Chapter 7.
Safety Element

Safety Introduction

Safety Element Purpose

The Safety Element focuses on protection of the community from risks associated with earthquakes, floods, fires, toxic waste, crime and other hazards. Some level of risk associated with these factors is unavoidable; the Safety Element is the means by which the City defines what measures will be undertaken to reduce these risks to levels determined by the City to be reasonable. The Safety Element is divided into several sections: seismic safety and geotechnical hazards, flood hazards, fire/police services and urban hazards and general safety considerations.

Safety issues were previously addressed in the "Seismic Safety Element" and the "Public Safety Element," both adopted September 4, 1979. Although the types of hazards addressed in the original elements are generally the same, more information is now available regarding these potential hazards and how to mitigate their impacts.

State Law Requirements

The legal authority and requirements for Foster City to prepare the General Plan derive from state law (California Government Code, Section 65300 et. seq.). This document contains the Safety Element required by Section 65302(g). The Safety Element is required to address natural hazards such as seismic and other geologic hazards, as well as urban fires, and safety issues related to evacuation routes, peakload water supply, minimum road widths and clearances around structures. The Safety Element is required to include mapping of known seismic and other geologic hazards.

THE VISION OF FOSTER CITY AS PRESENTED IN THE SAFETY ELEMENT

The Safety Element of the Foster City General Plan has four primary concerns:

■ ***Protect the Community from the Harmful Effects of Natural Hazards.***
Protect the community from unreasonable risk to life and property caused by seismic, geologic, and flood hazards.

■ ***Protect the Community from the Harmful Effects of Fire and Other Urban Hazards.***
Protect the community from unreasonable risk to life and property caused by fire, hazardous materials, and other urban hazards.

■ ***Maintain Public Safety and Security in the Community.***
Protect the community from unreasonable risk to public safety and security.

■ ***Prepare to Respond to Emergencies.***
Minimize potential damage to life, environment, and property through timely, well-prepared and well-coordinated emergency preparedness, response plans, and programs.

STATE LAW REQUIREMENTS FOR SAFETY ELEMENTS

Government Code Section 65302(g) requires that the general plan shall include a:

"Safety element for the protection of the community from any unreasonable risks associated with the effects of seismically induced surface rupture, ground shaking, ground failure, tsunami, seiche, and dam failure; slope instability leading to mudslides and landslides; subsidence and other geologic hazards known to the legislative body; flooding; and wild land and urban fires. The safety element shall include mapping of known seismic and other geologic hazards. It shall also address evacuation routes, peakload water supply requirements, and minimum road widths and clearances around structures, as those items relate to identified fire and geologic hazards."

Many other state law requirements relate to safety issues, such as building codes, including the Seismic Hazards Identification Program required by Section 19160-19164 of the Health and Safety Code and provisions regarding emergencies and emergency plans.

Summary of Key Issues

Foster City is a highly desirable place to live, work or own a business due in part to its location in the Bay Area and its waterfront setting. With these positive attributes come a number of natural and man-made hazards as part of the same "package." Foster City is located in a area of active earthquake faults, adjacent to a large body of water, and subject to the same man-made hazards as any urbanized area. The key policy issues are determining what the significant hazards are, what the City can do to mitigate the hazards, and the acceptable level of risk balanced against the cost of protection

Summary Table of Foster City Safety Issues

Type of Hazard	Rating	Comment
Seismic		
Ground shaking	High	Most significant of all geologic hazards
Liquefaction	Varies	Less hazard on properly engineered fills. Hazard somewhat greater in areas on or near filled tidal channels.
Subsidence	Varies	Less hazard on properly engineered fills. Hazard somewhat greater in areas on or near filled tidal channels.
Tsunami/Seiche	Low	Levee system provides protection.
Dam Failure	Low	Marina Lagoon provides protection.
Surface Rupture	Low	No known active faults lie within Foster City.
Non-Seismic		
Subsidence & differential settlement	Varies	Less hazard on properly engineered fills. Hazard somewhat greater in areas on or near filled tidal channels.
Shrink/Swell Behavior	Varies	Staff is not aware of any documented cases of shrink/swell behavior in Foster City
Flooding	Low	Levee and lagoon system provides protection.
Wildland Fire	Nil	Terrain and vegetation not susceptible.
Major Urban Fire	Low-Moderate	Terrain and vegetation not problems, response times are good, many of the buildings are sprinklered, although building pattern is dense.
Hazardous Materials Spills	Low-Moderate	Some businesses use hazardous materials; proximity to S.R. 92 increases risk of truck accidents involving hazardous materials.
Electro-Magnetic Fields	Unknown	Scientific studies are inconclusive.

Sources: Refer to sources cited for each item in the Safety Background section.

Safety Background

Previous Public Safety and Seismic Safety Elements

The Public Safety and Seismic Safety Elements were adopted by the City Council in September of 1979 and are replaced by this Safety Element. The Public Safety Element discusses various types of hazards: geologic, seismic, fire, flooding, aircraft accidents, and hazardous materials.

The Public Safety Element also discusses disaster preparedness and emergency plans. Contained below are the major policy recommendations contained in the Element and a comment indicating the status of implementation.

The Seismic Safety Element of the General Plan (1979) includes a discussion of geologic concepts and overview of the mechanism of earthquakes, as well as a discussion of specific geotechnical hazards as they pertain to Foster City, including liquefaction, tsunamis, seiches, inundation by failure of dams, ground shaking, surface rupture, and levee failure. Contained below are the major policy recommendations contained in the Element and a comment indicating the status of implementation.

While many of the issues addressed in this Safety Element are a continuation of those addressed in the previous Elements, the field of knowledge regarding the likelihood and predictability of these hazards as well as methods to address them has advanced in the intervening 16 years, allowing this

DEFINITIONS OF COMMON SAFETY TERMS

Electro-magnetic field: A field with two components: one electrical and the other magnetic. These fields arise whenever electricity is conducted through a medium of transmission.

Fault: A fracture or zone of closely associated fractures along which rocks on one side have been displaced with respect to those on the other side. A fault zone is a zone of related faults which commonly are braided, but which may be branching.

Flood, 100-year: A flood which has a one percent chance of being equaled or exceeded in any given year.

Flood Insurance Rate Map: The official map on which the Federal Emergency Management Agency or Federal Insurance Administration has delineated the areas of flood hazard.

Ground Failure: Mudslide, landslide, liquefaction or soil compaction.

Intensity: Measures the perceptible effects of energy released by an earthquake at a particular site.

Liquefaction: The temporary transformation of a saturated granular soil layer from a solid state to a liquefied state as a result of seismic ground shaking.

Richter Scale: The common standard of measurement of magnitude of an earthquake; a measure of the energy released by an earthquake.

Seiches: Oscillating waves in an enclosed or partly-enclosed body of water, caused by earthquakes or landslides which displace part of the water body.

Seismic load: Forces exerted on a structure by an earthquake.

Shrink/swell behavior: Occurs in soils which can expand or contract depending on moisture content and soil mineralogy.

Subsidence: The sinking or lowering of a part of the earth's surface which can occur as a result of or independent of earthquakes.

Tsunami: Extremely long-period ocean waves caused by undersea earthquakes, volcanic eruptions or massive landslides into adjacent water bodies.

Element to provide a more current analysis on which to base the City's goals, policies and implementation measures related to safety issues.

Public Safety Element (1979) Policies and Implementation

Recommendation	Status
Knowledge of emergency preparedness should be required throughout the City's structure.	The City's Multihazard Functional Plan is the basis for emergency exercises involving all City departments.
The parking of trucks carrying flammable and other hazardous substances on city streets other than for purposes of loading or delivery should be prohibited.	The Uniform Fire Code addresses storage of hazardous materials. The Department of Transportation addresses transport of hazardous materials.
The Planning Department should feature in its news release a summary of the Safety Element, as well as suggestions as to how the general public could react in the event of a disaster.	The Fire Department has managed a public information program regarding emergency preparedness, including the distribution of handbooks.
Foster City should consider the adoption of an emergency evacuation plan.	The "Movement Operations" section of the Multihazard Functional Plan contains the City's emergency evacuation plan.
Foster City should study the possibility of the addition of a third water tank to mitigate the possible effects of disruption of Hetch-Hetchy water.	A third water tank has been constructed that has a capacity of 4 million gallons. The City presently has a total of 12 million gallons of storage capacity in the three tanks.
If possible, it would be desirable to request that the San Francisco International Airport alter the flight paths of its aircraft to the middle of San Francisco Bay.	Improved navigational equipment will be installed as part of the expansion of the San Francisco International Airport that will assist in directing aircraft over the San Mateo Bridge.
Foster City should review its ability to sustain itself for a limited period of time.	Various capital improvement projects have been completed or are planned to improve self-sufficiency under emergency conditions.

Seismic Safety Element (1979) Major Recommendations

Recommendation	Status
All levels of government responsible for guiding and regulating development and building should adopt plans, policies and procedures and enact legislation to ensure the application of scientific and engineering knowledge to the protection of lives and property.	The City uses the most current edition of the Uniform Building Code to apply new knowledge to the protection of buildings. The Uniform Building Code is updated every three years.
San Mateo County and Foster City should actively seek to obtain county-wide coverage of the monitoring of seismic activity.	USGS monitors seismic activity. The California Division of Mines and Geology maintains a network of accelerometers throughout the Bay Area.
All levels of government should direct their agencies to give appropriate attention to seismic safety in the creation and execution of their programs, and cooperate with one another to ensure the effectiveness of their efforts.	The City maintains communication with other levels of government regarding emergency preparedness programs, including conducting joint emergency response exercises.
Governments, including the City of Foster City, in seismically active areas should work to establish adequate standards and tests for dams and levees.	The U.S. Army Corps of Engineers, California Department of Water Resources, Division of Safety of Dams, FEMA, and other agencies continue to work toward establishing standards.
It should be the attitude of the City of Foster City to have the bridges and levees checked independently every five to ten years, by either a private consulting firm or by the State, to determine if they meet seismic safety standards.	The City's bridges have been inspected every two years by the State of California. The City completed retrofit of two bridges to current seismic standards; the others did not require retrofit according to State standards.
The City of Foster City should be aware, through its Building Department, of any new technological advances in foundation design that might resolve the differential settlement problem. If these improvements come about and they sufficiently supersede the old standards, they should be adopted.	The City maintains awareness of new advances through membership in the International Conference of Building Officials and communications with the California Building Standards Commission.

Seismic Safety and Geotechnical Hazards

Regional Setting[1]
As shown on Map GP-**16**, the major active faults in the San Francisco Bay region include the San Andreas Fault, the Hayward Fault and the Calaveras Fault. Other faults in the region include the Seal Cove-San Gregorio Fault, the Healdsburg-Rogers Creek Fault, and the Green Valley-Concord Fault. These active faults are oriented in a general northwesterly direction. They are characterized by a right lateral strike-slip.

Foster City's Setting
The City is about five miles east of the San Andreas Fault and about 12 miles west of the Hayward Fault, as indicated in Map GP-**16** Potential activity on these two faults is the main source of seismic risk in Foster City. "Characteristic" earthquakes, meaning earthquakes that can be reasonably anticipated to occur within the next 30 years, are 7.1 on the peninsula segment of the San Andreas Fault and 7.3 on the Hayward Fault.[2]

Ground Shaking
Ground shaking, a general term referring to all aspects of motion of the earth's surface resulting from an earthquake, is normally the major cause of damage in seismic events. Several parameters control the extent, or intensity, of ground shaking. These include the magnitude of the earthquake, distance from the epicenter, local geologic conditions, and directivity (based on the angle between the line from the site to the fault source and the line of the fault axis).

The table on page 7-8 compares the most commonly used scales measuring the magnitude and intensity of earthquakes, describing the relative expected earthquake damage at the epicenter resulting from different levels on each scale.

Ground Shaking Potential in San Mateo County
Ground shaking in San Mateo County is a potentially serious hazard. The San Andreas Fault runs immediately west of the County's most heavily populated region - the urbanized area lying between the foothills of the Santa Cruz Mountains and the western shore of the San Francisco Bay. Earthquakes centered on the San Andreas, Hayward and Calaveras faults have caused ground shaking in the County, as have seismic events as far away as Hollister to the south and Santa Rosa to the north.

The Association of Bay Area Governments (ABAG) has projected shaking intensities from several scenario earthquakes, using information on geologic materials, location and length of earthquake faults, and theories of how an earthquake's energy is transmitted.[3] The scenario earthquakes were selected to correspond with the earthquake magnitude with a probability of at least 5% in the next 30 years. The ABAG estimates use "moment magnitude" rather than the Richter scale which is slightly different; for example, the 1989 Loma Prieta Earthquake was local magnitude M_L 7.1 on the Richter scale but had a M_W 6.9 moment magnitude.[4]

Ground Shaking Potential in Foster City
Ground shaking is the most serious seismic hazard in Foster City. Of all the scenario earthquakes studied by the Association of Bay Area Governments, the one likely to generate the most hazardous ground shaking in Foster City is the magnitude 7.1 earthquake on the Peninsula Segment of the San Andreas Fault, illustrated in Map GP-**17**, causing a ground shaking intensity of VIII-IX.[5] An earthquake of magnitude 7.3 on the Hayward Fault is predicted to cause a ground shaking intensity of VII-VIII, as indicated in Map GP-**18**. This is equivalent to the ground shaking that was experienced in the Loma Prieta Earthquake of 1989. The predicted intensities for

[1]This section draws extensively from the San Mateo County General Plan, Section 15, Natural Hazards, November 1986.

[2]J.B. Perkins and J. Boatright, On Shaky Ground,, (Oakland, CA: Association of Bay Area Governments, April 1995), p. 4-5.

[3]Ibid.

[4]Please refer to the Safety Element Glossary attached as an appendix for definitions of both intensity scales.

[5]These intensity maps are not intended to be site-specific. Rather, they depict the general risk within neighborhoods and the relative risk from community to community. Individual intensities can easily be incorrect by plus or minus one intensity unit. (Note from On Shaky Ground City Maps, Publication Number: P95002EQK-SM-4,ABAG, April 1995).

the scenario earthquakes are indicated in the table on page 7-9.

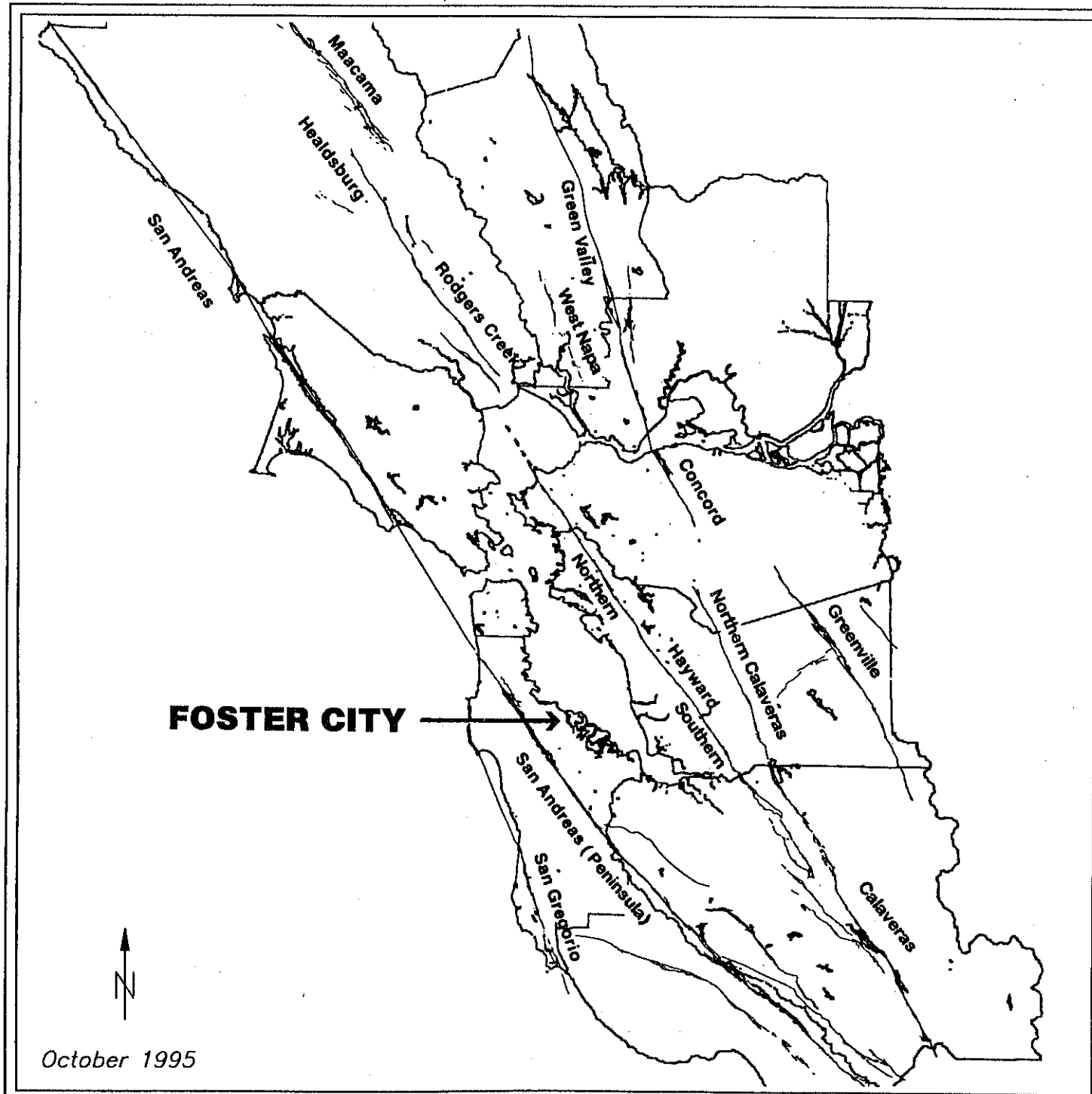
The most recent major earthquake was the Loma Prieta earthquake on October 17, 1989, with a magnitude of 7.1 and centered near Aptos in the Santa Cruz Mountains. Although earth shaking in Foster City was very powerful (estimated to be intensity VII on the Modified Mercalli Scale), there was no major damage. Minor damage included window breakage, minor damage to water pipes, shifting of heating and air conditioning systems on buildings, broken utility line connections, and minor damage to two bridges.

The City was able to respond quickly to the emergency with stabilizing repairs completed by approximately midnight following the 5:04 p.m. quake. The City's costs of repairs was approximately $172,000 for miscellaneous repairs, including flexible utility connections, $116,600 for repairs to the Shell Boulevard Bridge and $10,900 for repairs to the Bicentennial Bridge.

Approximate Relationship of Richter Magnitude and Modified Mercalli Intensity Scales to Expected Earthquake Damage

Richter Magnitude	Modified Mercalli Maximum Intensity (at epicenter)	Expected Earthquake Damage
2	I-II	Usually detected only by instruments
3	III	Felt indoors. May not be recognized as earthquake.
4	IV-V	Felt by most people; structures shake; windows and dishes rattle; wooden walls and frame creak; slight damage to unsecured objects.
5	VI-VII	Felt by all; many frightened and run outdoors; glassware breaks; items fall off shelves; furniture moves; cracks in unreinforced masonry; fall of chimneys, cornices and other unreinforced architectural ornament; some small slides can occur.
6	VII-VIII	Difficult to stand; steering of autos is affected; potentially moderate to major structural damage in masonry structures; frame houses move off foundations if not bolted; branches broken off trees; collapse of elevated structures such as chimneys, water towers.
7	IX-X	General panic; major or total damage to masonry structures; underground pipes broken; frame structures seriously damaged; cracks in ground; large landslides likely; serious damage to dams, dikes, embankments.
8+	X-XII	Major and total damages to buildings and infrastructure.

Source: California Division of Mines and Geology, "CDMG Notes," after Charles F. Richter, 1958, Elementary Seismology.



REGIONAL FAULTS

Fault Traces Used as Sources of Ground Shaking

Source: ABAG, On Shaky Ground, 1995.

Miles

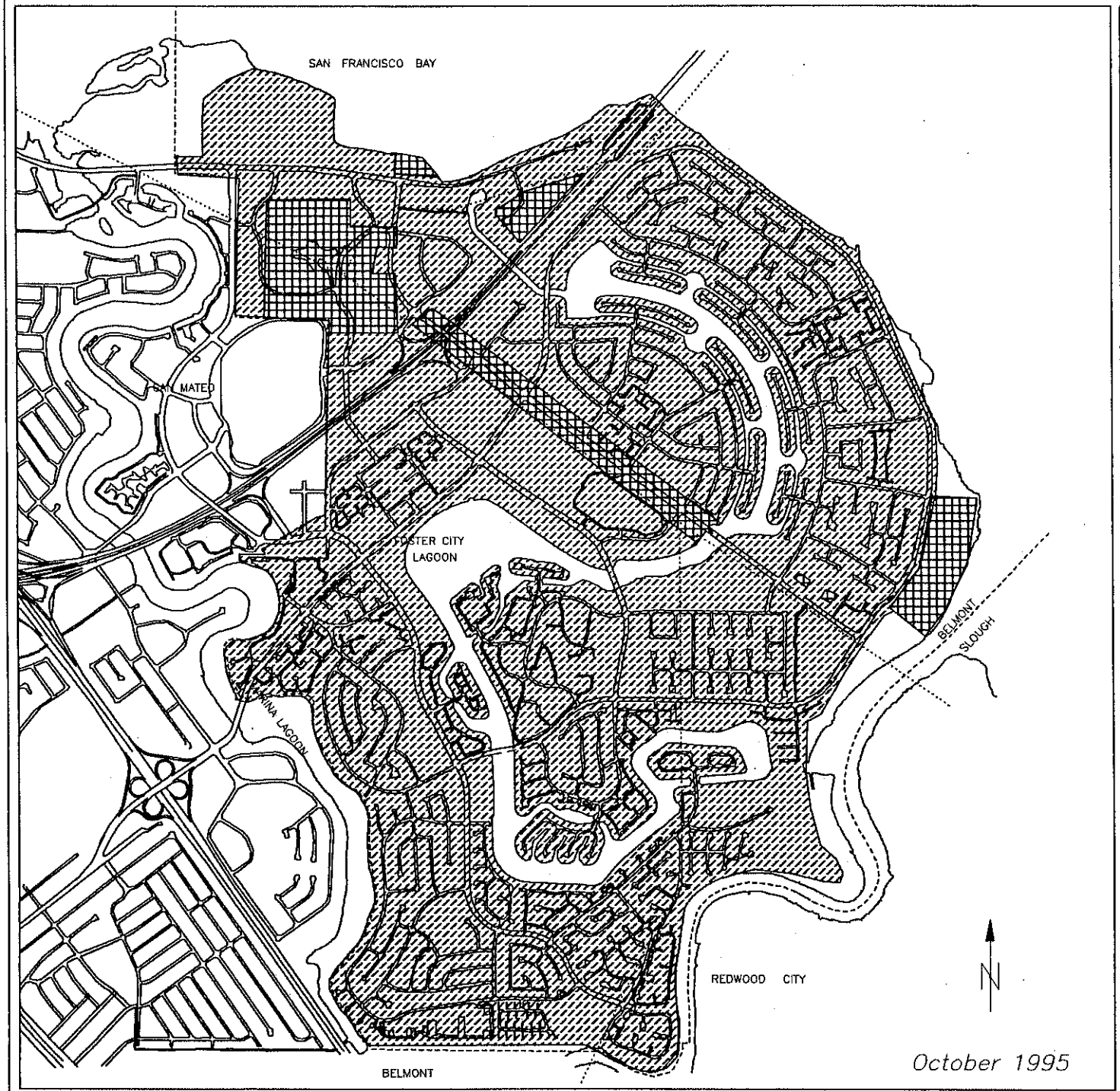
0 10 20 30

Map GP-16

Scenario Earthquakes Evaluated by ABAG, Showing Faults Closest to Foster City

Source Fault	Fault Length (in km)	Approx. Moment Magnitude	Probability of Occurrence in Next 30 Years	Distance from Foster City to Fault	Predicted Ground Shaking Intensity (Modified Mercalli Scale) in Foster City
Loma Prieta Earthquake (1989) As recorded at Redwood Shores, CSMIP Station #58375	40	6.9		63 km	VII
Peninsula Segment of the San Andreas	52.4	7.1	24%	8 km or 5 mi	VIII-IX
San Gregorio	57.1	7.1	Not available	21 km or 13 mi	VII-VIII
Northern Hayward	38.2	6.9	28%	21 km or 13 mi	VII-VIII
Southern Hayward	60.1	7.2	23%	21 km or 13 mi	VII-VIII
Hayward	98.3	7.4	5-6%	21 km or 13 mi	VII-VIII
Healdsburg-Rodgers Creek	56.5	7.1	22%	69 km or 43 mi	VI-VII
Northern Calaveras	37.2	6.9	33%	34 km or 24 mi	VI-VII

Source: Association of Bay Area Governments, On Shaky Ground, April 1995, USGS Circular 1053, and California Division of Mines and Geology, Special Publication 113.



SHAKING INTENSITY

San Andreas Earthquake Peninsula Segment Magnitude 7.1

Modified Mercalli Intensity

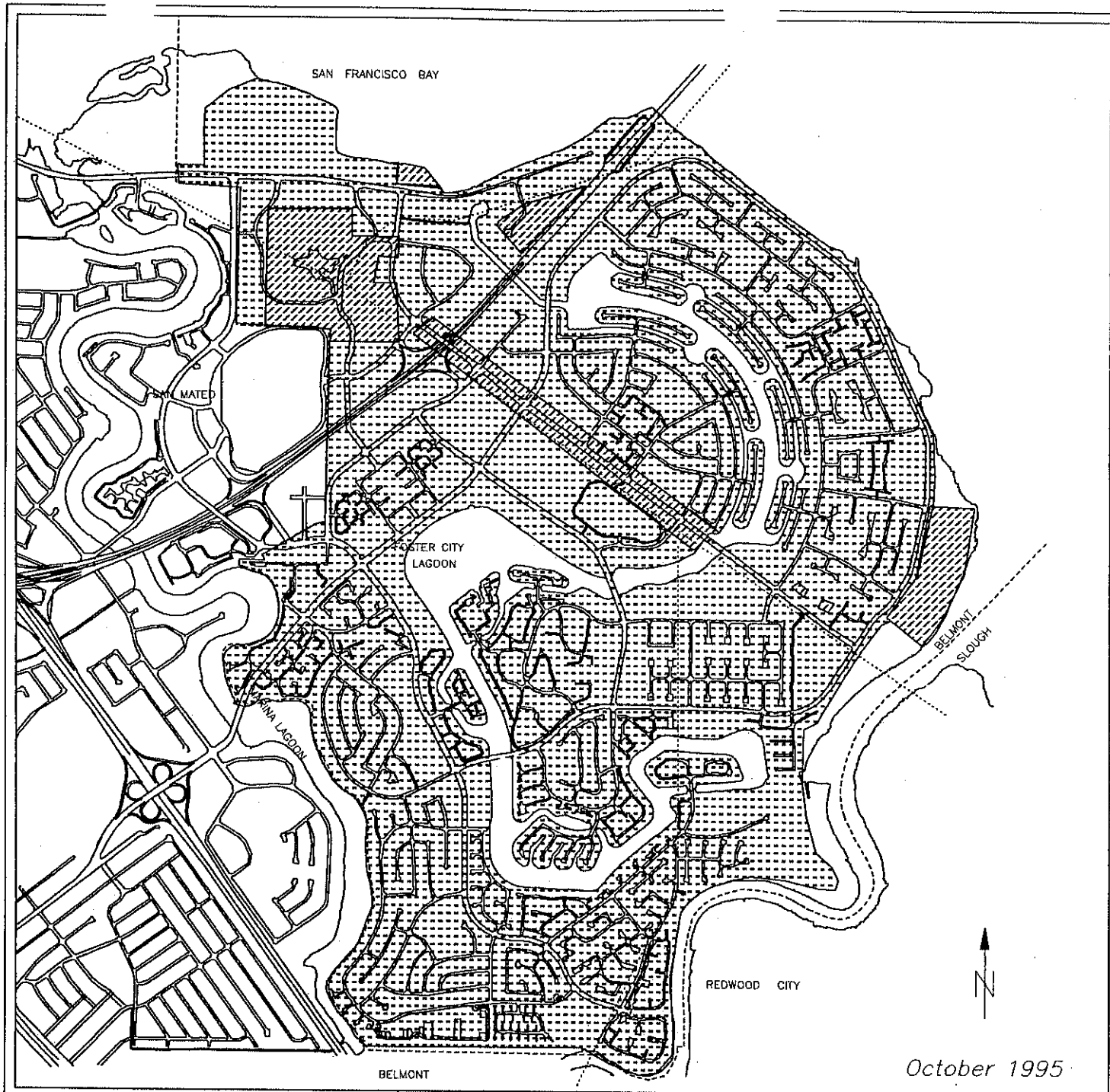
- X–Extreme
- IX–Heavy
- VIII–Moderate
- VII–Nonstructural
- VI–Objects Fall
- V–Pictures Move

Based on: ABAG, On Shaky Ground, 1995; Intensities may be incorrect by one unit higher or lower. Current version available on Internet at http://www.abag.ca.gov

Miles

0 .3 .6

Map GP-17



SHAKING INTENSITY

Hayward
Earthquake
Entire Length
Magnitude 7.3

Modified Mercalli Intensity

- X–Extreme
- IX–Heavy
- VIII–Moderate
- VII–Nonstructural
- VI–Objects Fall
- V–Pictures Move

Based on: ABAG, On Shaky Ground, 1995; Intensities may be incorrect by one unit higher or lower. Current version available on internet at http://www.abag.ca.gov

Miles

0 .3 .6

Map GP-18

Levee Stability in Foster City During Earthquake
Levees have protected the land area of what is now Foster City since before the 1906 San Francisco Earthquake. The lack of information regarding damage to the levees in the 1906 Earthquake suggests that there was little or no damage.[6] The approximately 11.5 miles of levees were improved to meet the standards of the Army Corps of Engineers in the early 1960s as part of the development of Foster City.

As mentioned in The October 17, 1989 Loma Prieta Earthquake by Dames & Moore, fill and dike performance in Foster City and Redwood Shores was excellent during the Loma Prieta Earthquake. Dames & Moore attribute this to the fact that when Foster City was filled, hydraulically dredged sand was dewatered in stilling basins (to remove the water from the sand) before being spread in thin layers and compacted with vibrating rollers to a relatively dense state. Analyses performed during the 1960's and 1970's confirmed the safety of the perimeter dikes under earthquake loading conditions specified by the U.S. Army Corps of Engineers.[7]

The levee is maintained and monitored regularly and in 1993, the City improved the slope protection to the Army Corps of Engineers standards to provide additional protection against destabilizing influences. Without extensive and expensive geotechnical borings, there is no feasible means to provide a more accurate assessment of its stability.

Liquefaction
Liquefaction is the temporary transformation of a saturated granular soil layer from a solid state to a liquefied state as a result of seismic ground shaking. In the process, the soil undergoes transient loss of strength, which commonly allows ground displacement or ground failure to occur[8] In unique situations where this layer is at or near the surface, increased pressure from rising groundwater may decrease the load-bearing capacity of the soil to a quicksand-like consistency, causing buildings and foundations to sink downward.[9] A subsurface layer which liquefies may serve as a sliding surface for overlying layers. Such a layer works much like ball bearings by reducing friction to the point that landslides and lateral spreading may occur even on very slight slopes.

Liquefaction Potential in Foster City
For the lowlands along San Francisco Bay, susceptible sand and silt layers are not randomly scattered, but generally lie in buried stream channels, most of which are not detectable from surface morphology, but require borings to locate. The City has on file the "Map Showing Liquefaction Susceptibility of San Mateo County, California" published by the U.S. Geological Survey[10] which indicates the results of borings. The text accompanying the map cautions that because the map is regional in scope and because the data shown are generalized to area averages, the map cannot be used to determine the actual presence or absence of liquefiable soils beneath any specific locality. Nevertheless, the map indicates that soils susceptible to liquefaction have been found in various boring locations in Foster City, although an approximately equal number of borings revealed soils which are not susceptible to liquefaction. While liquefaction occurred at other filled locations around the Bay during the Loma Prieta Earthquake, such as the Marina District of San Francisco, the Port of Oakland, the Oakland Airport, and Alameda, it is significant that no liquefaction was reported in Foster City.[11]

For properties without recent (within the past two years) geotechnical reports on file, the City requires geotechnical reports prior to construction of all new developments to determine the subsurface soil conditions, assess the potential for seismic hazards such as liquefaction in

[6]City of Foster City, Seismic Safety Element,, 1979, p. 48.

[7]Dames & Moore, The October 17, 1989 Loma Prieta Earthquake,, 1989, 9.

[8]T. Leslie Youd and Jeanne B. Perkins, "Map Showing Liquefaction Susceptibility of San Mateo County, California," Geological Survey Miscellaneous Investigations Series Map I-257-F, 1987.

[9]San Mateo County Department of Environmental Management, Planning and Development Division, General Plan, November 1986, 15.10.

[10]T. Leslie Youd and Jeanne B. Perkins, "Map Showing Liquefaction Susceptibility of San Mateo County, California," Geological Survey Miscellaneous Investigations Series Map I-257-F, 1987.

[11]G. Wayne Clough, James R. Martin, II, and Jean Lou Chameau, "The Geotechnical Aspects," in Practical Lessons from the Loma Prieta Earthquake, National Academy Press, National Research Council report from a symposium sponsored by the Geotechnical Board and the Board on Natural Disasters, 1994, p. 35.

accordance with Section 3309.7 of the 1994 Uniform Building Code, and recommend appropriate building techniques to minimize seismic damage.

Seismically-Induced Subsidence
Subsidence, defined as the sinking or lowering of a part of the earth's surface, can occur as a result of or independent of earthquakes. Seismically-induced subsidence can be either a direct or an indirect result of an earthquake. Direct tectonic displacement of bedrock can result from strong earthquakes, causing either subsidence or uplift of up to several feet over relatively large areas of ground surface. Indirect subsidence, resulting from compaction of granular soil layers caused by ground shaking, is more common. Such shaking causes subsidence by compressing the soil deposit so that pore space formerly filled by groundwater or air is eliminated. However, there must be an outlet for evacuation of these pore spaces in order for subsidence to occur.

Seismically-Induced Subsidence Potential in Foster City
As indicated above, for properties without recent (within the past two years) geotechnical reports on file, the City requires geotechnical reports prior to construction of all new developments to determine the subsurface geotechnical conditions, assess the potential for seismic hazards such as subsidence, and recommend appropriate building techniques to minimize seismic damage.

Tsunamis and Seiches[12]
Tsunamis are extremely long-period ocean waves caused by undersea earthquakes, volcanic eruptions or massive landslides into adjacent water bodies. Tsunamis are generally small in height in deep water, but very long and can rise to 20 feet or more when they approach the coast, causing great destruction in shoreline locations. The narrowness of the Golden Gate and the shape of the San Francisco Bay provide natural protection against tsunamis that originate in the open Pacific Ocean.

Seiches are oscillating waves in an enclosed or partly-enclosed body of water, caused by earthquakes or landslides which displace part of the water body. Four water bodies in San Mateo County are believed to be large enough to pose significant seiche potential: Upper Crystal Springs Reservoir, Lower Crystal Springs Reservoir, San Andreas Lake and Pilarcitos Lake. If an earthquake similar in magnitude to the 1906 earthquake were to occur at a time when these water bodies were at the high water mark, seiches could overtop the spillways of these water bodies by several feet, causing large-scale inundation downstream.[13]

Potential for Tsunamis and Seiches in Foster City
The U.S. Army Corps of Engineers, has concluded that, "Based on these tsunami run-up elevations, it is unlikely that a tsunami would cause significant flood damage within the Interim 2 study area (San Mateo and Northern Alameda Counties). Any levee or fill designed to protect against flooding from an extreme tide would also provide adequate protection from tsunamis."[14]

Even if seiches caused water to be released from water bodies upstream of Foster City, the Natural Hazards Map contained in the San Mateo County General Plan indicates that inundation from these dams would not reach Foster City, as it would first enter Marina Lagoon (see also section on inundation from seismically- induced dam failure, below).

Inundation from Seismically-Induced Dam Failure
Inundation from dam failure in the aftermath of a seismic event can pose serious risks to large segments of the population. Dam failure may be the result of direct ground rupture (if the dam is located in or near a fault zone) or severe ground shaking. Flooding and possible dam failure could also occur in the event of an earthquake-induced landslide into the reservoir which displaces a large volume of water. Seismically-induced dam failures are normally associated with older hydraulic fill

[12]The discussion on tsunamis in this section draws heavily from San Francisco Bay Shoreline Study: San Mateo and Northern Alameda Counties Interim Office Report, by the U. S. Army Corps of Engineers, San Francisco District, September 1989.

[13]San Mateo County Department of Environmental Management, Planning and Development Division, Seismic and Safety Elements of the General Plan, San Mateo County, 1976, Volume II, pp. 35 - 36.

[14]U.S. Army Corps of Engineers, San Francisco District, San Francisco Bay Shoreline Study: San Mateo and Northern Alameda Counties Interim Office Report, September 1989, 3.10.

dams. The San Fernando Dam in Southern California was built in this manner. Its partial failure during the 1971 earthquake necessitated the emergency evacuation of over 80,000 downstream residents.[15]

In San Mateo County, there are presently thirteen dams that are large enough to endanger lives and property in the event of failure.[16] The flood plain that would result from catastrophic failure of each of these dams has been mapped and incorporated into the Natural Hazards map contained in the San Mateo County General Plan.

Potential for Inundation from Seismically-Induced Dam Failure in Foster City

Review of the inundation area for the dam closest to Foster City, Crystal Springs, reveals that the waters would come down San Mateo Creek, spread out over portions of San Mateo, and flow into Marina Lagoon without reaching Foster City. This is consistent with an earlier analysis by Foster City Department of Public Works staff which stated, "There exists an area within the City of San Mateo east of the El Camino Real of the approximate size of Foster City which lies four to six feet below the crest elevation of the levee along Marina Lagoon in Foster City. Should Crystal Springs Dam fail and flood San Mateo, the height of the flooding would have to be in excess of six feet adjacent to Marina Lagoon. It is estimated that the maximum depth of flood inundation at the County Fair Grounds, approximately one mile west of Foster City, would be about two feet. It is, therefore, highly improbable that failure of the Crystal Springs Dam will produce any flooding in Foster City."[17]

Surface Rupture

Surface rupture occurs when the ground surface is broken due to fault movement during an earthquake.

Predicting exactly where surface rupture will occur during a seismic event is difficult because the time and intensity of earthquake occurrence cannot be predicted. The location, however, generally can be assumed to be along an active or potentially active major fault trace, the locations of which are well documented in San Mateo County.[18] However, there have been cases where supposedly inactive faults have experienced displacement during earthquakes centered on nearby faults.

The California State Legislature adopted the Alquist-Priolo Act in 1972 (and amended in 1993) to prevent damage from surface rupture by prohibiting the location of most structures for human occupancy across the traces of active faults. Under the Act, "Earthquake Fault Zones" are required to be delineated by the State Geologist and cities and counties must withhold development permits for sites within the zones until geologic investigations demonstrate that the sites are not threatened by surface rupture. The Alquist-Priolo Earthquake Fault Zone nearest to Foster City is the San Andreas Fault located across the Crystal Springs Reservoir along Highway 280 near State Route 92, a distance of about 8 km or 5 miles.[19]

Surface Rupture Potential in Foster City

Due to Foster City's distance from known earthquake faults, the potential for surface rupture in Foster City is considered minimal.

[15] S.T. Algermissen, et. at., A Study of Earthquake Losses in the San Francisco Bay Area, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1972, 126.

[16] San Mateo County Department of Environmental Management, Planning and Development Division, General Plan, November 1986, 15.12.

[17] City of Foster City, Public Safety Element of the General Plan, July 1979, 9.

[18] The City has on file the most updated version of the Alquist-Priolo Special Studies Zones Maps which delineate the known and suspected traces of the active fault zones.

[19] Earl W. Hart, Fault-Rupture Hazard Zones in California, California Division of Mines and Geology Special Publication 42, 1994.

Summary of Effects of Major Seismic Events on Foster City
The table below summarizes the effects of historic seismic events on Foster City.

Major Seismic Events in Foster City

Event	Magnitude	Effects
1906 San Francisco Earthquake	8.3	Levee survived; no structures known to exist.
1957 Daly City Earthquake	5.3	Levee survived; no information on structures.
1989 Loma Prieta Earthquake	7.1	Powerful shaking, minor damage to structures, damage approximately $172,000 to City facilities; no damage to levee.

Protection of Foster City from Seismic Hazards

Protection of Foster City's Infrastructure from Ground Shaking
The City has taken several measures to protect the City's infrastructure from the effects of ground shaking. These measures relate to the City's bridges, water distribution system, and sewer system and are described below.

Bridges. The Shell, Foster City, and Rainbow Bridges were built in the mid 1960s. The restraining cables on these bridges were installed in 1983. The restraining cables for the Bicentennial Bridge were constructed as part of the original bridge construction in 1975. The Shell and Foster City Boulevard Bridges were modified in 1994-95 to meet current State seismic standards.

The Vintage Park Overcrossing, completed in 1991, was constructed to the seismic standards in effect at the time of construction. The widening of the Foster City Boulevard Overpass also completed in 1991, and constructed to the seismic standards in effect at the time.

Water Distribution System. In 1992, work was completed on the installation of flexible connections on all water mains where they come out of the ground and interface with structures. This interface is the point at which water mains are most likely to fail due to sudden earth movement such as that caused by earthquakes. These retrofits copy a similar installation on the 24-inch main that brings all of Foster City's water into the City. That work was completed just weeks prior to the Loma Prieta Earthquake. The movement at that location was totally absorbed by the flexible fitting and no loss of service occurred.

At the three existing 4-million-gallon water storage tanks, flexible couplings have been installed at the interface between each tank and the underground pipe connection. These will allow for differential movements between the tanks and the pipes during seismic events.

Please see the section on *Peakload Water Supply Requirements* at the end of this Element for a discussion of seismic risk to the City's water supply line.

Sanitary Sewer System. The sanitary sewer system has a much lower exposure to damage from earth movement because most of the system is contained in the ground. With the exception of the connections at lift stations and the lagoon crossings at the Foster City Boulevard, Shell, and Bicentennial Bridges, there are no ground-to-structure interfaces. Even at the lift stations, the lift station structures are founded in the same ground that the connecting lines are, therefore differential movement is minimized. During the Loma Prieta Earthquake the sewer lines broke at the connection to the structure at both Lift Stations 10 (on Gull Ave. near Port O'Call Shopping Center) and 29 (at East Hillsdale and Edgewater Blvds.). The City's Capital Improvements Program includes a project for 1997-98 to seismically retrofit the lift stations by installing flexible joints where force mains enter lift stations.

The lift station at the City's Corporation Yard (Lift Station 59) was reconstructed in 1994/95. The new lift station and its piping connections meet all current seismic standards to resist earthquakes.

Protection of Buildings from Ground Shaking
The Building Inspection Division within the Community Development Department evaluates proposals for new and remodeled buildings for conformance with the safety standards in the latest adopted Uniform Building Codes. Inspections during construction ensure that the building projects are completed in accordance with the approved plans.

Foster City is fortunate that most of its buildings were constructed under building codes that incorporated seismic safety standards. The first buildings in Foster City were constructed in 1963. The codes at this time required house framing to be bolted to the foundation.

In 1973, the Uniform Building Code incorporated new seismic standards derived from the experiences of buildings in the 1971 San Fernando Earthquake. Changes in the mid-1980's addressed non-structural hazards. In 1991, the Uniform Building Code addressed problems associated with tilt-up buildings with large openings as a result of lessons learned in the Loma Prieta Earthquake. Although the Uniform Building Code provides a minimum level of design that is intended to protect life safety in a major earthquake, these provisions do not necessarily protect against structural damage or loss of operations.

In 1973, the Uniform Building Code incorporated new seismic standards derived from the experiences of buildings in the 1971 San Fernando Earthquake. Changes in the mid-1980's addressed non-structural hazards. In 1991, the Uniform Building Code addressed problems associated with tilt-up buildings with large openings as a result of lessons learned in the Loma Prieta Earthquake.

Typical Major Earthquake Weaknesses of Residential Buildings

Problem	Hazard	What Can Be Done
Unbraced water heater	Water heater can topple, causing gas or electrical lines to break, starting a fire	Use metal straps or tubing to secure the water heater to the wall
Foundation not anchored	House can move off its foundation, causing fire and other damage	Drill holes through sill place and install special bolts or steel plates
Weak cripple walls	Walls can collapse, causing damage and/or fire from broken utility lines	Nail plywood panels on the inside of the studs
Unreinforced masonry foundation	May break apart or shift	Strengthen or rebuilt foundation
Houses on tall walls or posts	May collapse	Obtain advice from architect or engineer
Unreinforced masonry walls	May collapse	Obtain advice from an architect or engineer
Room over garage	Large opening of a garage door may make wall too weak	Obtain advice from an architect or engineer

Source: California Seismic Safety Commission, The Residential Property Owner's Guide to Earthquake Safety. October 1993.

Typical Major Earthquake Weaknesses of Commercial Buildings

Problem	Hazard	Type of Building	What Can Be Done
Walls poorly anchored to floors and roofs	Connections between walls and the wood floors and roof pull away and building may collapse	Precast (tilt-up) concrete or reinforced masonry constructed to meet 1970 or earlier editions of UBC	Add new anchorage
Unreinforced masonry walls	Buildings may collapse or masonry pull away and fall	Brick, hollow clay tiles, concrete block, etc. built before 1940s are most likely unreinforced	Anchor walls to floors and roof, add interior partitions or braces
Poorly reinforced concrete walls or columns	Concrete walls or columns may collapse	Concrete walls or columns of structures erected before 1975 often lack enough reinforcing steel	Add new walls or bracing, or wrap columns with steel or new concrete

Source: California Seismic Safety Commission, The Commercial Property Owner's Guide to Earthquake Safety. January 1993.

In 1989, the City Council adopted a Seismic Hazards Identification Program as part of an amendment to Title 15, Building and Construction. This program calls for the Building Inspection Division to identify buildings that meet any of the following criteria:

- Buildings constructed of unreinforced masonry.
- Buildings constructed prior to January 1, 1935 containing more than 99 occupants.
- Buildings constructed prior to August 1, 1976 containing 300 or more occupants.

This survey was completed in 1995 and found that no buildings in Foster City met the criteria.

In addition to structural building hazards, non-structural hazards also pose a danger to occupants and may cause an interruption of operations for businesses. Typical non-structural building hazards are noted in the table below.

Non-structural hazards are addressed through building inspections for new and modified buildings. Two new programs to be considered pursuant to Housing Element Implementation Measure H-h are: resale inspections of single-family houses and rental housing inspections. Such programs could address nonstructural hazards such as bracing of equipment (e.g., water heaters) as well as look for other unsafe conditions as a result of unapproved building alterations.

Typical Non-Structural Hazards in Commercial Buildings

Problem	Hazard	What Can Be Done
Unbraced ceiling systems	Unbraced acoustic-tile systems can shake loose, fixtures and ducts can fall, fire sprinkler heads can be knocked loose	Add wire hangers and braces
Unbraced equipment	Unbraced equipment can topple or slide; utility lines and equipment can cause fire or flood damage	Bolt or brace equipment; add flexible connections between equipment and utility lines
Large windows	Glass may break	Add new framing, add new window mullions, add window film
Unbraced building contents	Contents may be damaged, may injure occupants	Fasten heavy equipment and furniture, store heavy items in areas that pose fewer hazards

Source: California Seismic Safety Commission, The Commercial Property Owner's Guide to Earthquake Safety, January 1993.

Geotechnical Review of Proposed Development
For properties without recent (within the past two years) geotechnical reports on file, the City requires geotechnical reports prior to construction of all new developments to determine the subsurface soil conditions and recommend appropriate building techniques to minimize damage from seismic and other geologic hazards.

Non-Seismic Land Subsidence and Differential Settlement
Subsidence and differential settlement (the uneven lowering of the ground surface) constitute minor natural hazards in San Mateo County. Local subsidence may be caused by extracting more ground-water than is replaced by the natural hydrologic cycle. The results from this drawdown are empty pore spaces in the soil, which are compacted from the weight of overlying material. Subsidence in San Mateo County has been minimal compared to the San Jose area, where subsidence of up to eight feet has occurred due to ground water extraction.[20]

Differential settlement, on the other hand, is more common, often occurring when buildings and bridges are built on poor foundation materials. Pilings are often used to anchor structures to firmer deposits below the surface in these situations. Surface footings tend to be used to support less important structures. If surface footings are used to support one part of a structure and pilings for another, differential settlement will occur, with the area supported by surface footings settling faster than the piling-supported section. However, differential settlement generally occurs slowly enough that its effects are not serious.

Areas of the County most susceptible to differential settlement and subsidence are the bay muds and the historic marshlands, which have been covered with artificial fill over the last 150 years. These areas are sinking as the deposits slowly consolidate. The rate of consolidation decreases with time, but it may take up to 100 years for complete stabilization, during which time the loss of elevation could amount to several feet.

Potential for Non-Seismic Land Subsidence and Differential Settlement in Foster City
Settlement of areas that have been filled on top of bay mud is to be expected and is typical in Foster City. The requirement for geotechnical reports and implementation of their recommendations has minimized differential settlement and subsequent damage to a large extent.

[20] San Mateo County Department of Environmental Management, Planning and Development Division, Seismic and Safety Elements of the General Plan, 1976, Volume II, p. 40.

Shrink/Swell Behavior
Shrink/swell soils are those which can expand or contract depending on moisture content and soil mineralogy. Generally, expansive soils are associated with the presence of certain types of clay minerals, which expand considerably when wet, and shrink, often into fine dusts, when dry.

Potential for Shrink/Swell Behavior in Foster City
Staff is not aware of any documented cases of shrink/swell soils behavior in Foster City.

Flood Hazards

Major Water Bodies
The major features relating to hydrology in Foster City include San Francisco Bay, Belmont Slough, Marina Lagoon, and the Foster City Lagoon system. These resources provide recreational, open space, wildlife, and scenic values to the City, and, in the case of the Foster City and Marina Lagoons, flood protection. Map GP- **19** indicates the tributary areas to the lagoons and sloughs. These water bodies, how they function, and the hazards they pose are described below.

San Francisco Bay. The Bay is the primary source of water for most of Foster City's waterways and constitutes the north and northeastern boundaries of the City. The levee system has been designed to protect the City from a combination of high tides, storm surge, wave runup and long-term sea level rise in San Francisco Bay.

Belmont Slough. Belmont Slough constitutes the southeastern boundary of the City and continues to Redwood City. The Slough performs the following three important functions: it provides water for Foster City Lagoon water exchange which maintains the viability of the lagoon, it provides a similar action to allow exchange of water levels in the Marina Lagoon (via O'Neill Slough), and it provides a natural wildlife refuge as a result of its tidal action, mudflats, and marshland vegetation. Belmont Slough functions as a part of the San Francisco Bay and therefore the City's levee system was designed to continue along the shore of Belmont Slough to provides protection from a combination of high tides, storm surge, wave runup and long-term sea level rise in San Francisco Bay.

Marina Lagoon. The Marina Lagoon establishes the southwestern boundary of Foster City and was originally a slough similar to the Belmont Slough described above. The City of San Mateo converted it to a lagoon for storm drainage detention purposes and to serve as a boating area. The Marina Lagoon drains an area of 8.32 square miles which includes portions of the cities of San Mateo and Foster City. Laurel Creek, Borel Creek (which flows into the 19th Avenue Drain) and the 16th Avenue Drain comprise the three major watercourses entering Marina Lagoon. The San Mateo Pumping Station located near the mouth of the Lagoon can pump 600,000 gallons per minute.[21]

By operating the gates and pumps during the 100-year storm, the maximum elevation of the Marina Lagoon is predicted to be 0.43 feet National Geodetic Vertical Datum (NGVD), equivalent to 100.2 feet Foster City datum. This elevation is well below the levee crest elevation protecting the City of Foster City along its western boundary, which provides a freeboard in excess of 6 feet.[22] Without the gates and pumping system, the Marina Lagoon would pose a flooding hazard as it filled with storm drainage.

Foster City Lagoon. As a part of the original development of the City, a system of islands was constructed to increase the number of residential lots with lagoon frontage. Bridges were constructed to accommodate most sailboats. The Foster City Lagoon is used as a storm drainage detention basin with intake gates at the south end and pumps and weirs at the north end. Surface drainage is collected and drained into the lagoon system where it is discharged by gravity or pumped into San Francisco Bay at the north end of the lagoon. Water from Belmont Slough is taken into the lagoon through tide gates located at the southeast end of the lagoon.

Approximately 2,300 acres of land contribute to the stormwater runoff going into the Foster City Lagoon. During a 100-year storm this is estimated to result in a peak runoff rate of 3,600 cubic feet

[21] Robert Born Consulting Engineers, Inc., Report on Analysis of Foster City Levees, June 15, 1988, III-8.

[22] Ibid., III-35.

per second with an accumulated runoff volume of about 1,000 acre-feet.[23] The water level in the Lagoon is typically lowered in anticipation of a storm through the use of the large pumps located at the City's Corporation Yard on East Third Avenue. Each pump can discharge 80,000 to 125,000 gallons per minute into the San Francisco Bay. Without the gates and pumping system, the Foster City Lagoon could pose a flooding hazard as it filled with storm drainage.

Flood Protection

The City's flood protection is provided by a combination of levees along San Francisco Bay and Belmont Slough and the storm water detention and discharge capabilities of the Foster City Lagoon and the Marina Lagoon. The levees and the Foster City Lagoon were designed to protect the development from the "adverse and infrequent condition of a coincidental storm, and prolonged high tidal block lasting as long as 18 hours."[24]

The National Flood Insurance Act of 1968 and the Flood Disaster Prevention Act of 1973 established a national flood insurance program which is administered by the Federal Emergency Management Agency (FEMA). FEMA prepares Flood Insurance Rate Maps (FIRM) which identify flood zones and areas which are susceptible to 100 year floods. The national flood insurance program provides insurance coverage to property owners within flood hazard areas if the community has filed an application and adopted minimum land use and flood control measures for new construction. Foster City has applied and is part of the National Flood Insurance Program which allows homeowners to obtain flood insurance even though the City is not within the area deemed susceptible to a 100 year flood. The most recent Flood Insurance Rate Map includes all of Foster City's land area within the levee system as outside of a Special Flood Hazard Area (100-year flood).[25]

The history of the flood designations in Foster City has been the source of some controversy. The City's first National Flood Insurance Rate Map dated January 1, 1977 (superseded January 19, 1995), divided Foster City into two zones: Zone A (an area of special flood hazard) and Zone C (an area of minimal flood hazard). Areas shown as Zone A included the area north and east of the levee system and an area along the southern boundary of the City. Based on fill operations along the southern boundary of the City in 1977, FEMA modified this classification from Zone A to Zone C.[26] By letter dated June 25, 1987, FEMA informed the City of its intention to issue a new FIRM for the City which would include all of the City within the area subject to a 100-year flood. FEMA advised the City that its proposed decision was based on a field survey conducted by the U.S. Army Corps of Engineers in 1976[27] and the findings of a 1984 report by the U.S. Army Corps of Engineers.[28]

The City pursued an appeal of FEMA's proposed determination. Extensive analysis of flood protection was performed by the City's consultant in 1988 as part of this appeal.[29] The report analyzed three issues related to flood protection: (1) the combined effects of high tides, storm surge, wave runup, and long-term sea level rise, (2) the potential impact of the 100-year storm on Foster City, and (3) a preliminary geotechnical analysis of the existing levee system, including an evaluation of its stability under possible increased loading due to potential raising of the levee, settlement, resistance to seepage, and resistance to erosion from wave action and potential overtopping.

[23] Ibid., III-11.

[24] Wilsey, Ham & Blair, Foster City - San Mateo County, California - Preliminary General Plan Report, March 23, 1961, 16.

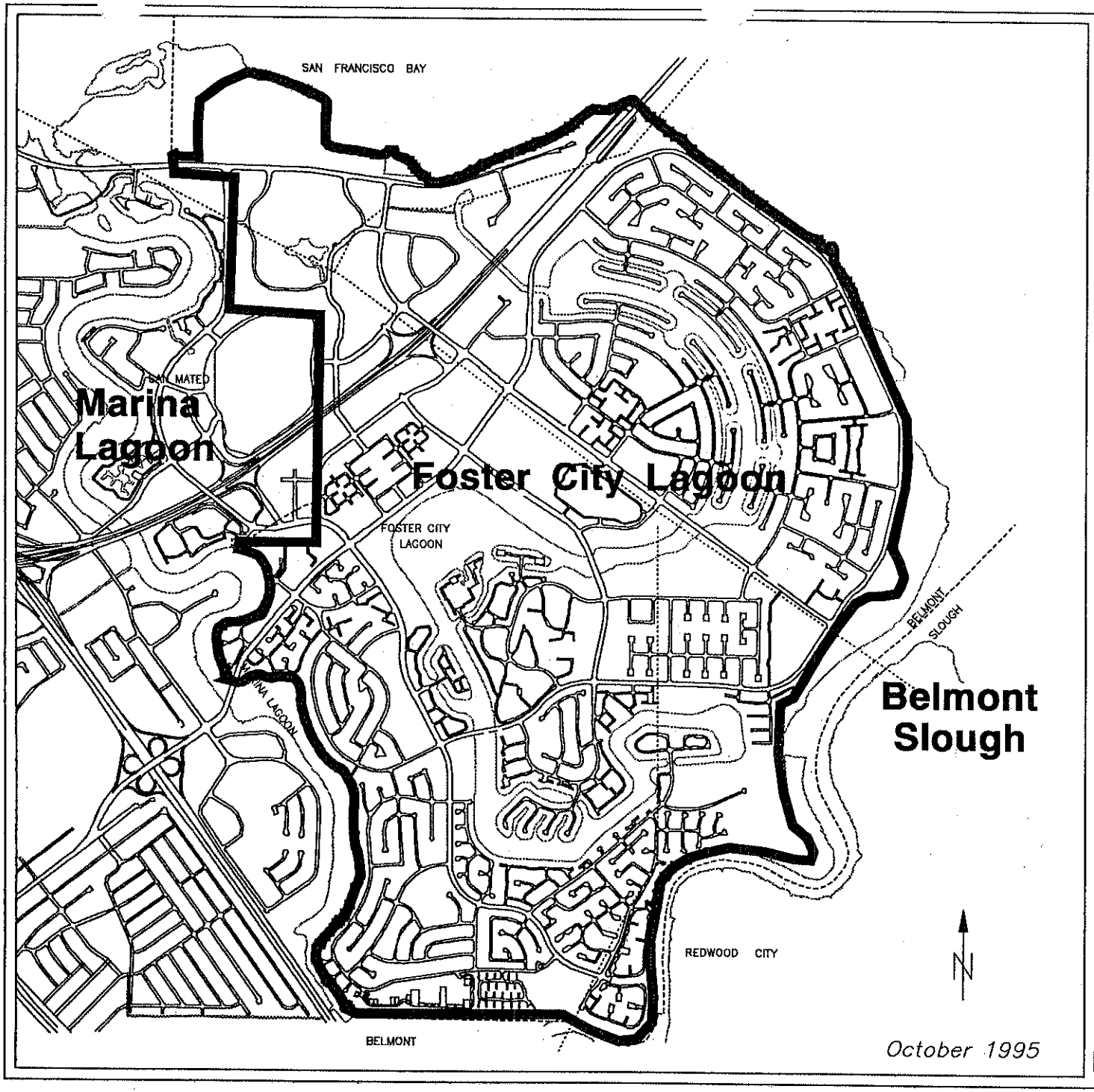
[25] Federal Emergency Management Agency, Flood Insurance Rate Map, Community Panel No. 060318 0010 C, January 19, 1995.

[26] City of Foster City, Public Safety Element of the General Plan, July 1979, 13.

[27] U.S. Army Corps of Engineers, Report of Survey on San Francisco Bay and Tributaries, California, December 1974.

[28] U.S. Army Corps of Engineers, San Francisco Bay Tidal Stage vs. Frequency Study, October 1984.

[29] Robert H. Born Consulting Engineers, Inc., Report on Analysis of Foster City Levees, June 15, 1988.



TRIBUTARY AREAS TO LAGOONS

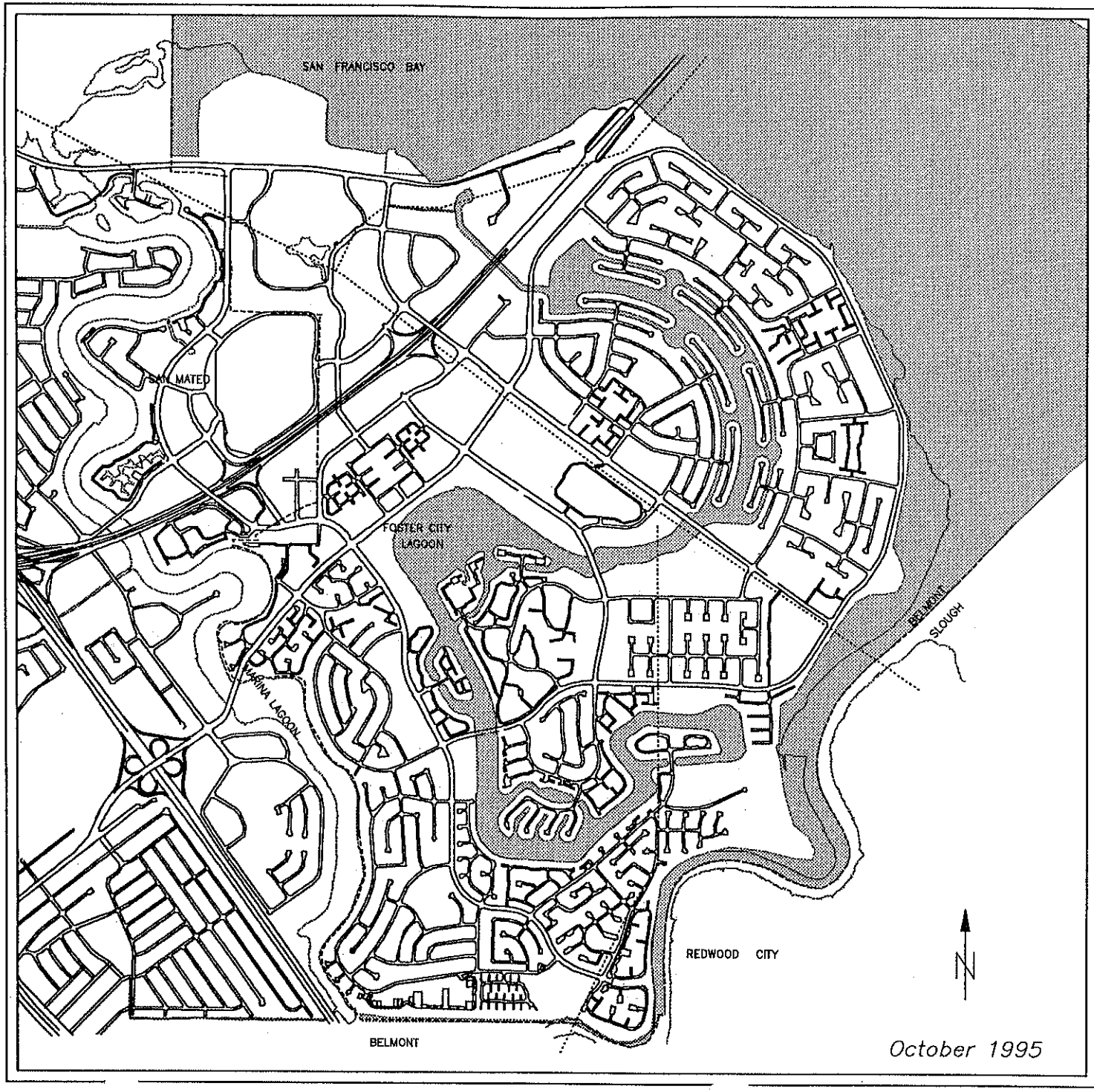
LEGEND

- Tributary Areas
- City limits
- Powerlines
- Shorelines
- Streets

Miles

0 .3 .6

Map GP-19



FLOOD HAZARDS

LEGEND

- Areas subject to 100-year flood
- City limits
- Powerlines
- Shorelines
- Streets

Flood information is generalized from the official Flood Insurance Rate Map.

Miles

0 .3 .6

Map GP-20

The report concluded that:

- The existing perimeter levee system, coupled with the existing pumping capacity of the Foster City internal drainage system, is adequate to protect the City of Foster City from flooding to the extent required under FEMA regulations except for the minimum freeboard specified under paragraphs (a) (1) of Part 65.10 of the Regulations.

- Even under existing conditions, the maximum flooding which could occur (under the required design criteria) would be limited to a few localized street areas for only limited durations. The water would likely be confined within curb faces and all developed residential and non-residential properties would be fully protected from flooding and flood hazards to the extent required under FEMA regulations.

- The U.S. Army Corps of Engineers concluded in San Francisco Bay Shoreline Study[30] that during a 500-year tidal event (6.73 feet National Geodetic Vertical Datum [NGVD]), the total volume of water overtopping the Foster City perimeter levee system will only be approximately 160 acre-feet, resulting in zero damage.

Additional efforts to appeal FEMA's reclassification would have required significant additional expense for engineering studies. Even if that work had been done, it was clear that FEMA's inclination would have been to require raising of the levee to avoid reclassification. Therefore, the City decided to raise the elevation of the levee system and provide other improvements to satisfy FEMA's requirements.

To meet FEMA's requirements, the height of the levee system would have to be 109.2 feet (Foster City Datum) which provides two feet above the 100-year high tide stillwater elevation. To allow for future settlement and future sea level rise, the City decided to raise the height of the levee system to 110.0 (Foster City Datum). (Sea level in San Francisco Bay is projected to rise four to five inches in the next 50 years.[31]) A Capital Improvement Program project was budgeted for installation of a soil mound ranging from 1' to 3' high on the seaward side of the levee crest or adjacent to the bike path along approximately 95% of the levee with slopes of 2:1 and 3:1. The project also provided for installation of concrete sea walls with a maximum height of 24" on the seaward side of the levee crest along approximately 5% of the levee system. In addition, the shoreline protection has been improved to meet the U.S. Army Corps of Engineers' and Bay Conservation and Development Commission's (BCDC) shoreline protection requirements. The levee improvement project was completed in 1994. The Operations and Maintenance Manual[32] for the levees was revised and adopted by the City Council in April 1994 to replace the previous manual[33] in accordance with FEMA requirements for on-going maintenance.

The Federal Emergency Management Agency (FEMA) issued a new Flood Insurance Rate Map (FIRM), effective January 19, 1995, designating all land areas inside the levee system in the City of Foster City as being in Flood Zone X, defined as **outside** of a Special Flood Hazard Area (100-year flood)[34]. Zone X is further defined as "areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood." The City's interior lagoons are designated Flood Zone A, defined as within the 100-year flood with no base flood elevations determined. Areas of the City outside the City's levee system are designated Flood Zone AE, defined as within the 100-year flood with base flood elevations determined. This elevation is indicated on the

[30] U.S. Army Corps of Engineers, San Francisco Bay Shoreline Study: San Mateo and Northern Alameda Counties Interim Office Report, September 1989.

[31] Moffat and Nichol, Engineers, Future Sea Level Rise: Predictions and Implications for San Francisco Bay, Prepared for San Francisco Bay Conservation and Development Commission, June 1987, 1.

[32] Robert H. Born Consulting Engineers, Maintenance and Operation Manual - Foster City Levees, Internal Lagoon and Pump Station, October 1988.

[33] Daniel, Mann, Johnson, & Mendenhall, Estero Municipal Improvement District - Levee Maintenance Program - Standards and Procedures, January 1973.

[34] Federal Emergency Management Agency Flood Insurance Rate Map, Community Panel No. 060318 0010 C, January 19, 1995.

FIRM as 7 feet (National Geodetic Vertical Datum of 1929).

As part of the Federal Emergency Management Agency's requirements for issuance of the revised Flood Insurance Rate Map for Foster City, floodplain management regulations must be adopted by the City. On January 3, 1995 the City adopted Chapter 15.36 of the Foster City Municipal Code, containing regulations based on the Model Floodplain Management Ordinance for California Communities (July 1992) as produced by FEMA. The purpose of the floodplain management regulations contained in the proposed ordinance is to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions. The ordinance establishes constructions standards within all special flood hazard areas. Within the levee system, the only area of the City that is classified as special flood hazard area is the lagoon.

Please refer to the section on Seismic Safety, above, for a discussion of seismically-related flood hazards.

Fire/Police Services

Fire Service

The Fire Department is located at 1040 East Hillsdale Boulevard. Land is available for a future fire sub-station, if needed, at the corner of Edgewater Boulevard and Hawksbury Lane in the southern portion of the City.

The Fire Department employs 36.5 full-time equivalent permanent employees (1995-96) organized into four divisions: Administration, Fire Prevention and Life Safety, Operations and Training. Two engine companies and one truck company are in service at all times with an additional unstaffed engine in reserve. All Captains and Firefighters are certified as Emergency Medical Technicians (EMTs) and the Department provides a semi-automatic defibrillator program. Several self-help and informational training presentations, including disaster preparedness, cardiopulmonary resuscitation (CPR) and recognition of common household fire hazards, are available to any group upon request.

The Administration Division handles records management, coordinates administrative support for all Divisions, manages special studies, and manages the Department's budget and goals.

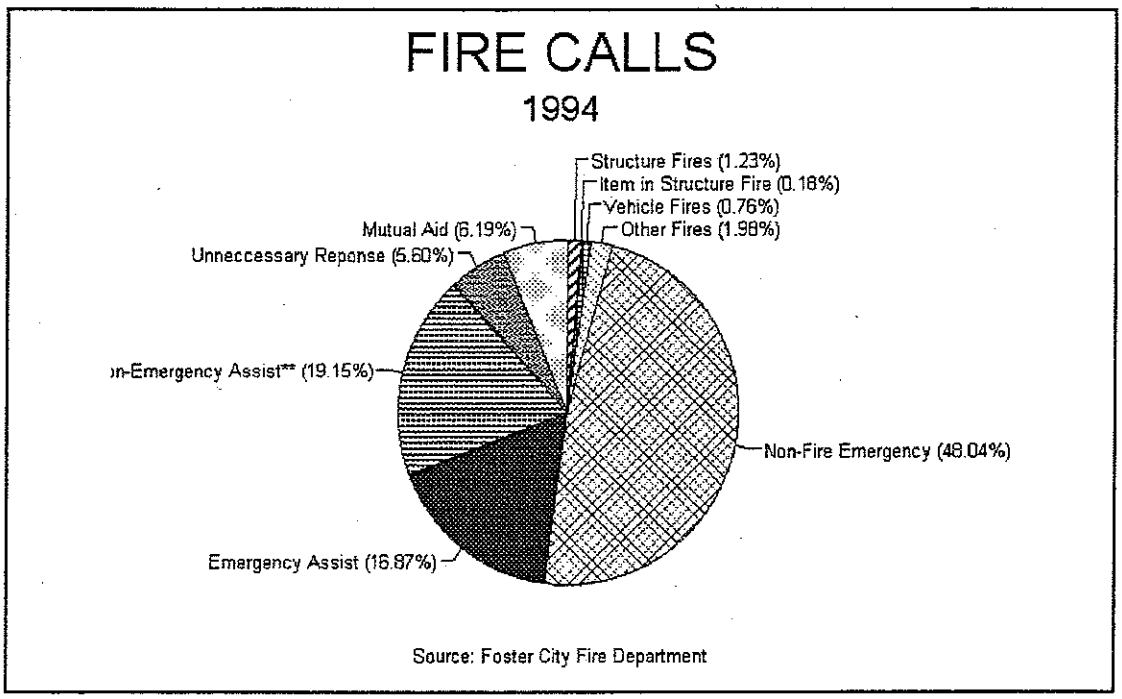
The Fire Prevention Division works to reduce the factors which contribute to the cause and spread of fire through consulting with the public, issuing permits, plan checking and inspecting buildings for fire code compliance, developing and recommending new or modified codes to the City Council, and conducting fire safety education programs in local schools.

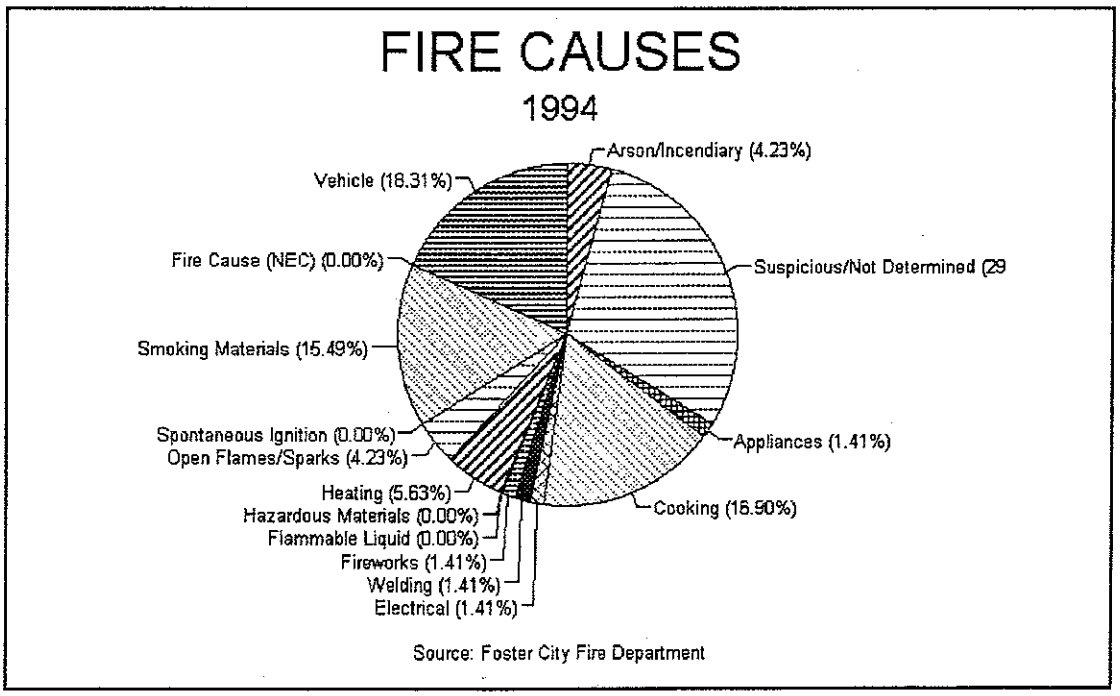
The Life Safety, Operations and Training Division assures that all personnel are kept abreast of the most current firefighting and medical techniques and ensures compliance with mandated training requirements as well as respond to fire, emergency medical aid and rescue calls, hazardous materials incidents and citizen assists.

The Department responds to about 1,700 - 1,850 emergency and non-emergency calls annually, consisting of fire, emergency medical aid and rescue calls, hazardous material incidents, and citizen assists. The breakdown of Fire Department calls by type for 1994 is contained in the adjacent figure. The causes of fires are summarized in a figure below.

The Cities of Foster City and San Mateo are considering a possible merger of their fire departments to occur in Fiscal Year 1996-97. Such a merger would be expected to provide efficiencies resulting from the reduction in the number of management positions and the overall number of companies needed to provide acceptable fire protection in both communities.

The proposal recommends the elimination of one Foster City engine company and increasing the staffing on other equipment. The initial review by the Foster City Fire Department indicated that potential impacts due to the elimination of the engine company would be offset by the increase in immediately available emergency response personnel and equipment, the response of a battalion chief to all structure fires, and the location of reserve apparatus in the Foster City Fire Station.


FIRE CALLS
1994
Structure Fires (1.23%)
Item in Structure Fire (0.18%)
Vehicle Fires (0.76%)
Other Fires (1.98%)
Mutual Aid (6.19%)
Unneccessary Reponse (5.60%)
n-Emergency Assist** (19.15%)
Non-Fire Emergency (48.04%)
Emergency Assist (16.87%)
Source: Foster City Fire Department


FIRE CAUSES
1994
Arson/Incendiary (4.23%)
Vehicle (18.31%)
Fire Cause (NEC) (0.00%)
Suspicious/Not Determined (29
Smoking Materials (15.49%)
Spontaneous Ignition (0.00%)
Open Flames/Sparks (4.23%)
Appliances (1.41%)
Heating (5.63%)
Hazardous Materials (0.00%)
Flammable Liquid (0.00%)
Fireworks (1.41%)
Welding (1.41%)
Electrical (1.41%)
Cooking (16.90%)
Source: Foster City Fire Department

Road standards for fire equipment access
Roads must be engineered to accommodate the Department's ladder truck which weights 50,000 pounds and has a 44' outside turning radius. Roads must be a minimum of 20' in width and maintain a 13'6" vertical clearance.

Response times/second fire station
An average response time of 3 to 4 minutes is the standard for most areas of Foster City, although response times are generally longer for Neighborhoods 7 and 8, with Neighborhood 7 being 5 minutes, 36 seconds and Neighborhood 8 being 4 minutes, 35 seconds. These times are an average and can be as much as one minute longer as a result of dispatching process time, known as the total reflex response time[35]

The City owns a 7,546 sq. ft. site at the corner of Hawksbury Lane and Edgewater Boulevard that is reserved for a fire station. The site is located 1.8 miles away from the existing fire station. The issue of whether a second fire station is needed has been periodically reviewed and is dependent on the City Council's policy determination of what constitutes an acceptable response time. To date, the City Council has determined that response times are adequate and a second fire station is not needed, including during review in 1995 of the FY 1995/96 to FY 1999/2000 Capital Improvements Program. The overall cost of the construction of the station is estimated to be $1,000,000.[36]

The Fire Department prepared a "Large Fire Incident Study" in 1981, updated in 1987 and again in early 1990.[37] This study examines all neighborhoods and the special hazards wtihin each area that would lend themselves to large fire involvement and fire spread. Building construction, water supply, personnel and resources, geogrphy and wind conditions are factors that have been studied in this document.

The City has adopted stringent fire safety regulations for high rise buildings four or more stories in height (75'), including requirements for fire hose cabinets, communications equipment, smoke ventilation, and emergency procedures signs. The Fire Department conducts fire drills annually in high-rise buildings.

The use of residential sprinklers has improved the fire safety in buildings constructed since they were required in 1982 under NFPA 13D standards. In 1995, approximately 1,450 of the City's 11,874 residential units are sprinklered. The instance of fires progressing beyond a first alarm assignment in sprinklered buildings is greatly diminished.

In April of 1993, the Foster City Fire Department, in conjunction with all San Mateo County fire agencies enhanced the City's mutual aid agreement. This enhancement is the Greater Alarm Plan which brought a vast imrpovement of the overall response capability of individiual fire departments, by having additional resources available as soon as a first alarm is called, rather than waiting until condtions deteriorate. As mentioned above, the two cities are considering a merger of the two fire departments.

The Insurance Services Office (ISO) gives fire safety ratings to cities about once every 10 to 15 years. The ratings are based on a grading system that weights the department's ability to receive and handle alarms (10%), the department's structure (50%) and water supply (40%) to achieve a rating of Class 1 through 10, with Class 1 being the best rating. Foster City currently enjoys a Class 3 ISO fire insurance classification, issued August 1, 1989. The ratings have a minor effect on commercial insurance rates and no significant effect on residential insurance rates.

Police

The Police Department is located at 1030 East Hillsdale Boulevard.

The Department organization consists of three divisions: Administration, Field Operations, and Technical Services. The Administrative Division is responsible for community relations, youth services, investigations, internal affairs, evidence control, crime prevention and budget preparation.

The Field Operations Division consists of the uniformed Patrol and Traffic Bureaus which

[35] William L. McDonald, Fire Chief, "Staff Report on Second Fire Station Feasibility," February 7, 1995., p. 2 and 5.

[36] Ibid., p. 2.

[37] Foster City Fire Department, "Neighborhood Staff Study for Large Fire Incidents," 1990.

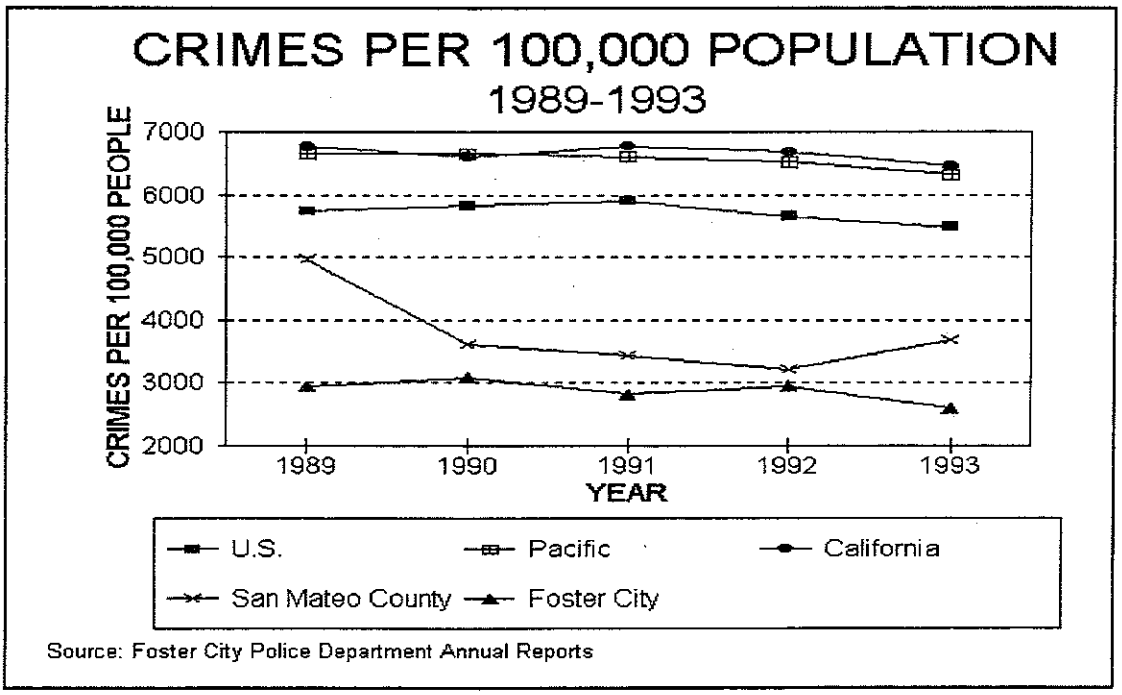
respond to calls and preliminary investigations. The Division includes patrol and traffic officers, K-9 officers, bicycle officers, field training officers, evidence technicians and community service officers and is additionally responsible for police training.

The Technical Services Division consists of the Records and Communications Bureaus. The Division is responsible for receiving all calls, dispatching, maintaining and distributing records, and the Department's computer operations.

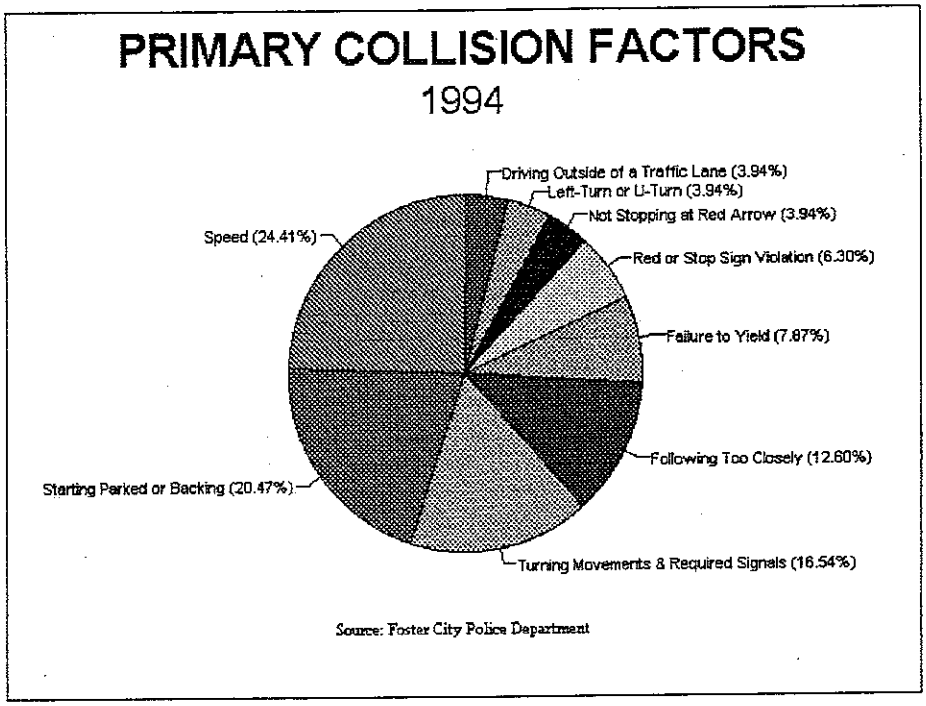
A comparison of major crime rates in Foster City with San Mateo County, California, the Pacific States, and the United States for 1989-1993 is contained in the adjacent figure (major crimes are Part I crimes as defined by the Department of Justice). A breakdown of major crimes for 1990-1994 in Foster City is contained in the figure below.

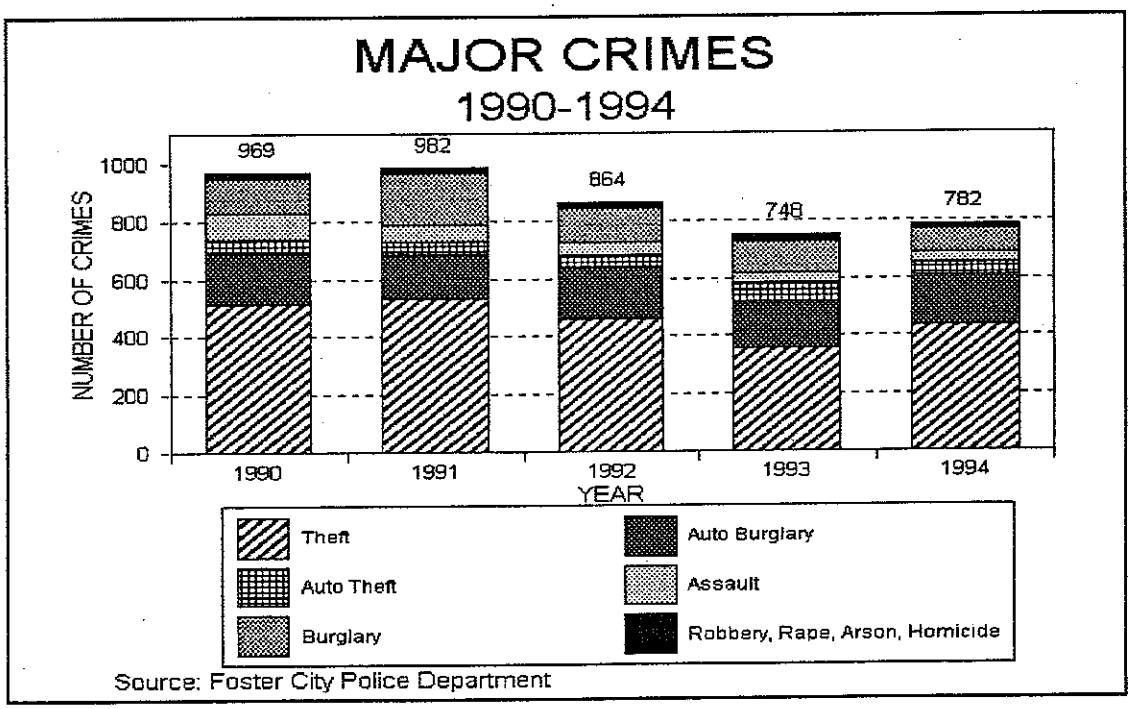
The Police Department also responds to vehicle accidents and reports on the types and causes of these accidents. In 1994, of the total 279 vehicle collisions, 209 were non-injury and 70 involved injuries. Seven involved driving under the influence. The various reported primary collision factors are indicated in the graph below.

The Police Department offers a wide variety of crime prevention programs including Neighborhood Watch, Apartment Watch, Business Watch, newsletters, security surveys, various public education and training programs, programs with community groups and organizations. Plans for new developments are also reviewed by the Police Department for compliance with crime prevention requirements.



Source: Foster City Police Department Annual Reports


PRIMARY COLLISION FACTORS
1994
Driving Outside of a Traffic Lane (3.94%)
Left-Turn or U-Turn (3.94%)
Not Stopping at Red Arrow (3.94%)
Red or Stop Sign Violation (6.30%)
Failure to Yield (7.87%)
Following Too Closely (12.60%)
Turning Movements & Required Signals (16.54%)
Starting Parked or Backing (20.47%)
Speed (24.41%)
Source: Foster City Police Department


MAJOR CRIMES
1990-1994
NUMBER OF CRIMES
1000
800
600
400
200
0
969
982
864
748
782
1990
1991
1992
1993
1994
YEAR
Theft
Auto Theft
Burglary
Auto Burglary
Assault
Robbery, Rape, Arson, Homicide
Source: Foster City Police Department

Urban Hazards and General Safety Considerations

Hazardous Materials
Of the over six million chemicals in today's marketplace, over sixty thousand are considered hazardous. Most people have hazardous materials in their homes, including such items as motor oil, paints, cleaning solvents, and pesticides. Hazardous materials are also stored and handled by many businesses in Foster City, which, in addition to the same materials found in residences, can also include chemicals and materials used in industrial processes and biological research.

Many of the businesses and residents that store and handle hazardous materials also generate hazardous waste. Hazardous waste generated by businesses may include industrial wastes (e.g., solvents, sludges with metallic content, waste oil, pesticides, and biological waste (e.g., laboratory research waste or specimens). Businesses that many consider "clean industry," such as electronic equipment manufacturers and biotechnology companies, use and generate hazardous materials. Household hazardous wastes can include paints, pesticides, batteries, motor oil, and other chemicals.

Federal and State Laws
Management of hazardous materials and hazardous wastes is guided by a number of federal and state laws, including:[38]

- Federal Resource Conservation and Recovery Act (RCRA)
- Federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)
- California Hazardous Substance Account Act (HSAA)
- California Hazardous Waste Control Act of 1973 (HWCA)
  - Tanner Hazardous Waste Management Planning Act of 1986
  - Hazardous Waste Source Reduction and Management Review Act of 1989
- Hazardous Waste Management Planning and Facility Siting
- Underground Storage Tank Act (USTA)
- Hazardous Materials Release Response Plans and Inventory Act
- Hazardous Materials Management Act
- Emergency Planning and Community Right to Know Act

Planning for hazardous waste management has been the subject of much effort in San Mateo County in the last decade as a result of changes in state requirements as well as an increased awareness of problems associated with hazardous materials and hazardous wastes. These efforts are summarized below.

San Mateo County Hazardous Waste Management Plan
The Tanner Hazardous Waste Management Planning Act of 1986 required that all counties in California develop plans to properly manage all hazardous wastes (residential, commercial, and industrial). Following approval of a county plan by the State Department of Health Services, each city is required to either adopt a city plan consistent with the approved county plan, or incorporate the applicable portion of the county plan by reference into the city's General Plan, or require all land use decisions to be consistent with the county plan. The San Mateo County Hazardous Waste Management Plan, approved by the San Mateo County Board of Supervisors and a majority of the cities in San Mateo County in September 1989, established broad policies and programs for the management of these wastes. The Plan establishes a "fair share" requirement with regard to hazardous waste facilities, designates appropriate areas for these facilities if additional facilities are required in the County, and assigns a Hazardous Waste Management Plan funding allocation to each jurisdiction. In December 1990, the City Council adopted the San Mateo County Hazardous Waste Management Plan.

[38] James Longtin, Longtin's California Land Use - 1995 Supplement, (Malibu, California: Local Government Publications), 1995, 300-312.

The San Mateo County Hazardous Waste Management Plan establishes possible strategies for dealing with hazardous waste, in order of highest to lowest preference, as follows:

1. Source reduction
2. Recycling
3. Treatment
4. Storage
5. Disposal

Joint Household Hazardous Waste Element
The Integrated Waste Management Act of 1989 requires each county to prepare an integrated waste management plan containing three components: (1) source reduction and recycling elements from each city and each county, (2) city and county household hazardous waste elements, and (3) a county-wide siting element (Public Resources Code 40950).

In compliance with the Integrated Waste Management Act of 1989, a Joint Household Hazardous Waste Element (HHWE) was prepared under the direction of a task force representing San Mateo County and fifteen cities. The HHWE includes programs to guide recycling, collection and refuse monitoring of household hazardous waste as well as public education and information. The Joint Household Hazardous Waste Element was adopted by the City Council on August 17, 1992.

Local Implementation of Hazardous Materials Requirements
Health and Safety Code Sections 25500-25521 require that business and area plans be established for hazardous materials storage, handling and emergency response. Each county or city which assumes responsibility for the implementation of the area and business information plans must designate a department, office, local fire district or other agency as the administering agency responsible for administering and enforcing the plans.[39] In Foster City, San Mateo County has been designated as the agency with primary responsibility for hazardous material review, inspection, and enforcement.

The Fire Department and the Building Inspection Division of the Community Development Department coordinate review of building permits to ensure that hazardous materials requirements are met. Building permits for new buildings or tenant improvements are reviewed to ensure that the required separation between hazardous materials and some types of land uses are met, and that where hazardous materials are permissible, proper facilities are included to handle and store them. Business licenses are reviewed to ensure that when businesses move into an existing building, their uses of hazardous materials are evaluated. The Fire Department also performs annual inspections of businesses which includes a review of hazardous materials handling and storage. (Health and Safety Code Section 25507.2 requires an inspection at least every three years.) The City's code enforcement program, carried out within the Planning and Code Enforcement Division of the Community Development Department also assists in enforcement and abatement of hazardous uses or structures.

The procedures for response to a hazardous materials spill are contained in the Foster City Multi-hazard Functional Plan. The City also participates in the County Hazardous Materials Response Plan. The California Highway Patrol, Caltrans, Foster City Fire, Police and Public Works Departments, and the County Hazardous Materials Response Team all have responsibilities with respect to a substance spill.

Electro-magnetic Fields

Health-related concerns
Electro-magnetic fields can be created by power transmission lines, power distribution lines, electrical service vaults and conductors, appliances, and also occur naturally. Electro-magnetic fields from electricity have a much lower frequency (referred to as Extremely Low Frequency or ELF) and therefore lower energy than microwaves or X-rays, although they are all forms of electro-magnetic energy.

Media attention has been focused on whether adverse human health effects could result from exposure to electric and magnetic fields (EMF). Public and private concerns are based on

[39] Ibid., 220.

research reports of a statistical association between EMF exposure to human populations and some forms of cancer, as well as measurable biological effects in laboratory animals, tissues, and cells. Although the existing evidence does nor prove a cause-effect relationship for EMF exposure and human disease or injury, it does suggest the need for further research to allow for a realistic evaluation of the possibility of public health risks and assessment of their potential magnitude.[40]

In Foster City, a major source of electro-magnetic fields is believed to be the power transmission lines that cross the City. These power lines are contained within large easements which preclude permanent structures within them. Parking, landscaping, and recreation areas are commonly located within the easements. Placing these lines underground is not likely to be economically feasible and could inadvertently exacerbate any potential electro-magnetic field problem by placing the lines closer to people on the surface.

Studies

Many studies have been performed regarding possible health-related effects of electro-magnetic fields. Many of these are listed in a bibliography contained in the Safety Element Technical Appendix. The City has collected copies of some of these studies as well as other reference material and these are available for the public's review in the Community Development Department. It has been the City's position that until there are more definitive studies and/or guidelines from the governmental agencies that have expertise in this field, the City should not prematurely attempt to enact its own regulations attempting to address suspected or potential problems associated with electro-magnetic fields.

The City does not have the resources or expertise to make analytical judgements of comparative studies on such technical medical and scientific subjects and relies on the state and federal agencies with such expertise to evaluate the information available and craft appropriate regulations and guidelines.

[40]Office of Research and Development, U.S. Environmental Protection Agency, Electric and Magnetic Fields: An EPA Perspective on Research Needs and Priorities for Improving Health Risk Assessment, EPA/600/9-91/016F, December 1992, p. ES-1.

Emergency Plan and Training

The City Council has adopted the Foster City Multihazard Functional Plan using the Standardized Emergency Management System (SEMS) as the City's Emergency Plan "to incorporate and coordinate all the facilities and personnel of the City into an efficient organization capable of reacting adequately in the face of any disaster, and to conduct such operations as the nature of the disaster requires..." The Plan assigns various emergency functions and responsibilities to different departments and also includes information specific to different types of emergencies. The City staff conducts training exercises at least twice each year to practice and refine the use of the Plan. These training exercises occasionally involve other resources in the City or surrounding area such as the American Red Cross, the San Mateo Area Office of Emergency Services, and RACES (Radio Amateur Civil Emergency Service).

Following the Oakland Hills fire in 1991, state legislation required cities to revise their emergency plans to follow a standardized format. A revision of the City's plan is anticipated to be adopted by the City Council in the fall of 1995.

The Fire Department participates in emergency preparedness with local businesses upon request. Department members also participate and assist local schools through the "Disaster Coalition" which is a standing committee of school and City representatives.

The City has, over the years, improved the ability of public facilities to operate in emergency conditions by adding emergency power generators. In addition to emergency power to many sewer lift stations, emergency power generators are in place at the Police Department (which also functions as the emergency operations center), Fire Department, Corporation Yard, and Community Recreation Center.

Evacuation Routes

Evacuation routes can include a roadway, waterway, or trail that will allow an orderly removal of people and possessions from an area endangered due to floods, hazardous materials spills, or other emergency. California law requires each city to discuss and map its emergency

evacuation routes in the Safety Element of its General Plan. Evacuations would be at the direction of the Director of Emergency Services, usually the City/District Manager.

Evacuation routes for Foster City are limited by the waterways and freeways that surround the City. There are basically two types of evacuation routes available: major evacuation routes (those that allow use by automobiles) and minor evacuation routes (those that allow use by pedestrians and bicyclists). Since Foster City is surrounded by the San Francisco Bay on the north and east and by Belmont Slough on the east and south, the evacuation routes are generally characterized in the City's Emergency Plan as "go west." Evacuation by water is not likely to be useful due to the fact that both the Foster City Lagoon and the Marina Lagoon are enclosed waterways and that boats suitable for evacuation of large numbers of people are not available. The use of Werder Pier for evacuation by boat is also not considered likely since the availability of any boats and their ability to tie up to the pier is unknown. The major and minor evacuation routes are listed below and shown in Map GP-**21**. The use of any evacuation route would depend on the type and location of a specific emergency, which if any, routes had sustained damage, and many other factors.

Peakload Water Supply Requirements
The Estero Municipal Improvement District (EMID) provides water and sewer service to Foster City and water service to the Mariner's Island area of San Mateo. The San Francisco Water Department (SFWD) supplies all the water sold by EMID. The existing connection to SFWD is via a single 24-inch main approximately 19,800 feet long which travels, in San Mateo, along East Third Avenue, Ninth Avenue, and Crystal Springs Road to the SFWD's Crystal Springs No. 2 pipeline. The water availability from the SFWD is, by agreement, unlimited except in time of drought. The current agreement with SFWD expires August 24, 2011. A new agreement will have to be negotiated at the time the current agreement expires.

Evacuation routes

Roadway	Number of Lanes	Average Width
Major routes:		
State Route 92	8	96'
East Hillsdale Blvd.	6	72'
Foster City Blvd. to East Third Ave.	4	48'
Minor routes:		
Trail to Belmont	(Not applicable)	12'
Levee pedway under S.R. 92 to East Third Avenue	(Not applicable)	10'

Source: City of Foster City, Multihazard Functional Plan.

EVACUATION ROUTES

LEGEND

- City limits
- Evacuation Routes
- Powerlines
- Shorelines
- Streets

Miles

0 .3 .6

Map GP-21

An emergency water supply line from the Belmont County Water District was completed in 1991 and enters Foster City from the south across the Belmont Slough. This emergency supply line is 12" in diameter and could, along with water in the District's storage tanks, be utilized to provide water to the community during a short-term outage. Depending on the time of the year, this could be from one to three days. An outage longer than this would require a severe curtailment of water use since the storage tanks would be drawn down. Also, the effect on the Belmont County Water District system would be significant if Foster City were to take the maximum amount of water available through this connection. For this reason it is anticipated that Belmont County Water District would be reluctant to approve more than a short-term use of the connection.

Another 12" emergency water supply line connects to California Water Company and is located at East Hillsdale Blvd. and Norfolk Ave. The water pressure in the California Water Company system is very low and thus this connection could not supply a significant portion of the District's daily demand.

The District has three water storage tanks which hold approximately 4 million gallons of water each. Within Foster City there are two or three private wells that supply water for use in large water features.

Pursuant to State Water Code requirements, the District adopted an "urban water management plan" in 1985 entitled "Water Conservation Management Plan," prepared by KCA Engineers. The implementation of the Plan includes regular water management reports, regular testing of large meters, preventative exercising of valves and flushing of mains, replacement of residential water meters, and public information programs.

EMID has performed three formal investigations of the adequacy of the supply and storage elements of the District's water system:

> "Study of a Second Water Supply Source for Foster City, " KCA Engineers, July 1984.
>
> "Water System Study," EMID staff, February 1988.
>
> "Engineering Evaluation and Feasibility Study: Water Supply and Storage Requirements," Harris Consultants, February 15, 1991.

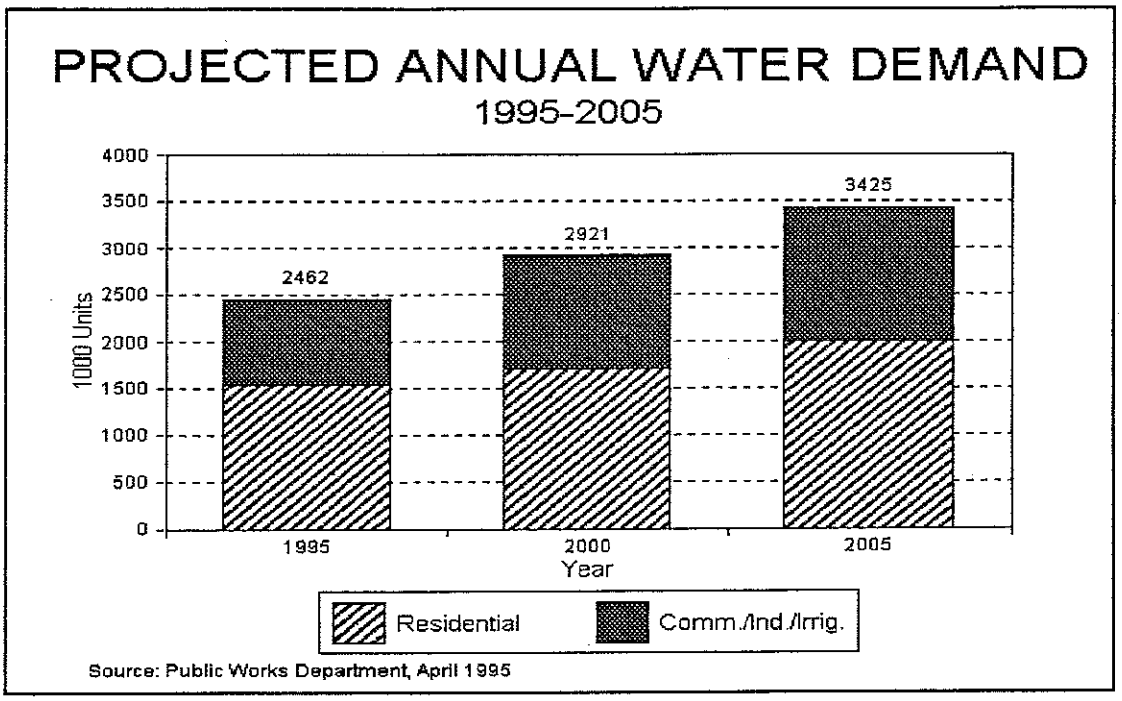
The 1991 study estimated that annual demand will increase to about 3,530,000 units (2,640 million gallons) by the year 2000 - up from 2,815,000 units (2,110 million gallons) in 1987, the most recent non-drought year. For the year 2000, the estimated average daily, maximum monthly and maximum daily demands will be about 7.2, 10.1 and 14.5 million gallons per day (mgd), respectively. For comparison, the average daily and maximum monthly demands in 1987 were 5.8 and 8.0 mgd.[41]

More recent water demand projections illustrate the effectiveness of water conservation efforts. Water use habits have changed in many households and businesses as a result of increased conservation during drought years and future demand projections have therefore been lowered. Water demand was projected in the "Water Shortage Contingency Plan" in January 1993 and again in 1995 for a study of sewer and water rates. The 1995 estimates project that annual demand will increase from 2,462,000 units in 1995 to about 2,921,000 units by the year 2000 and 3,425,000 units in 2005.

All three investigations discuss the options for one or more additional supply lines and additional storage capacity. The 1991 report concludes:

- the single supply line is vulnerable to both short- and long-term interruptions.
- the capacity of the existing supply is now strained by increasing demands caused by growth; this deficiency will become more serious by the turn of the century.
- storage, while satisfactory for peaking and firefighting needs, does not provide an adequate emergency reserve.

[41] Harris Consultants, Inc., Engineering Evaluation and Feasibility Study: Water Supply and Storage Improvements, 2-1.



The 1991 report points out that in most water systems, the maximum daily demand is met from supply (i.e., directly out of the connection to SFWD). Maximum hourly and fire-fighting demands are normally met using storage (i.e., from water tanks).

The 1991 report recommends the following improvements:

1. A south connection to SFWD facilities and a 30-inch transmission main.

2. A 24-inch Edgewater Blvd. feeder main.

3. A third, 4-million-gallon steel tank located at the Corporation Yard.

4. Extension of the existing north transmission main westerly to connect to SFWD's Sunset Supply Line.

5. Provision for approximately 8 million gallons of additional storage either in the south area of the District (or at an elevated site in San Mateo).

The third water tank was completed in 1994. The Capital Improvements Program includes a "Second Water Supply Project" to determine the District's course of action and then proceed with more detailed studies and investigations of either a "southern connection" or a "northern connection" to the San Francisco Water Department pipelines. Either connection is projected to cost approximately $20 million.

The Public Works Department also undertook its own analysis of the earthquake damage probability for the 24" and proposed 30" water lines. Earthquake-related damage probabilities for the EMID water lines were determined using earthquake probability data in conjunction with a water line damage model. Based on the earthquake data for the San Andreas San Francisco Peninsula fault segment, the earthquake-related damage probabilities for the next 30 years were 0.13 for the 24" water line, 0.14 for the proposed 30" water line, and between

0.02 and 0.13 for both lines to be damaged at the same time.[42]

The Public Works Department has taken several measures to improve the reliability of the water supply system. In addition to the installation of flexible connections in the 24" supply line, $50,000 in parts for the 24" line have been purchased and stored to reduce the time necessary for any emergency repairs. Also included in the Five-Year Capital Improvement Program is an ongoing program of repair and/or replacement of line and air relief valves to keep the water distribution system in good operating order. Efficient operating valves are necessary in order to allow quick response to emergencies and to minimize the area of shut down in case of an emergency.

The Public Works Department also evaluated the feasibility of construction and cost of a water storage facility at Sea Cloud Park as called for by the 1991 Harris Consultants study.[43] The storage facility would be located in the existing undeveloped portion of Sea Cloud Park with sports fields or courts placed on top of it. This report notes that although the project is hydraulically and structurally feasible, the most notable obstacle affecting the project is that most of the site is very likely to be considered a wetland. "Obtaining permits for constructing on a wetlands area would be extremely difficult, if not impossible."[44]

Water Rationing. Due to drought conditions, the District was under mandatory water rationing from SFWD in 1977, 1988, and 1990 to March 1993 (with the exception of 1989). The District has, in turn, had to impose water rationing on its customers during these periods. The mandatory water rationing plan adopted by SFWD included a system-wide 25% reduction from 1987 levels. SFWD imposed this reduction by separating water use into theoretical inside use and outside use. Inside use was determined by assuming that 90% of water use during December-March was for inside use. SFWD's method then provides a zero allotment for outside use in the winter months of December-March.

EMID's water rationing system was designed to emulate the total reduction in consumption that is dictated by SFWD's rationing formula and is explained in detail in the "Water Shortage Contingency Plan" adopted by EMID in March 1993. The EMID Board has adopted a methodology for determination of allotments for individual users based on land use. The EMID Board has adopted policies and measures in Chapter 8.60, Water Conservation and Rationing, to be followed in periods water emergencies including a list of prohibited uses when conservation measures are necessary and a more stringent list of prohibited uses during times of water rationing.

Future Outlook for Water Supply. In 1913 the Raker Act was approved which gave San Francisco development rights on the Tuolumne River. Construction of the Hetch Hetchy project, designed as a 400 million gallons per day (mgd) water system, commenced immediately. The system consists of waters of the Tuolumne River which drain into three reservoirs: Hetch Hetchy, Lake Lloyd and Lake Eleanor. Along with local Bay Area reservoirs, and with exchange storage in New Don Pedro Reservoir gained through a joint project with Modesto Irrigation District and Turlock Irrigation District, San Francisco's total storage capacity stands at approximately 1.47 million acre feet.[45]

A network of pipelines and tunnels transports water from the Sierra reservoirs to the SFWD service area. As constructed, the aqueduct has the capability of meeting a peak demand of 300 mgd and an average demand of 270 mgd. In fiscal year 1991 with mandatory rationing enforced, the system delivered an average of 205 mgd, of which two-thirds were used by suburban customers such as Foster City.[46]

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[42]Foster City Public Works Department, Earthquake Damage Probability Study for the 24" and Proposed 30" Water Lines, undated, 2.

[43]Foster City Public Works Department, Feasibility of Water Storage Facilities on the Undeveloped Area of Sea Cloud Park, March 16, 1992.

[44]Ibid., 2.

[45]Manna Consultants, Inc., Water Supply, Demand and the Future: A Summary of Current Conditions, Prior Work, and Their Implications for Future Water Supply Policy, November 6, 1992, 6.

[46]Ibid., 7.

Safety Goals, Policies and Programs

Introduction

The background section of this element described the natural and man-made hazards affecting Foster City as well as existing programs that address those hazards. This section of the element draws upon the background information to establish goals and policies for future City efforts to protect the community from unreasonable risks associated with these hazards.

Safety Goals

S-A Protect From Seismic and Geologic Hazards.
Protect the community from unreasonable risk to life and property caused by seismic and geologic hazards.

S-B Protect From Flood Hazards.
Protect the community from unreasonable risk to life and property caused by flood hazards.

S-C Protect From Fire and Dangerous Conditions.
Protect the community from unreasonable risk to life and property caused by fires and dangerous conditions.

S-D Prepare to Respond to Emergencies.
Minimize potential damage to life, environment and property through timely, well-prepared and well-coordinated emergency preparedness, response plans and programs.

S-E Provide Police Services.
Reduce criminal activity and instill a feeling of safety and security in the community.

Safety Policies

Protect from Seismic and Geologic Hazards

S-1 Use Most Current Uniform Codes. The City will use the most current uniform codes to review permits for new and modified structures.

S-2 Educate the Public about Seismic Hazards. The City will offer programs regarding hazardous buildings and conditions and possible mitigation measures to minimize seismic and geologic hazards.

S-3 Protect the City's Infrastructure and Emergency Facilities from Seismic and Geologic Hazards.
The City will take measures to prevent damage to the City's infrastructure and emergency facilities resulting from seismic and geologic hazards.

Protect From Flood Hazards.

S-4 Flood Protection. The City will maintain the City's levees and lagoon system for flood protection.

S-5 Flood Plain Regulations. The City will control development to minimize risks to persons and property within any special flood hazard area through flood plain regulations.

The Raker Act, which approved the Hetch Hetchy project, requires that San Francisco must recognize the prior rights of the Modesto Irrigation District and Turlock Irrigation District to receive water up to specified amounts of the natural daily flow of the Tuolumne River. This provision means that the amount of water available to SFWD cannot be determined until the late spring, since the timing of the snow melt can have significant impacts on the flows available.

Recent studies prepared for the San Francisco Water Department are not encouraging regarding the amount of water available to the Hetch Hetchy Water and Power system. A report prepared in November 1992 projects that post-drought demands will be well above the estimated "safe-yield" of the system.[47] The alternatives to deal with this are to limit demand, acquire additional water supplies or build additional facilities.

Appendices

Glossary of Terms: Safety Element

Safety Element Bibliography

Seismic Safety
Association of Bay Area Governments, On Shaky Ground, April 1995.

Flood Hazards
Federal Emergency Management Agency, Flood Insurance Rate Map, Community Panel No. 060318 0010 C, January 19, 1995.

Fire Safety
McDonald, Chief William L., "Staff Report on Second Fire Station Feasibility," February 7, 1995.

[47] Ibid., 1.

older facilities to current standards. Target: Ongoing. Responsible Agency: Public Works Department.

Protect From Flood Hazards.

S-g **Maintain Levees and Lagoon for Flood Protection.** The City will maintain the City's levees and lagoon for flood protection pursuant to the "Operation and Maintenance Manual, Foster City Levees and Pump Station" and the "Lagoon Management Plan." Target: Ongoing. Responsible Agency: Public Works Department.

S-h **Flood Plain Regulations.** The City will evaluate any proposed development within special flood hazard areas for conformance with the City's flood plain regulations as contained in Chapter 15.36 of the Foster City Municipal Code. Target: Ongoing. Responsible Agency: Community Development Department.

Protect From Fire and Dangerous Conditions.

S-I **Use of Uniform Codes.** The City will adopt and enforce the most current uniform codes with additional local requirements as necessary tailored to Foster City. Target: Ongoing. Responsible Agency: Building Division and Fire Department.

S-j **Development Review for Fire Safety.** The City will review proposals for new and modified buildings to ensure that fire safety provisions are included as required by the most current uniform codes and local regulations. Target: Ongoing. Responsible Agency: Building Division and Fire Department.

S-k **Fire Education/Prevention.** The City will provide a fire education/prevention program to schools, businesses and the community through publications, training classes, and other means. Target: Ongoing. Responsible Agency: Fire Department.

S-l **Annual Inspections for Fire Safety and Hazardous Materials.** The City will conduct annual inspections of businesses and multi-family dwellings in order to ensure compliance with fire safety and hazardous materials requirements. The City will continue to provide inspections of residential care facilities at the request of the Department of Social Services. Target: Ongoing. Responsible Agency: Fire Department.

S-m **Water Supply and Delivery.** The City will maintain a water supply and delivery system that can meet potential fire fighting demands through annual exercising of fire hydrants and periodic review of storage needs. Target: Ongoing. Responsible Agency: Public Works Department.

S-n **Resale and Rental Housing Inspections.** The City will consider expansion of the City's building code enforcement program to assure compliance with basic health and safety building and fire standards and appropriate permits, including: (1) resale inspections of single family homes; (2) rental housing inspections; and (3) public outreach and education. Target: 1996. Responsible Agency: Community Development Department.

S-o **Electromagnetic Fields.** The City will monitor available information regarding possible health hazards of electro-magnetic fields. Target: Ongoing. Responsible Agency: Community Development Department.

Protect From Fire and Dangerous Conditions.

S-6 **Minimize Loss of Life, Injuries, and Property Damage Due to Fires.** The City will minimize loss of life, injuries, and property damage due to fires through review of development proposals, public education, and maintenance of well-trained fire suppression personnel.

S-7 **Hazardous Materials.** The City will protect the community from unreasonable risks associated with hazardous materials.

S-8 **Electromagnetic Fields.** The City will monitor available information regarding possible health hazards of electro-magnetic fields.

Prepare to Respond to Emergencies.

S-9 **Emergency Response.** The City will prepare to respond to emergencies through the City's Emergency Plan, training, and other measures.

S-10 **Water Supply.** The City will provide an adequate supply of water for daily use and emergency situations.

Provide Police Services

S-11 **Police Services.** The City will provide police services necessary to maintain community order and public safety.

S-12 **Crime Prevention.** The City will provide crime prevention and other programs to educate the public and maintain and improve communication with community groups and organizations.

Safety Programs

Protect from Seismic and Geologic Hazards

S-a **Geotechnical and Engineering Reports.** The City will require site specific geotechnical and engineering reports for new structures. Target: Ongoing. Responsible Agency: Building Division.

S-b **Geotechnical Reports Library.** The City will establish a geotechnical report library at City Hall. Target: 1996. Responsible Agency: Community Development Department.

S-c **Seismic Safety Education.** The City will include seismic safety education in the Fire Department's public education programs, such as Neighborhood Emergency Response Team training and earthquake preparedness training. Target: Ongoing. Responsible Agency: Fire Department.

S-d **Non-Structural Hazards Assessment.** The City will include an assessment of non-structural seismic hazards as part of annual inspections of businesses as part of a public education program. Target: 1996. Responsible Agency: Fire Department and Building Division.

S-e **Expand Seismic Hazards Identification Program.** The City will consider expansion of the City's Seismic Hazard Identification Program to include additional potentially hazardous types of buildings and/or a lower number of occupants. Target: 1996. Responsible Agency: Building Division.

S-f **Protect City's Infrastructure and Facilities.** The City will protect the City's infrastructure and facilities from damage due to seismic and geologic hazards through proper design and retrofitting

Safety Element Program Summary

		Agency Responsible								
Safety Program		*CC*	*PC*	*CDA*	*CD*	*BLDG*	*FIRE*	*PW*	*Other*	*Time Frame*
S-a	Geotechnical and Engineering Reports					**				Ongoing
S-b	Geotechnical Reports Library				**					1996
S-c	Seismic Safety Education						**			Ongoing
S-d	Non-Structural Hazards Assessment					**	**			1996
S-e	Expand Seismic Hazards Identification Program					**				1996
S-f	Protect City's Infrastructure and Facilities.							**		Ongoing
S-g	Maintain Levees and Lagoon for Flood Protection							**		Ongoing
S-h	Flood Plain Regulations				**					Ongoing
S-i	Use of Uniform Codes					**	**			Ongoing
S-j	Development Review for Fire Safety					**	**			Ongoing
S-k	Fire Education/Prevention						**			Ongoing
S-l	Annual Inspections for Fire Safety and Hazardous Materials						**			Ongoing
S-m	Water Supply and Delivery							**		Ongoing
S-n	Resale and Rental Housing Inspections				**					1996
S-o	Electromagnetic Fields				**					Ongoing
S-p	Emergency Response	**	**	**	**	**	**	**	All	Ongoing
S-q	Emergency Plan						**			Ongoing
S-r	Emergency Power							**		Ongoing
S-s	Monitoring of Water, Sewer and Lagoon Systems							**		Ongoing
S-t	Water Supply							**		Ongoing
S-u	Water Delivery System							**		Ongoing
S-v	Police Services								Police	Ongoing
S-w	Crime Prevention								Police	Ongoing
S-x	Development Review for Crime Prevention								Police	Ongoing

Prepare to Respond to Emergencies.

S-p **Emergency Response.** The City will prepare to respond to emergencies through use of established procedures, programs of on-going training, periodic exercises of the City's Emergency Plan, and mutual aid agreements. Target: Ongoing. Responsible Agency: All Departments.

S-q **Emergency Plan.** The City will maintain the City's Emergency Plan indicating responsibilities and procedures for responding to an emergency. Target: Ongoing. Responsible Agency: Fire Department.

S-r **Emergency Power.** The City will provide emergency power at critical City facilities such as major sewer lift stations, lagoon pumps, and public safety buildings. Target: Ongoing. Responsible Agency: Public Works Department.

S-s **Monitoring of Water, Sewer and Lagoon Systems.** The City will provide and maintain a consolidated remote monitoring capability for the water distribution system, the wastewater collection system and the lagoon system that can be monitored 24 hours a day by Public Works staff or Police Department staff. Target: Ongoing. Responsible Agency: Public Works Department.

S-t **Water Supply.** The City will study the feasibility of adding water storage and/or supply facilities. Target: 1999. Responsible Agency: Public Works Department.

S-u **Water Delivery System.** The City will ensure the adequacy of the water delivery system through periodic testing, flushing, and replacement of parts as needed. Target: Ongoing. Responsible Agency: Public Works Department.

Provide Police Services

S-v **Police Services.** The City will provide adequate personnel, training, and equipment to support the provision of police services. Target: Ongoing. Responsible Agency: Police Department.

S-w **Crime Prevention.** The City will provide a variety of crime prevention programs to educate and involve the community, including but not limited to Neighborhood Watch, Apartment Watch, Business Watch, newsletters, security surveys, and programs with community groups and organizations. Target: Ongoing. Responsible Agency: Police Department.

S-x **Development Review for Crime Prevention.** The City will review proposals for new and modified buildings for compliance with crime prevention requirements. Target: Ongoing. Responsible Agency: Police Department.