FIRE SERVICES SUB-ELEMENT

ADOPTED BY CITY COUNCIL
AS
RESOLUTION NO. 132-95
APRIL 1995

CREDITS

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The Employees and Officers of the Sunnyvale Department of Public Safety

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- There are many inter-dependent issues and activities between the Fire Service, other programs and Departments within the City, and other government and private agencies.

- A variety of factors determine the level of fire and life safety in the community and the requisite activities of the fire service. Some can be predicted and can be influenced while others cannot.

- The character and quality of the City and its demographics presents a present day picture generally free of major fire problems. Over the long term some single incident building fires will result in large monetary losses, however the general trend will be for relatively low fire loss experience.

- Building fires are the foundation for most firefighting, training, equipment, and policy decisions. While representing only a small percent of total calls for service, building fires pose the greatest threat to life safety and high dollar property loss.

- An orderly and effective system of command and control is essential to the successful management of emergency operations.

- Major emergencies can exceed the capabilities of a single fire department and neighboring fire jurisdictions should have detailed plans to provide mutual assistance when necessary.

- The highest level of response activities, more than 60 percent of total calls for service each year, are related to medical emergencies requiring first aid, resuscitation, or rescue. Fire services response to emergency medical calls is a critical element in an effective regional EMS system.

- Although the widespread use of hazardous materials in local industry and business is diminishing in the

community, chemicals are still a significant concern. They are known to pose a serious health threat to the environment and to citizens and emergency responders who may be exposed to them because of mishap or negligence in their use. The result has been regulations and a significant area of responsibility for the fire service.

- A quick response to emergency incidents is essential to life saving operations and to the control and reduction of property damage.

- The equipment of Sunnyvale's fire service are in generally excellent condition. A high priority is given to the purchase, maintenance, and replacement of equipment having a direct relationship to both emergency response and to the health and safety of citizens and firefighters.

- Sunnyvale's training facility and fire stations, while well maintained and strategically located, are in need of redesign to reflect the changing activities of the fire service and the needs of the community.

- A strong prevention program is a necessity for a fire and hazard safe community. An appropriate combination of building and life safety codes, ordinances, permitting processes, inspection and enforcement efforts, and public education are all vital components of such a program. Its design must incorporate business concerns. The City has taken a leadership role in the simplification of the regulatory maze confronting business and industry which has been created by competing and layered government bureaucracies.

- Fire Service has an obligation to bring fire safety education not only into schools and private homes, but to occupancies with greater than average fire and life hazard potential, such as hotels, restaurants, nursing homes, and other public assemblies.

- Fire departments are representative of the local community that supports them. The impression they make on citizens affects how citizens view their government. Moreover, since fire stations are strategically located throughout the City, they can service as referral or dispensing agencies for a wide range of community activities.

- The Public Safety concept of dual training and rotation of assignment to both police and fire duties requires constant training and evaluation. This is particularly true for some specialized assignments requiring highly technical knowledge and for the many manipulative skills necessary for fire service activities.

- Technology that has great potential for assisting in fire service operations is being widely developed and marketed.

- Efficiency and timeliness of record storage/retrieval, information management, and reporting methods are essential to both routine and emergency activities. Knowledge of how well the fire service is doing and of how practices should change to improve performance depends on a system that can meet these needs.

ADOPTION OF 1985 FIRE SERVICES SUB-ELEMENT

Establishment of Goals, Policies, and Action Statements

In keeping with the City's effort of comprehensive planning, the Department of Public Safety proposed an amendment to the City's 1972 General Plan. The Fire Services Sub-Element was developed as part of the Public Safety Element and was adopted August 6, 1985 by Council Resolution Number 189-85. Since the General Plan is an integral part of Sunnyvale's Planning and Management System (PAMS), it contains many more elements than those required by the State of California's Government Code Section 65032. Although, the Fire Services Sub-Element is not mandated, it does reinforce the intent of the Government Code by addressing additional physical, social, and economic development factors important to comprehensive community planning.

The Fire Services Sub-Element is intended to be the primary method to review and establish priorities, policies, and actions which will be consistent with the community's needs and expectations for fire and life safety services. It describes those services, activities, and operations currently required of the Fire Services Division and what foreseeable changes and alternatives may develop in the future years.

Progress and Accomplishments

This has been a decade of transition and significant change within the Fire Services Division. Traditional methods in several areas such as Division organization, budget structure, emergency operations procedures, apparatus and equipment configurations, apparatus and equipment purchase procedures, and approach to training have undergone critical examination. New approaches and new methods have been developed and tested as part of a continuing evaluation

process of how fire services can more effectively and efficiently be delivered.

It was the goal of the Fire Services Division in the first Sub-Element to provide a fire services response system that will control the spread of fire in buildings and other properties and maintain minimal casualties and property loss from fire and other related emergencies. To meet this goal the Fire Services Division maintains an aggressive replacement and maintenance schedule for emergency apparatus and equipment. The Division has also made a concerted effort to develop a unified and consistent approach to service delivery and to strengthen the role of the line supervisor as a key position in the organization.

In addition, management of the training function was transferred from Support Services to Fire Services. The transfer reflects the adoption of a new approach to providing in-service and specialized training for Public Safety personnel assigned to the Fire Services Division. Redesign of monthly tower training, development of individual training plans, creation of the Fire Field Training Officer position, establishment of formalized (in-house) supervisor training, and development of local specialized training courses are indicative of the changes which are being implemented in an effort to meet or exceed mandatory training standards for the fire service.

The Division has also set response time goals to improve the delivery of service to the citizens of the community. Records of the response time data is now being monitored to insure adequate service levels and coordination with other departments has also provided traffic signal controllers and street signing to alleviate obstacles to the prompt delivery of services.

False alarms were determined to be an obstacle to providing emergency services as the availability of personnel and apparatus is decreased and response time may be increased to an actual emergency. In an effort to reduce the number of

preventable false alarms, the Fire Prevention Bureau developed and evaluated an education program which focused on stimulating voluntary efforts by business to reduce the number of false alarms without resorting to criminal or civil sanctions to gain compliance.

During this past decade a critical examination of the Fire Services Division management structure was accomplished. Changes to the emergency response policy were also made to support and enhance emergency scene management.

These programs illustrate the Fire Services Division's commitment to continually meet or exceed the goals set forth in the first Sub-element. The Division has been successful in controlling the spread of fire and has maintained a minimum of casualties and property loss over the last decade.

The second goal of the Division as stated in the Sub-element was to provide effective response capability for non-fire incidents that may directly endanger the lives, property, and well-being of the community. In meeting this goal, the improvements made in response time and response time monitoring are also an issue.

Significant increases in emergency calls for service have primarily been in the area of emergency medical responses (EMS). To meet this challenge, a new level of service was proposed. It began with the implementation of an early defibrillation program which was brought on line April 1994, significantly enhancing the overall EMS capability available to the community by Fire Operations personnel. Although the program is in its early tenure, it is attributed with two "saves." In addition, the Division conducted an in-house California State Fire Marshal accredited Heavy Rescue course to hone skills in preparation for a disaster situation.

Hazardous materials are another non-fire emergency that threatens the well-being of the community. The Division operates a specially trained and equipped response team capable of mitigating emergencies resulting from hazardous materials leaks, spills, and discharges and conducts related inspections and permit activities. The Hazardous Materials

Unit of the Fire Prevention Bureau also conducts follow-up investigations when necessary. The Hazardous Materials Unit received the Association of Bay Area Governments' Award for "Best Spill Prevention Program of a California Local Government or Agency." Nominations for this award can only be made by private industry.

Through routine and specialized training of personnel, the Division is providing effective response and management of non-fire emergencies. Although great strides have been made in terms of this goal, the responsibilities for fire departments are changing quickly and will necessitate on-going training and planning.

The third goal of the Fire Services Division Sub-element was to control the number and severity of fires and hazardous materials incidents and provide protection for the lives, welfare, and environment of people within the community. In order to meet this goal, the Fire Prevention Division conducts fire and life safety inspections on commercial, institutional, and large residential buildings to enforce Fire Prevention Codes and to educate the public on fire and life safety issues. In addition, building plans are reviewed prior to construction to ensure the safety of future residents and maintain consistency in the interpretation of code requirements.

As rezoning and conversion of commercial/industrial property to residential property takes place, a great deal of redevelopment will occur. Older buildings have been replaced with newer buildings. This new construction has and will result in safer, more fire resistive occupancies.

Although the majority of fires occur in the home, private residences are excluded from fire inspection programs. The Fire Services Division, in an attempt to address the issue of home fire safety, developed and implemented new education programs within the Community Services Bureau. Additionally, two new ordinances directed toward residential fire safety were adopted. The two ordinances are the residential sprinkler ordinance and the roof covering ordinance which were both

adopted in 1987 and 1988 respectively. It is believed each has had a positive impact on the number and severity of residential fires, although it is difficult to measure the number of fires prevented.

In an effort to make information more available to the public, the Fire Services Division staff began a major revision of all Fire Prevention Bureau handouts to reference changes in the Municipal Fire Code resulting from the adoption of the 1991 Uniform Fire Code. Information sheets were simplified and a reference sheet was provided which assists customers in contacting the correct inspector for the required inspections. Two pamphlets were designed to answer questions in the areas of greatest public inquiry: "Hazardous Materials Storage Programs" and "Large Family Day Care Fire Regulations."

The Fire Prevention Bureau has made significant strides toward providing a higher level of service to meet the new legislative demands in the area of hazardous materials. These projects represent a collective and cooperative effort of the Fire Services management group. In addition to specific projects which are discussed in this sub-element, there has been a concerted effort to develop a unified and consistent approach to service delivery and the strengthening of the line supervisors' role as a key position in the organization.

A combination of permit, inspection, and educational programs were developed and enhanced during the last decade. These programs will remain essential to the foundation for fire and life safety in the community. The Department of Community Development, Economic Development Division, and Public Safety Fire Services Division have and will continue to work closely in these efforts.

The final goal stated in the Fire Services Division Sub-element is to provide planning and administration while maintaining liaison with other agencies and organizations to provide a quality level of fire services to the community. The Fire Services Division provided major staff support for the Department's Comprehensive Public Safety System (CPSS) Development Project. Staff provided the lead in the consultant selection process and prepared the report to Council for the

award of the contract. In conjunction with the Departmental project, a comprehensive evaluation of present and future needs for the Fire Services Division, including data management, radio communications, alarm and alerting equipment, and reporting capabilities were completed. The Fire Services Division continues to provide the lead as well as major staff support for the Department's new CAD/RMS project.

In addition, cooperative efforts between City Departments aimed at economic development and growth for the City have intensified. An interdisciplinary group examined all City and County permit and inspection processes to identify areas where streamlining could be accomplished. Fire Services Division staff participates in "Advantage Sunnyvale" meetings, the interdepartmental "Bio-Tech" committee, and the Facility Managers' forums sponsored jointly by the Chamber of Commerce and the City directed at business retention.

The Fire Services Division has expanded its role in supporting the Department's efforts to build visible partnerships within the community. This includes active participation in such events as the Emergency Response Team Games, All for Kids Day, State of the City, and Kiwanis' Identification for Safety (KIDS). Fire Operations personnel assisted the Community Development Department with neighborhood clean-up projects in both the Lakewood and San Miguel neighborhoods. The Program Manager has tried to target specific events for participation in an effort to balance operational efficiency and productivity against the potential benefits for heightened fire safety awareness.

Another cooperative effort between Fire Operations and Community Services was a program for strengthening the community partnership during the emergency response following a major earthquake. After a pilot class at the close of fiscal year 1992-93, in cooperation with Emergency Preparedness personnel, a curriculum was developed to provide practical "hands-on" light rescue training for community members active in the Sunnyvale Neighborhood Actively Prepared (SNAP) program. The short course taught by fire

operations personnel has a two fold purpose. It creates an awareness of the hazards associated with building collapse so the novice rescuer does not unwittingly become another victim, and it creates a larger pool of people able to assist in initial rescue efforts. The class has been modified to provide an introduction to "heavy" rescue for industry emergency response teams.

Through cooperation with other agencies and the community, the Fire Services Division has taken an active role in planning for the future level of services to be provided to the community. The Division will continue to prepare internally and externally to meet the challenges of emergency service.

Unresolved Issues

Although this has been a decade of transition and change for the Fire Services Division, and significant strides in the delivery of services were made, not all of our goals were successfully accomplished. A summary of the most significant projects is included. A comprehensive chart of the goals, policies, and action statements can be found in Appendix A.

In an effort to reduce response times further and have access to more apparatus and personnel in a major fire incident, Sunnyvale met with other agencies to discuss automatic mutual aid. While an automatic response agreement was reached with Mountain View Fire Department for sections of Highway 101 and Highway 85, staff was unable to establish a "drop boarder" agreement which provides for nearest response. Efforts in this area will continue.

As a means of reducing response time and costs of non-fire emergency incidents, the Fire Services Division staff also worked with Mountain View, Los Altos, and Palo Alto Fire Departments to establish a North Santa Clara County agreement for Hazardous Materials Incident response. Although tentative steps have been accomplished in the areas

of training and cost recovery, there is a reluctance to reduce duplicate resources. Staff will continue discussions in an attempt to overcome some parochial barriers to a shared resource agreement.

As a portion of the quest to supply effective response to non-fire emergencies that endanger the lives and well-being of the community, the Fire Services Division has a goal to monitor the performance results of the EMS providers to assure adequate levels of service delivery and if appropriate study feasibility of city operated EMS. As the contract with the private EMS provider is controlled by Santa Clara County, the Division has no direct way to monitor performance levels. The County has only begun auditing the provider in the last few months, and the data available is inadequate at best. The Division will be participating in the restructuring of the EMS system in the upcoming months and may be investigating other service delivery options in the next year.

The Fire Services Division also planned to develop and maintain a data processing system capable of providing operational and management analysis. The new CAD/RMS will be in place in mid-1995.

In evaluating the cost effective allocation of personnel to each fire station and fire services activity a study on the feasibility of converting Fire Prevention Inspectors from sworn to civilian positions was proposed. The study was delayed and is yet to be accomplished. It is expected that an increase in experience and knowledge as well as a minimal cost savings will be gained through such a conversion as was seen in the shift from sworn to civilian Plan Check/Fire Protection Engineers.

These issues will continue to be concerns for the Fire Services Division through the next decade and will be addressed further in the appropriate sections of this sub-element.

COMMUNITY CONDITIONS

Community Setting - Present and Future

In 1985, the year in which the first Fire Services Sub-Element was adopted, Sunnyvale was rapidly approaching complete "build-out." During the previous thirty years the community had experienced phenomenal residential and industrial growth as it was transformed from a small town abounding with farms, fields, and orchards to a major center for the electronics industry--literally at the "Heart of the Silicon Valley."

Two of the major issues facing Sunnyvale in the early 1980's, hazardous materials and traffic congestion, were by-products of the prosperity and growth of semi-conductor industry. Each had a direct impact on the quality of life for every member of the community.

Hazardous materials raised environmental concerns with the discovery of significant soil and groundwater contamination throughout the County. The proliferation of exotic and extremely hazardous chemicals raised health and safety concerns about their manufacture, storage, use and disposal, but also about the consequences of improper discharge or accidental spills. Sunnyvale took a leadership role in the co-operative regional efforts toward the development of hazardous materials and toxic gas regulation. These model codes later served as the basis for national and state standards. Sunnyvale was also the first fire agency in the county to incorporate a hazardous materials incident apparatus with dedicated staffing as part of its emergency response capabilities.

The character of the semi-conductor industry in Sunnyvale has changed over the past decade. The City is no longer a major manufacturer of semi-conductors. Though there remains a strong semi-conductor business, the orientation is now directed toward research and development, marketing, and central offices, and less to actual chip production. Appropriate

regulation to ensure safe practices coupled with a significant reduction in the quantities of hazardous and toxic chemicals used and stored in the community has dramatically decreased the number and magnitude of hazardous materials incidents.

The shift in the character of industry in Sunnyvale, especially in the case of *Lockheed Missiles and Space Company*, has had a direct impact on the Fire Services Division over the past few years. At one time Lockheed operated its own fire department and ambulance service. They were capable of handling minor fires and virtually all of the emergency medical calls originating at their facility including transportation to a medical facility. As of June 30, 1994, Lockheed Fire Department ceased to exist. As a result of this closure, the Division has and can expect to continue to see an increase in emergency response activity at this facility, especially in the area of emergency medical calls.

The pendulum has also swung in the regulatory arena. Sunnyvale is now taking a leadership role in regional and state efforts to simplify the regulatory maze confronting business and industry which has been created by competing and layered governmental bureaucracies.

As with many other communities in Santa Clara County, Sunnyvale has experienced a variety of challenges associated with achieving an appropriate balance between housing and jobs. In 1985 under the auspices of the Santa Clara County Manufacturing group, the Golden Triangle Task Force (GTTF) was formed to address traffic, employment, and housing issues in Santa Clara County. The GTTF's Strategic Plan, completed in 1988, focused on a combination of land use and transportation strategies to reduce congestion. An acute shortage of available housing in Santa Clara County was a key finding of the planning process.

As a result of the City's participation in the GTTF and as a measure of its commitment to the regional goals, Sunnyvale developed a local initiative, the Futures Study, as a strategy for bringing the transportation infrastructure, employment densities, and housing supply into better balance for this

community. The impetus of the Futures Study was to increase available housing units and provide more efficient use of the transportation system through a comprehensive review of potential land use changes. Alternatives for rezoning existing parcels to improve the job/housing balance and address traffic congestion were examined.

The chosen strategy adopted by Council from the Futures Study has long term implications for the delivery of fire services as identified in the Environmental Impact Report. These implications are from three major perspectives: service demand based upon planned residential and daytime populations, traffic strategy, and land use decisions.

Residential and Daytime Populations

The planned residential population for the year 2010 is 143,711[1]. This is in contrast to 112,600 in 1985 and the current population of 124,230 residents. The number of available jobs in Sunnyvale (which is a factor in determining daytime population) is actually expected to decrease over the short term from a high of 123,440 in 1990 to 114,500 by the end of 1995 and then increase gradually to 134,270[2] in 2010. Generally, increased population translates to increased service demand both in terms of emergency response and regulatory/inspection activities.

In addition to the affects of population size on the demand for Fire Services, the age and economic status of the population can also have an influence on demand for services. In 1990, 19% of the population of Sunnyvale was 55 years of age or older. It is expected that this number will continue to increase, placing a greater demand on the Emergency Medical Services

[1] This projection is based upon total build-out under the current General Plan. While population will increase, it is very unlikely that this number will be reached. On a citywide basis, many properties are built to well below allowable densities. It is doubtful that they will all redevelop.

[2] Source: Association of Bay Area Governments.

provided by the Fire Services Division. Additionally, the school age population, those between 5 and 14 years of age, is expected to increase to 23% of the population by the year 2000. As this group reaches the teenage level it is expected that the increase in numbers will be reflected in an increased demand for services based on the tendancy of teenage drivers to have a greater number of vehicle accidents, as well as, a tendency to experiment with vandalism and fire play.

Although the income level of the community does not directly affect the demand for services, there are some indirect links. In communities with a low economic base, the emergency room is often used as a primary care facility with the ambulance serving as a means of transportation impacting the demand for Emergency Medical Services. In Sunnyvale, it is expected that the percent of the population employed will fluctuate only slightly from the current 75%. Because of the high employment rate, few Sunnyvale citizens are without insurance coverage or the economic means to provide preventative medical care for their families so use of emergency medical services is not expected to be impacted by the income level of the population. In addition, as more companies provide HMO insurance plans for their employees, there may be less demand on the emergency medical services as HMOs encourage patients to utilize urgent care facilities rather than ambulances and emergency rooms. In terms of Fire Suppression, the relative affluence of the community is reflected in newer structures meeting strict fire codes and the ability to replace faulty or hazardous items when necessary. In addition, the education level of the community is such that precautions are taken to reduce the risk of fire through the use of smoke detectors and safe practices.

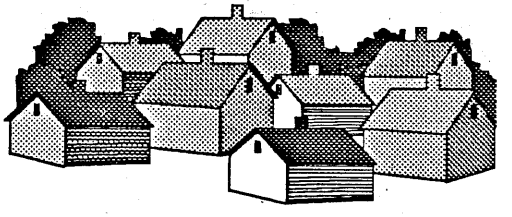
Traffic Strategy

In the mid-1980's the City had experienced a steady increase in the number of vehicle miles driven in and through its boundaries. Traffic levels have continued to rise during the past decade and have only recently leveled off. A principal cause of the traffic coming into Sunnyvale is that there are an

estimated 114,230 jobs located in Sunnyvale and only 76,535 working residents, of whom only 31.6% actually work in Sunnyvale. Traffic engineering estimates that 92,000 commuters travel into Sunnyvale on a weekday.

The level of traffic and the attendant traffic patterns have a dual impact. Although injury traffic accidents have decreased (see Law Enforcement Sub-Element), emergency medical and victim extraction capabilities within the fire services response has increased since 1985 resulting in a greater commitment of resources for each individual accident. Better road and intersection design as well as more sophisticated traffic signal control systems have helped alleviate the degree of congestion caused by commuter traffic. However, traffic congestion still has a significant adverse impact on emergency response time.

Building and Land Use



Land use decisions reflected in what is built and how it is built have implications for fire services. The shift to increases in density to accommodate more housing units in limited space has resulted in accessibility and exposure problems, but built-in fire protection systems help compensate for these problems by providing a higher level of early detection and rapid suppression of fire. Modern noncombustible building materials limit the spread of fire to adjacent structures. Similarly for commercial facilities, safer construction or renovation of buildings from the life safety, seismic, and fire protection standpoints has decreased the incidence of fire emergency response.

The Uniform Fire and Building Codes, as well as local ordinances recognize occupancy type, density, and square footage as significant factors related to fire and life safety issues. These codes were written to require specific designs, construction standards, and engineered fire protection systems for those occupancies presenting the greatest potential for hazards in the event of fire. In Sunnyvale, built-in fire protection systems are based on occupancy classification and square footage of the structures.

The assumption that certain activities are compatible and may be mixed or allowed to operate side-by-side while others must be separated is important from the standpoint of fire protection and life safety, as well as for orderly and accepted community planning and development strategies. The land uses within the City of Sunnyvale largely conform to the underlying zoning district standards and the general plan designations for the area. A limited number of land uses and related facilities are not in conformance with the current zoning code largely because they pre-date the standards. These are considered legal non-conforming uses until such time as the sites will be redeveloped.

A building's construction and its use have a direct impact on the demand for fire services. There are three main classifications for the buildings in Sunnyvale: commercial, industrial, and residential. These three classifications comprise two thirds of the developed land available in Sunnyvale. The remaining third consists of streets, transit, utilities, educational, public, religious, military, recreational, and agricultural facilities.

The data currently available related to the building and land uses in Sunnyvale is from 1994 and should be viewed as general, recognizing that land use patterns, and development and redevelopment activities are changing and will continue to change in the future.

Residential Uses - Approximately 40.7 percent of the developed land within the City is devoted to residential uses, including single-family detached, duplexes, multi-family complexes, and mobile homes within the community. Within this classification, approximately three-fourths consist of single-family detached housing including mobile home units.

The majority of multi-family complexes are two and three stories in height with a few being four stories. A recent approval of the Lawrence Expressway/Highway 101 Site Specific Plan will, however, permit the construction of a twenty story residential tower with incidental related retail, in

combination with condominium units in two, three, four, and five story buildings. This project is located in a highly visible location and will serve as a landmark feature adjacent to State Highway 101.

Commercial/Office Uses - These buildings constitute the smallest single land use category in the city, comprising only 5.6 percent of the total. This category, however, includes a wide variety of commercial uses ranging from regional, neighborhood, and specialty shopping centers, automobile sales and service uses, service stations, recreational facilities, e.g., miniature golf, bowling alleys, etc., financial institutions, hotels, motels, child care centers, commercial condominiums, and various other types of office uses.

The older buildings in the downtown business district are mainly of wood frame, masonary construction. They are generally closely spaced and low in height. Fire spread between buildings is of concern because of their close proximity to one another. However, during the past few years this area has experienced major rehabilitation which now includes the latest fire and life safety technology and standards including automatic sprinkler systems lessening the spread of any fire which might occur.

It is anticipated that over the next twenty years, there will probably be significant private commercial redevelopment activity within the City. Many of the older structures will be either rehabilitated or replaced with newer construction and designed to meet the changing commercial/office needs of the community. The new construction will incorporate the latest in fire safety technology and standards which will be an asset to the city.

Industrial Uses - Industrial land uses within the City comprise approximately 17.9 percent of the total. These uses consist of a range of light and heavy industrial uses including assembly, manufacturing, and packaging of merchandise or products, administrative office, and research and development facilities. The heavy industrial uses often utilize larger manufacturing facilities located on large parcels in the City. Many of these

facilities require sufficient space for specialized manufacturing equipment.

The light industrial activities often consist of medium and small size lots developed in a campus-style research and development complex. These uses, common to advanced electronics, high technology, and communications industries, are widespread throughout the City. These types of uses have become much more widespread within the last decade and have contributed to the changing economy and land use patterns within the community.

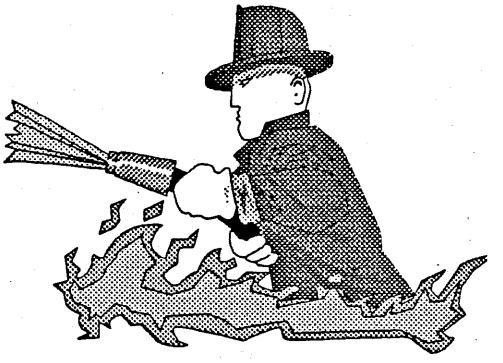
The majority of industrial buildings in the City are constructed of non-combustible materials, generally tilt-up concrete. They are of low height and generally well spaced with most having automatic sprinkler protection. Due to the generally good spacing and the use of masonry walls, fires should be confined to the building of origin.

The current land use patterns of the city reflect both historical precedent, and short and long term land use policy decisions by the Sunnyvale Planning Commission and the City Council. The fundamental character of the developed land within the City will continue to remain a combination of residential, commercial, industrial, and public and semi-public uses such as the civic center, parks, schools, and recreational facilities.

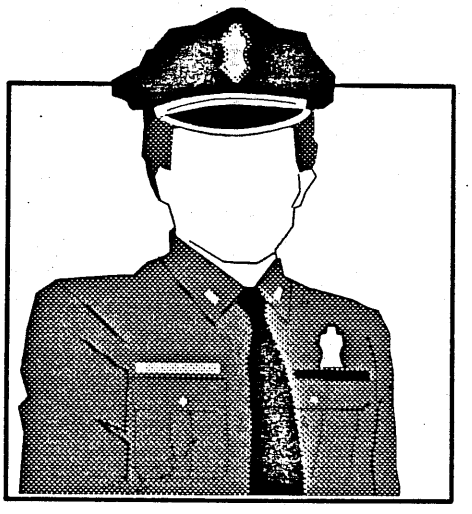
Since the City is largely a "build-out" community, it is probable that much of the modifications to land uses will be through development and redevelopment activities. The timing and development of theoretical build-out is contingent upon various economic and market factors and will be related to the gradual evolution of the City and its increase in population over the next several decades.

Public Safety Service Description

The Department of Public Safety was established formally in the City of Sunnyvale June 6, 1950, by Council Resolution Number 1040. Although the term "Public Safety" is widely used, few people fully understand the unique concept by which police and fire services are provided to the citizens of Sunnyvale. Prior to the formation of the Public Safety Department, the City was served by a small 16 member police department and a volunteer fire brigade force. The public safety alternative was adopted on the premise that training and equipping safety personnel to provide both police and fire services would avoid duplication of effort, be more flexible and responsive to community safety needs, and achieve economies in operations. These services have resulted in the local crime rate being among the lowest in the nation for cities of comparable size and a class 3 fire rating by the Insurance Services Office, the national organization who rates municipal fire protection capability.



The basic principle of the Public Safety concept is that personnel are trained to provide both police and fire services. Sunnyvale has developed and enhanced this principal through a system where most personnel, except those with highly specialized skills, are re-assigned from police to fire duties, or vice-versa, every one to three years. In addition to this assignment rotation, officers assigned to police patrol respond and assist in handling fire emergencies when required. This allows the Public Safety Department to assign fewer personnel to the fire stations while still permitting swift response and an adequate force at the scene of major emergencies. Statistics show only a small percentage of a firefighter's time is actually spent responding to fire emergencies.



Currently, the Fire Services Divison staffs two officers per apparatus. There is one lieutenant per station who serves as the station supervisor and from one to three pieces of apparatus depending on the station. There are 12 pieces of front line apparatus and 2 reserve apparatus currently in use

by the Division. The Division functions on a daily basis with a Team Coordinator, 6 lieutenants, and 18 PSOs. A traditionally staffed Fire Department would have 12 - 14 additional officers assigned to apparatus each shift. In Sunnyvale, if a call requires additional staffing, such as in the case of a building fire, patrol officers will be dispatched to the scene where they will perform the duties of a firefighter until the situation has been resolved. The patrol officers will then be released to resume their regular patrol duties. In addition, off-duty officers will respond to the scene on a volunteer basis to provide additional staffing.

It is conceivable that a review of the effectiveness of the Public Safety Concept as is presently practiced might be necessary. Currently, the trend throughout California is toward local fire departments providing paramedic and ambulance transport services to their communities. Provision of EMS and ambulance transport services are being considered by many cities with two main ideas in mind, improvement in Emergency Medical Services (EMS) and revenue generation. It is not clear at this point what the impacts of this trend will be on the Countywide EMS system or on Sunnyvale in particular.

Another issue that may effect the Public Safety Concept is the increase in mandatory training required by regulatory bodies. As the amount of training increases, the cost of training increases substantially when training the entire department to perform both police and fire duties.

Regionalization of Fire Services is also a consideration when looking at the Public Safety Concept. There is a trend towards providing services over a larger area, crossing city boundaries, through consolidation of departments or joint powers agreements. How the Public Safety Concept would work if other differently organized cities were involved in the supply of services is questionable.

It is unlikely that new issues will bring into question the Public Safety Concept as a general approach, but consideration of changes in organization structure, philosophy or policy may be

required. For example, changes such as designating some special assignments as permanent, or the permanent assignment of station-based fire personnel might at some point provide a more efficient use of resources by allowing a reduction of department-wide training and an increase in division specific training and knowledge.

Interrelationship with Departments

The Department of Public Safety is comprised of three major divisions, one of which is the Fire Services Division. The Police Services Division and the Support Services Division comprise the remaining two sub-element service delivery centers of the Department. Due to the unique aspect of the Public Safety organization, an extremely close relationship exists between the providers of police services, fire services, and support services. This is often not the case in cities with separate departments for police and fire services.

Besides the internal services from the other two Public Safety operating divisions, the Fire Services Division relies on many other key service centers in the city in providing an overall approach to fire protection. The Economic Development strategy of the City of Sunnyvale provides for a viable basis for the provision of service from an economic standpoint. The Fire Services Division continues to work closely with the Economic Development Division and local business to meet fire and life safety codes with safety and feasibility in mind.

Department of Community Development

Planning Division

- Controls development designs which affect fire access to buildings, separation of buildings, open space and density factors.
- Provides information by which fire protection needs can be analyzed

Building Safety Division

- Enforces appropriate codes. The Uniform Building Code and similar codes provide primary elements of construction

standards, fire resistive materials, structural stability and reduction of fire hazards and fire spread for life safety considerations

- Classifies occupancies and their required types of construction to assure fire and life safety needs
- Issues permits which control changing occupancies to assure fire and life safety protection each time a change in occupancy occurs
- Assigns street addresses and approves numbering systems in large multiple occupancy developments

Economic Development Division

- Supports land use policies to achieve a healthy relationship between the creation of new jobs and housing
- Supports land use policies that provide a diversified mix of commercial/industrial development
- Supports regional revenue raising efforts to fund needed highway and transit improvements
- Considers development of a strong business retention program
- Provides a forum where the business/industry community and City Departments can discuss mutual concerns

Department of Finance

Purchasing Division

- Processes purchase requisitions and acquires equipment and supplies

Budget Division

- Supplies budget information and tools for managing programs and resources.

Department of Public Works

Engineering Division

- Considers fire apparatus access (street width, turning radius, cul-de-sacs) during street development
- Provides utility maps of water, sewer, and storm drain systems
- Maintains up-to-date maps of city streets and boundaries

Field Services Division

- Maintains water supply adequate for fire suppression flow requirements
- Maintains hydrants, valves and distribution systems
- Provides connections for private fire protection systems
- Maintains required records of water system and inspections
- Makes notification of hydrants and water mains that are out of service
- Provides preventive maintenance and repair of emergency apparatus on a priority basis
- Provides on-call emergency repairs to fleet vehicles

Traffic Division

- Provides traffic signal pre-emption equipment to allow faster response of emergency fire apparatus

- Plans and determines the most efficient and safe methods for the flow of traffic in the city

Environmental Division

- Provides liaison and assistance concerning hazardous materials discharges into sewer and storm systems. There is some overlap in regulatory functions between the Fire Services Division and the Environmental Division.

Department of Parks and Recreation

Parks Division

- Coordinates maintenance and repairs of headquarters building and the six outlying fire stations, buildings and grounds

The Fire Services Division of the Department of Public Safety has identified specific objectives and tasks necessary to accomplish the required levels of services. It is evident that those services are dependent upon a close and cooperative working relationship with other elements within the City organization.

Water Supply

Since water is still the primary extinguishing agent, the ability of municipal water systems to supply sufficient quantities of water to fire department pumpers or fixed extinguishing systems, such as sprinklers, is basic and vital. Regardless of the speed of response or the number of firefighters available at the fire, without sufficient volumes of water delivered at working pressures, extinguishment will be difficult or impossible. Without municipal water supply systems, which typically consist of a source of water, pumping stations, water storage tanks, water mains, valves, and hydrants, water supply for firefighting will need to be drafted by pumps from streams, ponds, or other sources, or brought to the scene by tank truck. For this reason, the interrelationship with the Field Services Division (Public Works Department) is critical.

Basic to the City's capability for controlling fire loss is the adequacy and reliability of the water distribution system. Sunnyvale's water distribution system includes large diameter water mains, feeder mains, valves, and hydrants. The City receives its water for domestic and firefighting purposes from three sources; San Francisco Water District, Santa Clara Valley Water District, and City Wells. Sunnyvale's water system is both adequate and reliable.

Sunnyvale purchases approximately 44 percent of its water from the San Francisco Water Department which is taken from their Hetch-Hetchy mountain reservoir. The water is transmitted to the City through two large gravity fed pipelines. The Hetch-Hetchy water enters the City system through six separate valve connections along the pipeline right-of-way on the City's north side.

Approximately 40 percent of the water is purchased from the Santa Clara Valley Water District which is transmitted to the city through a 36 inch main. The water enters the City system through two valve connections along the pipelines located on the City's south side.

The remaining 16 percent of the City's water is pumped from eleven separate City owned wells. The wells are generally located in the central and southern areas of the City.

The critical components of a water system are volume, pressure, and availability of connections (hydrants). Water volume and pressure is more than adequate at the hydrants in most areas. However, a few older areas of the City, mostly in the annexed additions, have four inch mains which deliver only minimal or sub-standard flows and pressure. California Water Service, a privately owned water system, maintains the water system in those annexed areas, but the City has outside connections to these areas so they can be supplied with water in an emergency.

The City recently completed two major improvements to the water distribution system by tying its Hetch Hetchy system to its Santa Clara Valley Water District system. As a result, water can now be transported to or from either side of the City. Also, two important tie-ins, one at the Mary/Carson water plant and one at the Wolfe/Evelyn water plant, have been completed. Future plans include two additional tie-ins to create a looped system. When this improvement is completed, it will be possible to move water around the City using the Hetch Hetchy pressure rather than pumps, when necessary, allowing the City to maintain adequate water pressure throughout the system in the event of a major power failure. This will enhance fire protection capabilities in the Raynor area.

In addition, the Ortega Well was recently finished and is now on line. One additional well has been funded for future construction as part of the long term water system plan. The City has also implemented a water reclamation system for irrigation purposes. If the system is extended within proximity of station 2, the possible use of reclaimed water for training purposes should be considered.

There are 3,285 public fire hydrants connected to the water distribution system. Each is inspected and completely serviced on a regular schedule averaging once every two years. The Field Services Division of the Public Works Department is

responsible for the maintenance and repair of all public hydrants. Most hydrants provide a combination of 2½" and 4½" threaded connections for fire apparatus use. The hydrants are spaced at 300 foot intervals in commercial and industrial areas and 500 foot intervals in residential neighborhoods. A program of marking hydrant location with reflectorized markers placed on the street has been completed. The markers make it easy to locate hydrants, especially during the hours of darkness, or which may be obstructed by shrubs or illegally parked vehicles.

In the event of a system failure, agreements have been procured with neighboring cities to provide a mutual source of water. Five outside metered connections between the City of Santa Clara and Sunnyvale are available, should either city require additional water in an emergency. Several of the valves automatically respond to a significant pressure drop and provide water to the failed system. Sunnyvale has similar outside metered connections between the Cities of Mountain View, Cupertino, and the California Water Service, which all provide water in the event of a system failure.

As the Futures Study's adopted Alternative is implemented and basic land use categories change to accommodate the increased housing demand, changes in the water distributions system will have to be made. Some older and smaller distribution mains may need improvement in older areas of the City where new construction or rehabilitation requires more fire flow. Additionally, a privately owned water franchise services some annexed areas of the City. In those cases where more fire protection water is required than can be supplied, connections have been made to the City system to supplement the private water system franchise.

DELIVERY OF EMERGENCY SERVICES

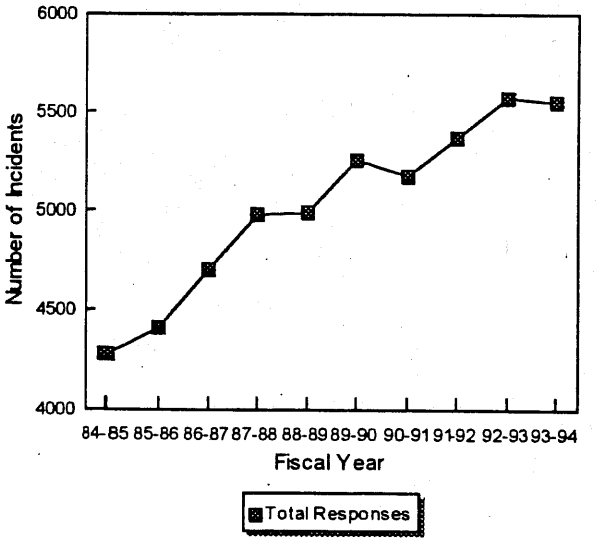
Introduction

An emergency is defined as an unforeseen combination of circumstances that calls for immediate action. These unplanned events require the immediate attention of emergency personnel because human life and property may be in serious jeopardy. As such, emergencies must receive the highest priority of all fire services related activities.

The fire services role in emergency services is expanding. The demands have increased and changed. In fact, the great majority of fire service responses no longer involve fire. There is a clear trend for fire departments to engage in new missions, such as emergency medical services (EMS) and hazardous materials response, services the Fire Services Division has been providing in Sunnyvale for some time. In addition, the Fire Services Division plays an integral part in the provision of services and incident control for citywide disasters as part of the Emergency Management Organization (EMO).

Sunnyvale, like other departments nationwide, is experiencing a decline in fire related calls while the number of total calls for emergency service continues to increase as depicted in chart 1. During fiscal year 1984-85, fire services personnel responded to a total of 4,279 emergency calls for service. Ten years later, that number increased to 5,646, a 32 percent increase. However, when compared to the fiscal year 1982-83 statistics, which were used in the 1985 Fires Services Sub-Element,

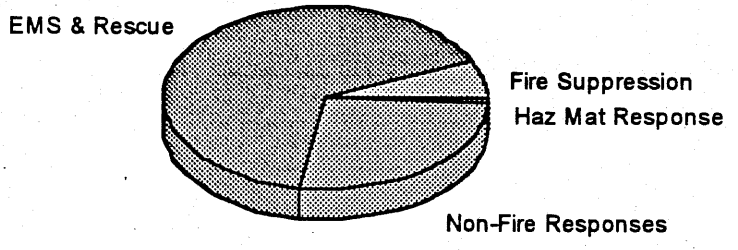
Chart 1
TOTAL ALARMS



the increase is a staggering 49.5 percent. This is significant considering the fact that the population of the city has increased only 14 percent during the same period.

In order to track the demands on the Fire Services Division in Sunnyvale, statistics are kept in the form of a consolidated report following each 28 day budget reporting period cycle. All calls for emergency service to which the Fire Services Division responded are recorded in the total alarm category. Alarms include calls for Fire Suppression, Emergency Medical and Rescue Services, Hazardous Materials Containment, Non-Fire Services, and Mutual Aid Responses. A copy of the Sunnyvale consolidated report comprised of yearly totals on a fiscal year basis can be found in the Appendix.

Chart 2
1992-93 Emergency Service Responses



Fire Suppression

History

Since the dawn of time fire has served as both a protector and an agent of progress. Uncontrolled, however, fire can unleash forces of destruction that are one of humankind's greatest curses. Learning to bring fire under control in order to modify the living environment has presented humans with one of their greatest challenges. Controlled fire provides urban society with many conveniences that a good portion of the world's population now considers necessary. Although great progress has been made in acquiring knowledge and developing the skills necessary to harness fire as a servant, fire frequently breaks out of control and becomes destructive.

Most frequently, accidental fire results from ignorance or lack of attention; in short, the human factor. For this reason, contemporary efforts to control fire must include education as well as research to determine new ways of controlling the complex physical and chemical processes of fire itself.

Trends

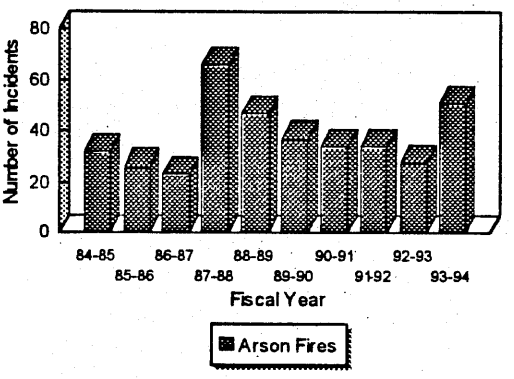
Though the long-term trend has been downward, fire is a problem of much larger dimensions in the United States than most Americans realize. Fire kills thousands of Americans and injures hundreds of thousands more each year. It destroys billions of dollars in property and costs tens of billions in personnel and services, but the general public including elected officials, school officials, and the media are still largely unaware of the magnitude of these numbers.

The United States fire problem has been declining fairly steadily throughout this century. On an overall basis this downward trend has resulted in a 22.6 percent decrease in the number of fires occurring in the nation. Although progress has been made in the last decade, the United States continues to have one of the highest per capita fire death rates in the world.

Nationally, arson continues to be a pervasive problem affecting many of the major types of properties. It remains the leading cause of dollar loss from fires. Annual direct losses from arson reported by the fire service are almost $2 billion. The true total is undoubtedly higher.

It is estimated that approximately 40 percent of all arson fires are set by juveniles.[1] The rate of juvenile fireplay and firesetting, short of arson as determined by fire investigators, may also be quite high. While the majority of the juvenile set fires were set out of curiosity, not malice, the damage they cause, both in economic and human costs, are real and devastating.

Chart 3
Arson Fires



In Sunnyvale, the arson rate has remained fairly level over the last ten years with sharp increases in 1987/88 and 1993/94 as depicted in chart 3. Approximately 18 percent of the fires investigated were determined to have been set by juveniles. Another 30 percent of those fires were detemined to be arson fires set by adults, and 52 percent were determined to be by accidental or other causes. Although a portion of the adult arson fires can be credited to serial arsonists, the remaining arson fires do not fall into any specific categories.

Within the fire suppression classification there are two main categories of fires, building fires and the "other fires" category.

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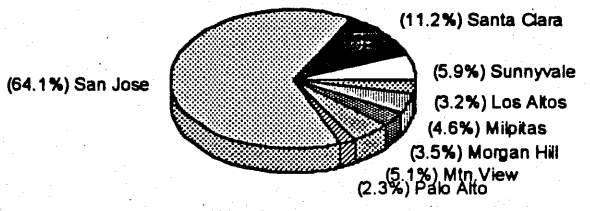
[1] *The National Juvenile Firesetter/Arson Control and Prevention Program, Guidelines for Implementation*, Federal Emergency Management Agency / United States Fire Administration, FA-147/June 1994, pg. 9, November, 1993.

Although building fires represent a small percentage of the emergency calls received, they are responsible for the greatest risk to life and property.

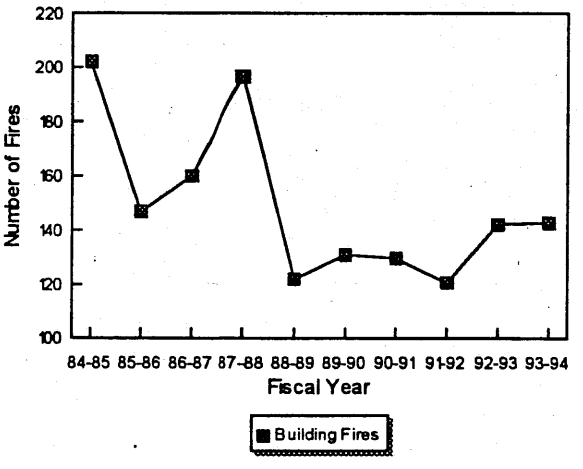
Chart 4
1992 Building Fires



Building fire statistics available for Santa Clara County represent eight of the fifteen cities within the county. The cities included can be found in chart 4. The county has seen a downward trend in building fires parallelling that of the nation. Overall between 1983 and 1992, the number of building fires decreased by 20 percent countywide.

In Sunnyvale, during the same period the decrease was 44 percent. As indicated by chart 5, the number of building fires fluctuates from year to year, but has remained relatively stable at a low level for the past six fiscal years. It is expected with the increase in low cost fire prevention technology available, increased public awareness, and the adoption of comprehensive building and fire protection codes that the trend will remain level even though the population is expected to increase.

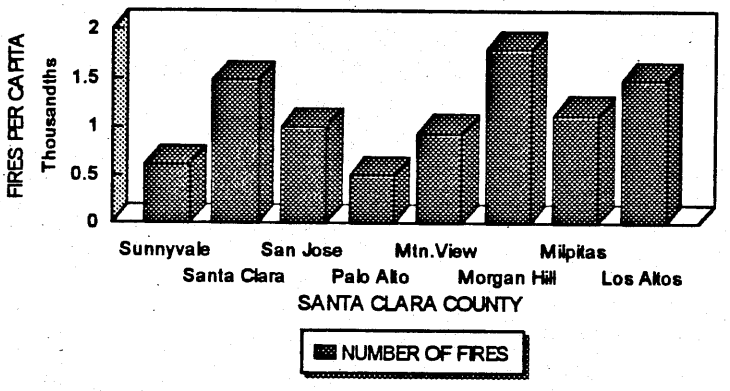
Chart 5
BUILDING FIRES



Although the City of Sunnyvale is the second largest in the county (representing 10% of the total population of the cities surveyed), it accounted for only 6

percent of the fires in 1992. Sunnyvale ranked second lowest in the number of fires per capita in 1992 finishing just behind the City of Palo Alto.

Chart 6
1992 Fires Per Capita



In addition to collecting data on the number of building fires occurring in the City, the amount of damage caused is also captured and reported as fire loss. Fire loss is that amount of damage to structures including their contents caused by fire, smoke, and water. It is based on replacement cost at the time of damage.

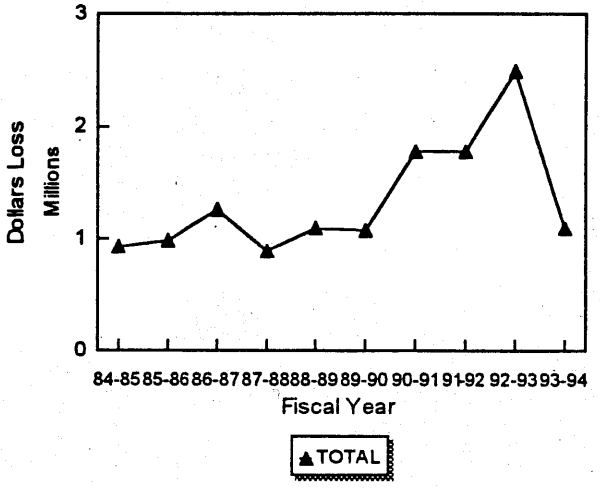
From a national perspective, the total cost of fire to society is staggering; over $100 billion per year according to a recent study.[2] This includes the cost of adding fire protection to buildings, the cost of paid fire departments, the equivalent cost of volunteer fire departments ($20 billion annually), the cost of insurance overhead, the direct cost of fire-related losses, the medical cost of fire injuries, and other direct and indirect cost. From a monetary viewpoint, fire ranks among the significant national problems.

The total dollar loss of fire, between 1983 and 1992, has increased 43 percent countywide. Inflation and property value are major factors in comparing total dollar loss. In addition, the amount of dollar loss can be misleading as one or two large

[2] William P. Meade, *A First Pass at Computing the Cost of Fires in a Modern Society*, The Herndon Group, Inc., February 1991.

fires can skew the numbers. This is the case in Sunnyvale's dollar loss in the 1992-93 fiscal year as demonstrated by chart 7. The high dollar loss during that time was the result of two major fires and should be considered an aberration. In comparing the 1983 figure with the most current 1992 figure, the total dollar loss in Sunnyvale has decreased 0.5 percent. When adjusted for inflation, this is a significant decrease.

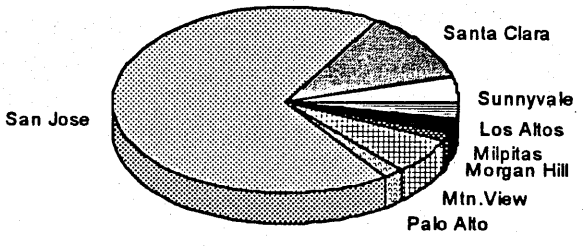
Chart 7
DOLLAR AMOUNT OF FIRE LOSS



Sunnyvale has recently begun measuring fire loss as a percentage of the market value protected. Although this is a better measure, taking into account inflation and property value, it is not widely used or reported so no comparisons can be made.

Sunnyvale's total dollar loss over the ten year period from 1983 - 1992, is only 4.1 percent of that for the eight reporting cities in the county. Considering the size in population and the high property values of Sunnyvale, the total dollar loss is quite low.

Chart 8
Total Dollar Loss - Bldg Fires

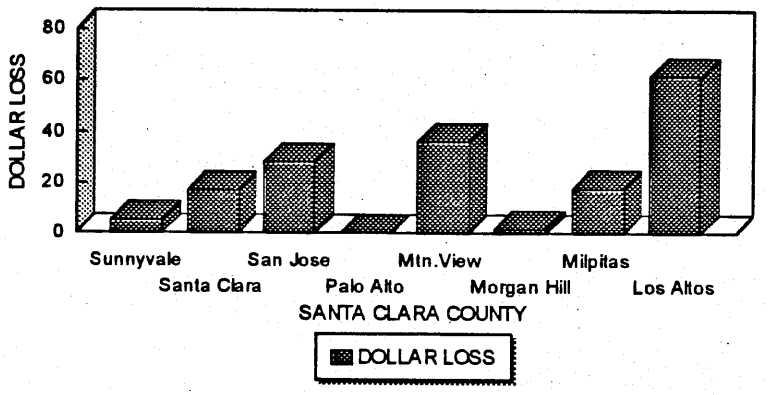


On a per capita basis, the City of Sunnyvale experienced a dollar loss of $4.98 in 1992. This is the third

lowest in Santa Clara County, Palo Alto and Morgan Hill reporting the two lowest losses. The average per capita dollar loss was $20.92 with Los Altos experiencing the greatest loss. As stated above the property value of an area is a major factor in comparing dollar loss.

Chart 9

1992 Fire Loss Per Capita



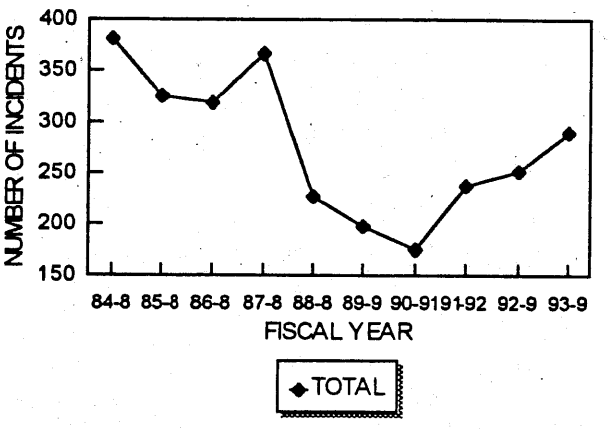
In addition to responding to building fires, the Fire Services Division responds to other types of fires as well. The "other fires" category is comprised of six classifications which include: transport vehicles, outdoor property, construction unoccupied/special structures, special vehicles, railroad property, and road property. This category represents 67 percent of all the fires occurring in Sunnyvale.

Outdoor property fires currently accounts for almost 60 percent of the total fires in the "other fires" category and is continuing to rise. Since fiscal year 1990-91, the number of outdoor property fires has risen substantially.

Transport vehicle fires accounted for about one third of the total fires in the "other fires" category. Although the trend has been somewhat downward, the number of fires has remained relatively stable. It is possible the number of transport fires will increase based on the predictions of increases in traffic and population in the Futures Study.

The remaining five classifications comprising the "other fires" category accounted for 3.8 percent of the total during fiscal year 1993-94. The number of occurrences are so infrequent it is not possible to show any type of trend other than they occur sporadically.

CHART 10
OTHER FIRES



Present Services

Fire services, much like police services, are provided primarily as a result of direct requests by citizens. Services are demand oriented in nature. That is, when a fire or other emergency occurs, the reporting party's call is a request for service. The type of fire, size, amount and nature of fuel involved, and the location of the fire dictates the number of personnel and apparatus assigned to respond. When a call for service is received through emergency communications, it is evaluated and an appropriate response is dispatched. The situation found dictates the tactics and equipment employed upon arrival.

In Sunnyvale, building fires of all types present the most concern in terms of firefighting and are the basis for most equipment and training decisions and policies. While comprising only 2.5 percent of all emergency calls, building fires represent the greatest threat to life safety and high dollar property losses. The primary emphasis in Sunnyvale therefore, will remain in providing the necessary equipment and capability to suppress fire in all types of buildings. This capability will then lend itself to deal effectively with other kinds of fires and other fire service emergencies that are likely to occur in the City.

Future Issues

When viewed in its entirety, the balance of factors in Sunnyvale is favorable. The character and quality of the City and its demographics presents a present day picture generally free of major fire problems. While the potential for

extraordinary disaster always exists, and while the aging process of the City and its buildings will have some adverse impacts, the overall environment is comparatively fire safe. Master planning for the City's fire services should continue to emphasize prevention, education, and engineered fire protection systems as methods to meet service demands.

Although the number of fires may be declining, the fire suppression mission itself has become more complex in the face of new and greater risks. High-rise structures have become increasingly common in most municipalities within Santa Clara County. Sunnyvale currently has one high-rise structure with one other in the planning stages. Technology has changed the way buildings are constructed and how they are furnished. As the MGM Grand fire in Las Vegas demonstrated, fires in modern, high-tech structures can grow to disastrous proportions. Firefighting tactics have changed to better manage the heavy resource demands and allow for a more coordinated approach to the high-rise fire problem. This issue may need investigation in the future as the City reaches build out and begins to build upward, increasing the number of high-rise buildings within the City.

Throughout the Bay Area, the trend for fire departments is towards consolidation of services. This is being achieved through a variety of methods including joint powers agreements, takeovers and mergers, and the formation of

fire districts. This trend is also reaching the state level where currently the California Department of Forestry Fire Department is consolidating with the State Fire Marshal's Office. Although Sunnyvale is open to the sharing of resources and joint efforts, such as the Regional Fire Academy, consolidation with another deparment or city would require dissolvement of the Public Safety Department as it exists today.

Emergency Medical Services and Rescues

History

As the name implies, Emergency Medical Services (EMS) is designed for assisting those who require *emergency care* because of injury or illness. They are victims of accidents, fires, drownings, heart attacks, criminal assaults, and other life endangering maladies. They require immediate medical attention and stabilization.

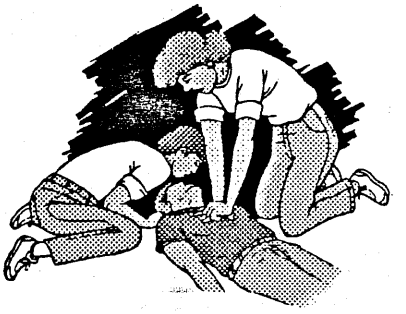
EMS has become a reality for the majority of fire departments in the United States. Today, from half to three-quarters of the emergency incidents handled by a typical fire department are EMS-related.[1] Although not all agree that EMS is an appropriate function of a fire department, it is a public expectation. Nonetheless, the management of emergency medical and rescue services remains complex and challenging, particularly in light of changes in the economics of local government and of health care.

The role of the fire service in the system is generally limited to the prehospital phase, which is often shared by other local government employees (most often police officers) and various private-sector groups such as ambulance companies. Fire service involvement in EMS has evolved gradually. As early as 1928, a few fire departments began to provide first aid services to citizens suffering from breathing difficulties and heart attack symptoms. Primitive resuscitator/inhalator devices used by fire departments to assist firefighters in cases of smoke inhalation became the standard equipment for aiding the public in medical episodes. By 1930, fire departments had begun to develop special vehicles for this function; these often include heavy rescue and extrication equipment for specialized rescue and firefighting situations.

[1] Editorial, *Journal of Emergency Medical Services 9*, no. 6 (June 1984):4.

Equipment, medical aid training, and operational procedures changed very little over the next three decades. In the early 1960s, however, new techniques in artificial breathing and circulation were devised, leading to the technique of Cardiopulmonary Resusitation (CPR). Also during this period, resuscitation equipment was made more compact and portable. At the same time, public demand for fire department first aid services was steadily, if slowly, increasing.

By 1971, there were at least twenty-four mobile intensive care units in operation in the United States.[2] That year, a popular television series opened depicting the adventures of a team of Los Angeles County Fire Department paramedics. Fire departments showed new interest in EMS as citizens began to ask why their local fire department did not provide the same services. By 1977, advanced life support systems (using paramedics) were operational in at least 310 American communities. It was estimated that 33 percent were operated by local fire departments.[3]



In subsequent years, first-response and basic life support services have been developed and upgraded throughout the fire service. A study conducted by the California Fire Chiefs Association in 1986 revealed that fire departments serve 90 percent of that state's population with some level of EMS, and that 67.5 percent of all emergency calls answered by California Fire Departments are EMS-related.[4]

A significant advance in prehospital care has been the evolution of a new classification of emergency medical

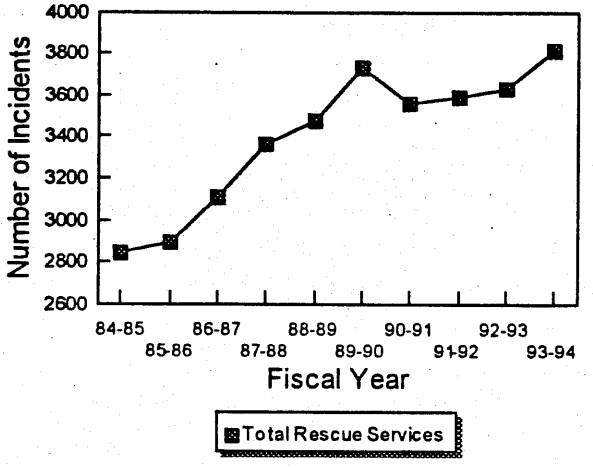
[2] Leonard B. Rose and Edward Press, "Cardiac Defibrillation by Ambulance Attendants," *Journal of the American Medical Association 219* (3 January 1972):64.

[3] *Emergency Care News* (published by Public Technology, Inc., Washington D.C., for the Emergency Medical Services Technical Assistance Program, October 1977), p.1.

[4] California Fire Service/EMS Survey and Directory, published by California Fire Chiefs Association, Emergency Medical Services Section, Southern Division, 1986.

technician, Emergency Medical Technician-Defibrillation (EMT-D). Research conducted in King County, Washington, and in the state of Iowa indicates that very prompt defibrillation is the most effective therapy in cases of cardiac arrest (ventricular fibrillation).[5] Also, research has shown that basic life support EMTs can be trained to recognize lethal arrhythmias and defibrillate patients through training programs of ten hours or less. New automated defibrillators have been created and have added to the relative safety of the EMT-D concept.

Chart 11
RESCUE SERVICES



Accompanied by ample publicity, these developments in emergency medical services have elevated public expectations. Along with other segments of the EMS community, fire service EMS providers generally have responded with improvements in training, equipment, and operational procedures.

Trends

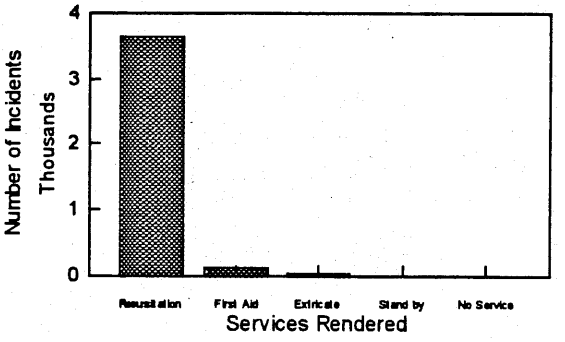
The emergency medical and rescue services category is by far the most active of the five emergency fire service areas being provided by the Fire Services Division. This category includes

[5] Mickey S. Eisenberg, et al., "Treatment of Ventricular Fibrillation: Emergency Medical Technician Defibrillation and Paramedic Service," *Journal of the American Medical Association* 251, no. 13 (1984): 1723-26; Kenneth R. Stults et al., "Pre-Hospital Defibrillation Performed by Emergency Medical Technicians in Rural Communities," *New England Journal of Medicine* 310 (1984): 219-23.

resuscitation, first aid, extrication, standby, and a no services rendered classification. It should be noted that although the number of rescue service calls have steadily trended upward, the number of calls for each individual classification is skewed. This is due in large part to a change in reporting standards by California Fire Incident Reporting Standards (CFIRS), as well as grouping some activities into a larger classification. This change became effective January 1, 1990 which coincides with the number of responses made between fiscal years 1989-90 and 1990-91.

Throughout the nation, rescue services accounted for 56 percent of all 1992 fire department calls. In Sunnyvale, rescue services accounted for 67 percent of the alarms responded to by Fire Services emergency personnel in 1992. During the 1980's, it was believed the number of emergency medical calls the department responded to would remain relatively level, with some fluctuations occurring, into the twenty-first century. The trend did not remain level as predicted, but continued to increase. The increase in rescue calls is due to an increase in population, public awareness of the 911 system, and a change in demographics.

Chart 12
Emergency Medical & Rescue



The first and most active of the five categories is the resuscitation classification. This includes the provision of CPR, inhalation, resuscitation, and ambulance assistance services.

First aid emergency calls for service began decreasing with the change in reporting standards. This classification includes those situations where firefighters apply bandages, disinfect wounds, or apply splints. No resuscitation or CPR is involved.

The extrication classification is the only area that remained somewhat stable. Extricating a victim from a vehicle or collapse building makes up the bulk of this classification.

The two remaining classifications, no services rendered and standby, have seen the greatest reduction in numbers mainly due to the change CFIRS made in 1991. The no services rendered classification includes those incidents when firefighters arrive on the scene after the paramedics, after the situation has been resolved by those present, or if the necessary assistance is beyond their training. Another reason this classification has decreased is that through training, officers are now providing some type of service to the patients/victims while at the scene; either in the form of patient needs assessment/evaluation or just reassuring them or providing comfort until the paramedics arrive.

The standby classification experienced a similar outcome as that of the no services rendered classification; a drastic drop in numbers. The standby classification is generally used in situations where injuries cannot be immediately assessed, but the firefighters are requested to be on scene as a precaution.

Rescue calls of every kind have been influenced by a general public perception that paramedic and ambulance services are quickly available by dialing 9-1-1. The 9-1-1 system is advertised on City vehicles and continues to be the theme of numerous popular television dramas. The projected increase in population and vehicular traffic through land use changes will in of itself add to the already upward trend experienced in this area.

Present Services

The Emergency Medical Service of Santa Clara County is currently based on a three tier response system. Tier one is the activation of the E-911 system and the response of local Basic Life Support (BLS) providers within 4 to 6 minutes. Tier

two is the response of Advanced Life Support, and tier three is the transportation of the patient to a definitive care facility.

In Santa Clara County, tier one services are provided by the fire departments. At the present time, BLS service is provided without charge. There are two levels of certification of Fire Service BLS providers within the county, Emergency Medical Technician - Defibrillator (EMT-D) and First Responder-Defibrillator (FR-D). Generally BLS services include: Basic airway support including nasal and oralpharengeal airway insertion, oxygen therapy, airway suction, Cardio Pulmonary Resuscitation (CPR), OB, shock and hemorrhage control, fracture splinting and spinal injury protection.

Currently, Sunnyvale Public Safety Officers are certified by the American Red Cross as Emergency Medical Services Agency (EMSA) First Responders and by the American Heart Association in BLS-C (CPR). Additionally, all officers presently assigned to the Fire Services Division have completed the certification upgrade to First Responder - Defibrillator (FR-D).

Tier two is the response of Advance Life Support providers (ALS) commonly referred to as EMT-P Paramedics. ALS response is activated by relay call from the local E-911 system to Santa Clara County Communications, who provide dispatch services for the local ALS provider. Current ALS service is provided by county contract with American Medical Response-West (AMR-W), a private paramedic transport service provider, under exclusive contract with Santa Clara County. Contractually, the response of ALS Paramedics is 10 minutes from the time of dispatch. Charges for paramedic response and transportation are billed directly by the private provider based on the type and extent of service provided. Prior to September 1, 1994, AMR-W had designated one (1) 24 hour paramedic unit to be housed within the city limits, (Unit 210 based at Fire Station 1) and a second 12 hour unit (218 based at Fremont and Hollenbeck). The second ambulance was taken out of service and reassigned based on AMR-W status management system without the consultation or prior knowledge of the City of Sunnyvale.

The third tier in the emergency medical response is the transportation of the patient to a definitive care facility. Currently AMR-W paramedics have base station contact with the medical staff of the Valley Medical Center, (Stanford Hospital and San Jose Hospital have discontinued providing base station services). Patients are categorized based on the seriousness or mechanism of injury. Depending on type of injury, patients may be directed to one of three trauma centers in the county, (Valley Medical Center, San Jose Hospital and Stanford Hospital). Trauma ratings and directives are currently determined by county Emergency Medical Services Agency (EMSA).

Present research demonstrates a casual relationship between response time for CPR, defibrillation, and advanced cardiac life support and the chances of cardiac arrest survival. A new study by a team of University of Washington physicians shows that response time is the most critical element of survival for cardiac arrest victims.[6] The study confirms that fire department based EMS are the best systems for cardiac arrest victims because of their historically fast response times.

Generally, the shorter the interval between collapse and the arrival of critical treatment, the higher the probability of survival. From the moment of collapse, the likelihood of survival decreases rapidly with each minute that elapses without initiation of lifesaving procedures. The model developed by the University of Washington researchers showing EMT and paramedic response times with corresponding predicted survival rates is shown in Table 2.

[6] Mickey Eisenberg, MD, Ph.D., "Predicting Survival From Out-of-Hospital Cardiac Arrest: A Graphic Model," *Annals of Emergency Medicine*, November 1993, Reprinted *IAFF Newsletter*, 1/3/94.

Table 2
Predicted Survival Rates for Different Types of EMS Response

Agency Type	EMT Response Time (min.)	Paramedic Response Time (min.)	Estimated time to (min)			Predicted Survival
			CPR	Defib	ACLS	
EMT only	7	-	8	20	20	0%
EMT-D	4 10	- -	5 11	6 12	20 20	7% 0%
Paramedic	-	4 6	5 7	6 8	8 10	30% 21%
EMT/ Paramedic	3 4	7 9	4 5	8 10	10 12	28% 19%
EMT-D/ Paramedic	4	9	5	6	12	24%

Similar to fighting fires, delays have geometrical adverse impacts.

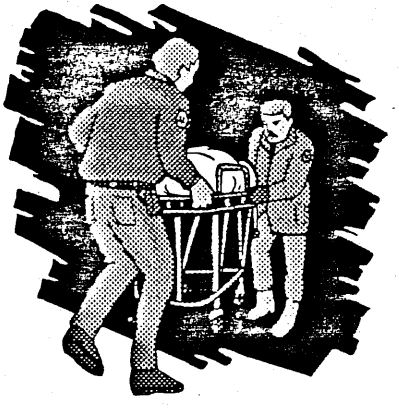
Recognizing the importance of response times in relation to the survivability rate for these types of patients, Sunnyvale Public Safety, Fire Services Division began evaluating the First Responder-Defibrillator program. Proposals for providing automatic defibrillators on all fire apparatus and training for fire based personnel were developed during fiscal year 1992-93. Following the above chart, and evaluating the current training levels and response times, the survival rate for a cardiac patient in Sunnyvale is approximately 7 percent or lower.

The defibrillator program was implemented in early 1994. During the first seven months (April 1 through October 31, 1994), there were a total of 29 cases where the defibrillator was used by Fire Operations personnel. As of November 1, 1994, two patients have been confirmed saved by the use of the defibrillator by Fire Services personnel; a confirmed save is defined as being released from the hospital after receiving defibrillation.

Future Issues

As a result of the training received by Fire Services Personnel, and the Department policy of complete cross training, the officers assigned to patrol will have the knowledge and ability to provide early defibrillation. Within the next three years, all line level officers will be certified and will be required to maintain their certification in defibrillator use. While Fire Division responses would still continue, the access to rapid defibrillation by available patrol units is great and should not be overlooked in future planning as additional equipment is the only requirement.

A second issue to be addressed in the future includes the changes beginning to appear in the area of Emergency Medical Dispatch (EMD) and Pre-arrival Instructions (PAI's) given to 9-1-1 callers requesting medical assistance. There are several proven PAI systems currently available. EMD will provide the 9-1-1 caller with proper pre-arrival emergency medical procedural information. By providing the step-by-step information, the caller will be better able to provide emergency medical care to the patient/victim prior to the arrival of emergency fire personnel. Sunnyvale is currently investigating an EMD pre-arrival instruction program. It appears that additional personnel may be necessary to implement the program if approved.



Also to be addressed in the future, is the issue of paramedic services. The debate over private vs. public provision of paramedic and ambulance transport services will change the method of providing EMS services as they exist today.

Paramedic ALS services are currently provided by a single provider under contract awarded by Santa Clara County in an Exclusive Operating Area (EOA) extending from Gilroy to Palo Alto. (Currently, Palo Alto is the only city providing fire-based paramedic services.) American Medical Response - West (AMR-W) was awarded the county contract first in 1979, and has not been rebid since that time as AMR-W was given an extension in 1989 which is valid until July

1996. The local county EMSA has proposed extending the contract until 1997 to allow time to solicit a request for proposal (RFP). Due to the possible withdrawal of some cities from the countywide system it is unclear whether the contract will be extended or when the RFP will be released.

As previously indicated all cost associated with ALS paramedic responses are directly billed to the patient by the provider. AMR-W receives no subsidy from local agencies and is by contract required to pay for dispatch services provided by the county.[7] Costs for dispatch services is approximately $900,000.00 per year. Table 3 indicates the various and additional costs associated with AMR-W providing both BLS and ALS services. In Santa Clara County, virtually all transports are billed at the higher ALS costs. AMR-W has recently indicated that on a countywide basis, the average amount billed for a paramedic response per patient/event is $603.00.

Table 3
Cost of Current Paramedic Services

Services Provided	BLS	ALS
Base Rate*	$241.50	$499.70
Mileage	$9.87/per mile	$11.31**
Oxygen	$63.00	$59.29
Night Charge	$63.00	$30.25
Infectious Control	$11.50	
Waiting time after 15 min.	$168.00 per hr.	
Airway suction	$35.00	
Compressed Air	$20.00	
CPR	$30.00	
Disposable Liner/Infection control	$11.50	$6.00
Emergency Response	$60.00	
Cannula/Mask	$6.00	
Neonatal Ventilator	$75.00	

[7] Although AMR-W does not receive direct subsidy, they are in some way being subsidized by Sunnyvale. AMR-W staffs their paramedic units with two paramedics, but many times require three to provide the service. Sunnyvale fire personnel respond with AMR-W to the hospital as the third person putting our fire apparatus out of service until the officer returns to the station. AMR-W also charges patients for bandages and other equipment fire personnel use at emergency scenes without reimbursing us for the materials. Sunnyvale initially purchased C-Spine collars, bag mask valves, and nasal canulas, which, through an agreement with AMR-W are replaced on a one-for-one basis when they are used.

OB Kit	$42.00	
Spineboard/Scoop	$35.00	
Splinting	$35.00	
Supplies	$12.00	
Spine immobilization		$38.60
Cervical Spine Collar		$24.00
Headbed (spineboard attachment)		$8.00
OB Kit		$42.00
Drug Therapies***		

* The BLS base rate may be charged by ALS unit depending on type of call, however, normal 9-1-1 activated paramedic responses are charged at the ALS rate.

** Multiple patient rate is $6.45 per mile per patient.

*** Varies depending on service provided.

An important fact to note is that the Fire Services Division responds to all emergency medical calls. AMR-West utilizes fire department personnel on scene and, when the situation warrants additional help, Sunnyvale officers will accompany the patient to the hospital. No reimbursement is received by the Division for these services either from the patient nor AMR-W.

At present within Santa Clara County two agencies, San Jose and Santa Clara Fire Departments, have presented formal proposals to provide fire based EMS services within their cities. Several additional cities indicate they are considering providing their own fire based paramedic services as well. This proposed withdrawal will impact the rest of the county. The implications for the County of Santa Clara and Sunnyvale in particular are difficult to determine at this time. It can be reasonably assumed the following events will be triggered by the withdrawal of cities from the countywide system:

1. Complete disruption of paramedic ambulance service to the remaining cities and districts within the operating area. The private provider has indicated that it may not be economically feasible to continue as the contract provider.

2. The private provider or the county would seek relief through legislation.

3. Lacking cooperative effort and coordination the resulting system would be patchwork at best. The responsibility for coordination efforts and the level of financial responsibility of each jurisdiction is unclear.

4. The County's responsibility to the other agencies in the County EMS system if the current system dissolves is unknown.

The Fire Services Division will be participating in the County EMS Design Task Force in order to be informed and ensure that Sunnyvale's needs are addressed. It is the mission of this task force to evaluate the present system and recommend changes. The end result of the Task Force will be greatly influenced by the actions of San Jose and Santa Clara.

Those who feel that the fire service should not only provide basic EMS, but paramedic services as well, have pointed out several benefits of this arrangement. For example, productivity increases when cross-trained employees are able to perform two essential public safety tasks: fire protection and emergency medical services. Furthermore, the structure and stability of the fire department and the paramilitary discipline and training of firefighters are compatible with EMS responsibilities. In addition, the transport component of an ALS system would provide a source of revenue.

As the Department of Public Safety is already based on the concept of cross-training personnel to provide police and fire services, the staffing levels in the Fire Division are lower than that of a traditional fire department. Therefore, without an increase in staffing level, Sunnyvale could not provide paramedic and ambulance transport services as proposed by San Jose and Santa Clara. Another issue that the Department of Public Safety would confront if faced with providing paramedic services is the current training structure. Currently, all officers are trained equally in all areas. Providing paramedic training to all officers would be cost prohibitive, on the other hand creating a specialized group would impact the ability of the department to rotate personnel. Sunnyvale Public Safety, Fire Services Division is currently studying the options

available to the City in terms of ALS response and ambulance transportation.