awareness programs include:
- Citizen Police Academy - acquaints citizens with law enforcement issues and procedures.
- Cul-de-sac Program - a traffic reduction program to create a safer environment by blocking-off through streets in residential areas.
- Graffiti Removal Program - contracted service to remove graffiti within 24 hours of being reported.
- Business Watch Program - Initiated in 1998 to form an alliance and support group among businesses to share information such as emergency phone numbers, and alert each other regarding suspicious persons and shoplifters.
- Volunteer Program - Citizens have varied assignments ranging from Records to assisting the Detective division with missing persons.
- Citizen Patrol Program - A program initiated in 1997 with volunteers assisting with traffic control, subpoena service and vacation checks.
- Neighborhood Partnership Program - Initiated in 1990, the Community Activist Program (C.A.P.) places an officer in an area of the community to establish open lines of communication.
- Stop Gun Violence Bounty Program - This program is designed to encourage responsible citizen to call the police when guns are seen in public places.
- Cell Watch - Initiated in 1999, the program is designed to provide an effective communication link between community members using cellular phones to report emergencies and crimes directly to the Police Dispatch Center.

B. Goals, Objectives and Policies - Emergency Operations

Goal 4: Maximize the efficiency of City's Disaster Program.

Objective 4.1: Maximize the efficiency of City's O.E.S. System

Policy 4.1.1: Require the O.E.S. system to be exercised periodically on less severe disasters, or mock disasters in order to enlighten emergency personnel and keep equipment functional.

Policy 4.1.2: Expand fire safety programs to include earthquake safety.

Policy 4.1.3: Sponsor earthquake disaster drills at public schools including a community awareness program outlining a procedure where students would be reunited with their parents, after the disaster.

Policy 4.1.4: Require preparation of internal emergency response plans for medium and high-rise buildings.

Policy 4.1.5: Enact an ordinance requiring the preparation of internal emergency response plan for all facilities housing dependent population such as elderly.
Policy 4.1.6: Promote expansion of disaster recovery program to include assurance of maximum citizen awareness.

Objective 4.2: Enact Ordinances to Aid in Prevention of Disasters.

Policy 4.2.1: In hillside areas, home sites must be planned, designed, and developed to provide maximum safety with respect to fire, earthquake faults, geology, drainage, erosion, and siltation hazards.

Policy 4.2.2: Give primary emphasis to the alleviation of the most critical hazards affecting existing populations and development.

Policy 4.2.3: Give greater emphasis to abatement strategies for dealing with critical hazards.

Policy 4.2.4: Employ incentives to encourage private actions aimed at reducing safety hazards.

Objective 4.3: Enact Ordinance to Aid in Evacuation of/or Access to Areas of Disasters.

Policy 4.3.1: Designate evacuation routes for all areas of the City.

Policy 4.3.2: In hillside areas, no cul-de-sac street shall have a length exceeding one thousand feet unless provided with an emergency access connector.

Policy 4.3.3: Hillside streets shall have minimum widths as specified in hillside development policies and standards.
Document Preparation Resources

1. Persons Contacted

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   April Soash, Deputy City Manager, Director, Community Services
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   Los Angeles County Department of Public Works
   Alan Moss, Survey Division
   Esther Diaz, Water Resources Division
   Rodney Brown, Water Resources Division
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2. Other Resources

   http://www.scec.org - earthquake information
   http://www.consrv.ca.gov - earthquake information

3. Document Preparers

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