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Santa Clara County General Plan

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Safety and Noise

Rural Unincorporated Area Issues and Policies

Introduction

Summary

This Chapter of the General Plan addresses a range of rural area public health and safety issues. While at first glance they may seem so diverse as to be unrelated, on closer examination it becomes clear that they all touch on aspects of natural and built environments which are critical to sustaining the quality of life for rural residents. As in the Countywide Chapter, this chapter includes policies which are intended to minimize potential human or environmental injury and property damage.

The Safety Element of the General Plan is one of seven mandatory elements identified in State Government Codes addressed General Plan requirements. The Code directs local governments to evaluate the natural and built environment for potential hazards and, to the extent possible, assess and describe the risk factors of the most threatening of those hazards. Sections of this chapter, combined with those in the Countywide chapter, are intended to satisfy those requirements.

The chapter includes the following sections:

- Noise,
- Natural Hazards,
- Aviation Safety, and
- Waste Water Disposal.

[Amended Aug. 25, 2015; File#: 10184-11GP, Air Quality Section superseded by Health Element, Air Quality and Climate Change Section; chapter title changed from Health and Safety to Safety and Noise.]

Background

ESTABLISHING ACCEPTABLE LEVELS OF RISK

The General Plan guidelines point out that the safety element should contribute to land use policies and standards by relating the type and intensity of land use relative to estimated levels of risk, and to the availability of services and facilities to ensure safety.

Risk, by definition, implies assessing the probable outcome of development actions in relation to likely future events. Clearly, assessing "level of risk" implies a degree of imprecision given our incomplete knowledge of the future. Nonetheless, the guidelines recognize that this can be done in broad yet useful terms by comparing the likelihood of specific events to "unreasonable" levels of risk.

PERFECT SAFETY IS UNATTAINABLE

The concept of acceptable versus unreasonable risks recognizes that perfect safety is unattainable or so confining and costly as to be undesirable even if approached. Extremely unacceptable risks are relatively easy to determine, for example, buildings should not be placed on known active faults. Likewise, few would question the wisdom of standards of construction required to insure a high degree of safety in schools and hospitals.

The guidelines recognize that other risk situations which requires some local controls and regulation are less clearly definable. In some cases an exact and clear definition of acceptable risk is impossible. The solution in such cases must not only avoid unnecessary risk, but also must be economically and socially acceptable.

MINIMIZING PUBLIC COSTS

The County and other public agencies are unable to guarantee that any development will not, at some point in the future, be adversely affected by the hazards identified in this chapter. Hazards, by their nature, defy precise prediction. The ideal would be to divert new development from areas with high hazard potential and the policies of this chapter strive to achieve that objective. Problems arise however in areas where risk is more difficult to assess (i.e., residential development in areas far removed from fire and medical facilities) but there is enough evidence to raise doubts concerning the safety of residents or visitors under specific circumstances.

In some instances, where there is a significant factual question about whether a particular development has sufficiently mitigated risks from hazards to an "acceptable" level, the property owner may wish to proceed despite the existence of such a factual question. In such cases, it is important to consider potential costs to public agencies which may occur should disaster strike future residents or visitors of the project. The public costs of providing emergency services and disaster relief should be assessed and made a part of the decision making process.

RELATIONSHIP OF CHAPTER TO VISION

The Health and Safety Chapter policies address all the major themes and several goals of the Vision of the General Plan. By encouraging the development in the appropriate urban and rural locations, the policies strive to create Balanced Growth. The attention to minimizing risks for people and property addresses objectives for Livable Communities and Social Well-Being. The economic dimensions of adequately planned waste management facilities, and accessible health services underscore community concerns for overall Economic Well-Being.

Overall Strategies

AVOIDING RISKS

The strategies and policies in this chapter are intended to discourage development which will place residents, employees and visitors in unreasonable or avoidable high risk situations. Through these policies and the related Land Use Map policies, the County seeks to limit the range of land uses allowed in hazardous situations in order reduce the number of people and buildings exposed to high risk.

The policies focus attention on and encourage cooperation in developing effective, economically feasible implementation procedures which do not unduly burden local businesses and individual households. The policies are also intended to minimize potential for undue financial burden on the County, and other public agencies by avoiding development which is likely to incur unusually high public service or disaster relief costs.

PREVENTION, MITIGATION, AND PREPAREDNESS

Strategies common to all sections include:

- Preventing exposure to dangerous conditions - First and foremost, the strategies encourage us minimize to the extent feasible the likelihood that harm will come to either people or the environment.
- Minimizing danger when exposure is unavoidable - Living in our complex, modern society entails certain risks. Where we have determined a certain level of risk is appropriate, we should use the appropriate measures to ensure that level is not exceeded.
- Being prepared for disaster - Despite our best efforts, disasters will nonetheless occur. We must prepare for these occasions in ways which will minimize death and injury, and ensure swift restoration of normalcy.

Noise

Summary

All citizens are entitled to a peaceful and quiet environment, free from unnecessary and annoying levels of noise. Noise has been shown to interfere with speech, sleep and mental concentration, induce stress and headaches, and disrupt overall efficiency and enjoyment of life. It is, therefore, in the public interest that the County and the cities evaluate techniques and develop policies which provide for an environment free from noise which may be hazardous to public health and well-being. Santa Clara County strives to ensure an environment for all residents that is free from noise that jeopardizes public health and well-being. Toward that end, the strategies in this section focus on two principal areas:

- Minimizing Noise Conflicts, and
- Minimizing Exposure to Airport Noise

Background

Noise is unwanted sound. The impacts of noise can be annoying and physically harmful. Exposure to intense noise may lead to irreversible hearing damage, and may induce other health problems due to stress. The effects of noise build up over time, so it is necessary to deal not only with the level of sound but also the duration of exposure.

COEXISTING WITH NOISE

Where noise sources are a given, the ideal situation would be complete separation of noise-sensitive uses from noise-generating sources. However, real world conditions make it difficult to isolate all noise sources. Consequently, all new uses are evaluated for potential noise impacts on existing uses and for their sensitivity to existing noise sources which may already be affecting the site. The new use generally bears the burden of ensuring that it is compatible with existing uses.

■ Measures to Mitigate Noise Impacts

Where the potential for significant noise impacts exists, buffers can be placed between noise sources and existing or proposed development. This approach is most effective in large scale, mixed use or planned developments. Such techniques include locating noise sensitive buildings away from noise sources and using the natural topography or intervening buildings to shield noise sensitive uses. There are also a number of techniques to minimize interior noise, including site planning, architectural design and construction standards, and noise barriers.

Within areas identified as being impacted by noise, projects should be designed to be compatible with the specific types of noise which affect the site the most. In the case of airports, such noise is the loudest aircraft that normally uses the airport. In the case of roads, the maximum noise levels are those of large trucks traveling at the speed limit.

■ Noise Impacts at the Urban Fringe

The techniques described above can mitigate noise impacts only so far. Some noise impacts are more difficult to mitigate than others. A growing source of noise-based conflicts in rural unincorporated areas is the mix of essentially suburban residential development with active agriculture. Many new rural area homeowners, particularly recent urban transplants, appear to be surprised by the sights, smells and sounds which have always been apparent to farm families. Although initially attracted to the area by what they perceived to be a “farm” lifestyle, they have shown a degree of intolerance for the noise and dust generated by heavy farm equipment and the extreme hours crop maintenance demands. Their discomfort has led to a rise in citizen complaints and citations of farmers and machine operators.

Most of these incidents have occurred at the fringe of the urban area as development expands into what are active farming areas. Although County land use policies generally discourage non-farm related housing in agricultural areas, some housing for urban workers has occurred there. For many reasons, friction between new and existing land uses at the urban fringe may be largely unavoidable.

■ Noises Appropriate to the Rural Area

Some types of noises are common and appropriate to the rural area. Noise producing land uses such as farming activities, quarrying operations, and a range of transportation types are typical of rural agricultural areas. New uses carry the burden of proving they are compatible with existing uses and with long term projected uses in the area. The County should carefully assess the compatibility of non-farm-related uses before allowing such uses to expand into active farming areas.

■ Reducing Noise Conflicts

A variety of options do exist for reducing friction between farm and non-farm uses. Principal among these would be to inform prospective buyers that they are purchasing property adjoining or near to active farm operations and that this necessarily places them within range of the noise of tractors and other vehicles on or traveling to and from the fields. Farmers, too, must strive to be good neighbors by keeping noise to a minimum. Community contacts which will bring these two groups together will enhance mutual understanding and the opportunity to develop more effective and more feasible solutions to noise abatement. If not, dispute resolution services should be made available as a less costly alternative to litigation.

Measuring Noise

Three common measures of sound form the basis of County standards discussed in this section: Day-Night Average Sound Level (DNL), Community Noise Equivalent Level (CNEL), and A-weighted Sound Level (dB).

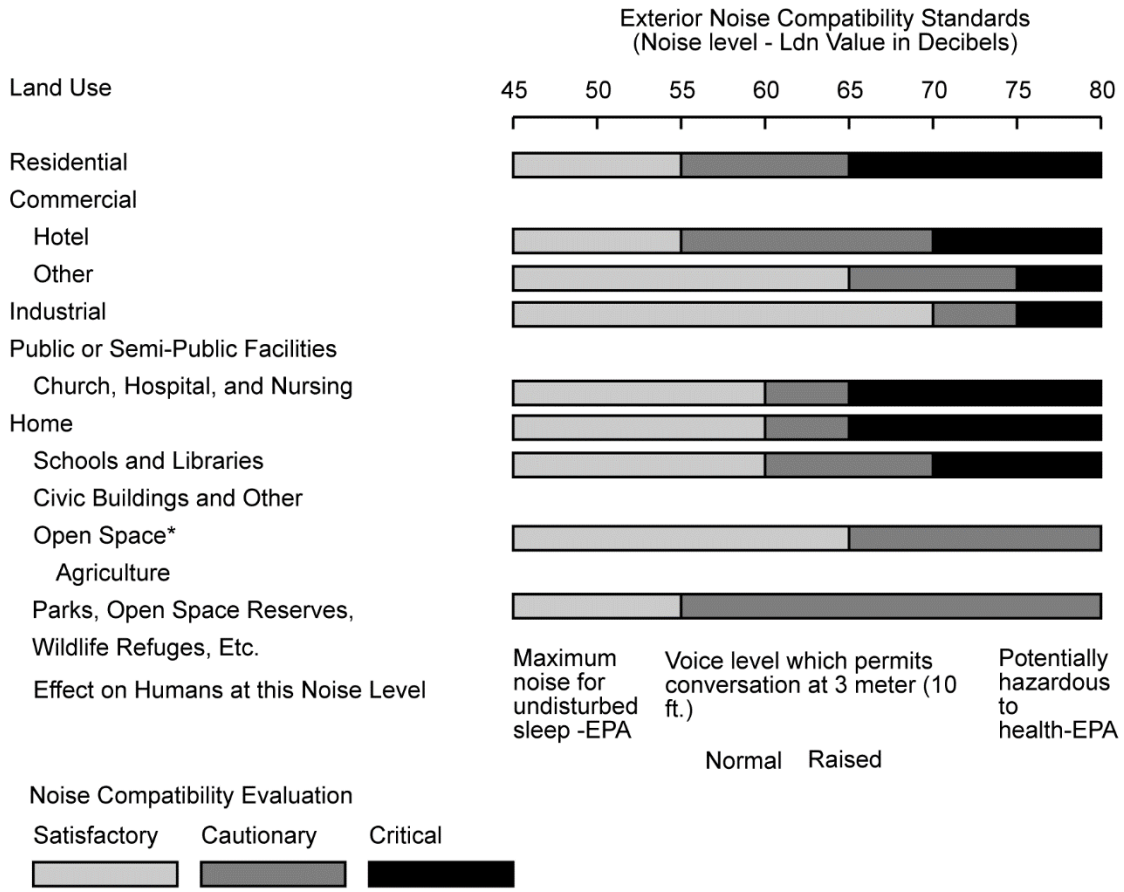
The level of sound that impacts a property varies greatly during the day. As an example, the sound near an airport may be relatively quiet when no airplane is taking off or landing, but will be extremely loud as a plane takes off. In order to deal with these variations, several noise indices have been developed which measure how loud each sound is, how long it lasts, and how often the sound occurs. The indices express all the sound occurring during the day as a single average level, which if it occurred all day would convey the same sound energy to the site.

The sound indices most commonly used to describe environmental noise are the Day-Night Average Sound Level (DNL) and the Community Noise Equivalent Level (CNEL). When calculating the 24-hour average of sound in an area, these two indices respond to the community's preference for a quieter environment in the evening and nighttime hours by assigning penalties to noises which occur during those specified hours prior to calculating the average. Both indices place a 10 dB penalty on all noises occurring from 10:00 p.m. to 7:00 a.m. The CNEL calculation varies in that it also places a 5 dB penalty on noise events during evening hours (7:00 p.m. to 10:00 p.m.). The two systems yield generally similar results and are used interchangeably.

In this General Plan, noise standards are expressed as DNL levels, as recommended by the Environmental Protection Agency (EPA) for community noise planning. Santa Clara County's Airport Land Use Commission expresses its standards in terms of CNEL values, as is commonly practiced in California.

Sound is measured in decibels (dB) using a special meter. The decibel scale of sound is logarithmic. Each increase of 10 dB means that the acoustical energy is multiplied by 10 - a sound of 70 dB is 10 times as intensive as one of 60 dB. However, the relative loudness of sound as perceived by the human ear does not closely match the actual relative amounts of sound energy. For example, while 70 dB is physically 10 times as intensive as 60 dB, listeners tend to judge it as only twice as loud.

Noise Compatibility Standards for Land Use in Santa Clara County



* For open space use, there are no critical noise levels listed. Homes in agricultural areas are not subject to the "Residential" standards. Public buildings in parks and open space areas shall meet noise standards as listed under "Public of Semi-Public facilities. " For open space use, theximum level of noise which a new land use may impose on neighboring open space shall be the upper limit of the "Satisfactory Noise Level."

MAJOR NOISE SOURCES

Noise sources are divided into two categories: stationary sources and mobile sources. Stationary sources emanate from a single point. Mobile sources are those that move around or can't be attributed to a single point (i.e. a plane in flight). As one moves away from a sound source, the sound level gradually decreases or attenuates. Aside from distance, a sound may be attenuated by objects which shield a potential receiver from unwanted sound.

In 1974, the County conducted a survey to determine the areas most impacted by noise. The study found that the major areas affected by noise are those located near transportation—streets, freeways, rail lines, and airports. The County has previously identified areas experiencing noise levels of 55 dB DNL or greater as "noise impact areas". Noise impact areas exist in connection with all of the identified sources.

In general, the lands not affected by transportation had readings in the 40 to 55 DNL range, with remote parks having readings in the very

low range below 40 DNL. In rural areas, general noise levels are low but specific noises are often extremely annoying (i.e., blasting from quarries, shooting ranges, power boats, and off-road vehicles may disturb the serenity of an area without significantly affecting the day-long average readings of the DNL scale.)

Noises generated by transportation are by far the most significant and persistent countywide. The affected areas along freeways and near airports have been mapped by the State of California, by the County Transportation Agency, and by the Airport Land Use Commission (ALUC). In addition, the County noise survey indicated a pattern of noise impact along several county highways. (Updated noise contour maps for areas along major transportation corridors are available for review in the County Planning Office).

AIRPORT NOISE

■ ALUC Plan and Land Use Regulations

Ensuring compatibility between aircraft noise and various types of land uses is one of the primary functions of the Airport Land Use Commission (ALUC). The ALUC's Land Use Plan for Areas Surrounding Santa Clara County Airports (ALUC Plan) includes a detailed discussion of the types of noise generated by aircraft, how the noise environment around airports is measured, how noise compatibility standards were established, and the steps being taken to control airport noise.

Several types of noise are common in the vicinity of airports. Noise generated during take-off and landing operations is most commonly the focus of neighborhood concerns, but other types of aircraft-generated noise can be a problem. Planes in flight, engine "run-up", the low frequency "rumble" of jet aircraft, or helicopter noise can be intrusive to some individuals.

The Community Noise Equivalent Level (CNEL) contours have been mapped and are used to evaluate the compatibility of various types of land uses within the noise environment surrounding the airport. These contours are also called noise zones and illustrate the reduction in acoustical energy which can be expected to occur as sound travels away from the airport.

There are however, limitations to using just the CNEL values in this case. CNEL measures noise over a 24 hour period, placing a 5 dB penalty on noises occurring from 7:00 p.m. to 10:00 p.m. and a 10 dB penalty on all noises occurring from 10:00 p.m. to 7:00 a.m. Single events may be 40 or 50 dB higher than the overall average of sounds in a given area and therefore constitute a nuisance even though the CNEL is acceptable.

The majority of complaints originating from outside of the designated noise impact areas surrounding our airports are related to single events, rather than the overall operation of the airport. Similarly, people living further from the airport than those within the 60-65 CNEL contour may hear a lower level of sound from aircraft operations, but be more irritated by it because the sound lasts longer at their location. Weather conditions can also change where sound travels. For this reason, Single Event Noise Exposure Levels (SENEL) may also be calculated for airports such as San Jose International Airport. The combination of the average noise environment as shown by the CNEL and the single event levels gives a better understanding of the noise environment that will be encountered by a proposed land use and, thus, provides a better basis for decision making.

■ Sources of Airport Noise

There are five airports in Santa Clara County, one of which is located in the rural unincorporated area. The San Martin Airport, previously named South County Airport, is located in the unincorporated area of San Martin, between the cities of Gilroy and Morgan Hill.

San Martin Airport is a Basic Utility II airport and occupies 179 acres. A Basic Utility II airport means that it can service about 75% of the single-engine and small twin-engine airplanes used for personal and business purposes. A Basic Utility II airport can also serve some small business and air taxi-type twin-engine airplanes.

■ Heliport Traffic

In addition to fixed wing aircraft, San Martin Airport is also home to several helicopter training and repair facilities. As a heliport, it is also the site of frequent helicopter training exercises by pilots of the San Jose Police Department.

Heliports may be operated for private businesses and individuals, and emergency uses. Noise at heliports is primarily produced by helicopters on takeoff or landing, in over flights, and in warm-up or cool-down procedures. Noise levels produced by individual helicopter operations may be predicted using the Federal Aviation Administration's "Helicopter Noise Exposure Curves for Use in Environmental Impact Assessment" (Report No. FAA-EE-82-16), or by computer models developed by the FAA for airports (e.g., the Integrated Noise Model, or INM) and for heliports (e.g., the Heliport Noise Model, or HNM).

The noise levels associated with operations at a given heliport will depend upon flight tracks, the helicopter types used, the number of operations, and the time of day during which operations occur. Each of these aspects of heliport operation must be defined to assess the potential noise impacts upon noise-sensitive land uses.

Recommended Maximum Interior Noise Levels For Intermittent Noise

Use		dBA
Residential		45
Commercial		
	Hotel-Motel	45
	Executive Offices, Conference Rooms	55
	Staff Offices	60
	Restaurant, Markets, Retail Stores	60
	Sales, Secretarial	65
	Sports Arena, Bowling Alley, etc.	75
Industrial		
	Offices (same as above)	55-60
	Laboratory	60
	Machine shop, Assembly and others	75
	Mineral Extraction	75
Public or Semi-Public Facility	Concert Hall & Legitimate Theater	30
	Auditorium, Movie Theater & Church	45
	Hospital, Nursing Home & Firehouse (sleeping quarters)	45
	School Classroom	50
	Library	50
	Other Public Buildings	55

Strategies, Policies, and Implementation

The strategies below affirm the County's intent to continue its efforts to ensure an environment for all unincorporated area residents that is free from unwanted noise which jeopardizes their health and well-being.

The State has researched the impacts of differing noise levels on a variety of land uses, as have the Federal government and local jurisdictions. Based on those studies, noise standards for interior living spaces have been incorporated into a County Noise Ordinance. Standards for multifamily units are also incorporated into both State Law -Title 24 and the Uniform Building Code (UBC). The UBC standards have been adopted by the County.

Strategy #1: Minimize Noise Conflict

Given that many types of land uses must coexist in the unincorporated county, the challenge for planning is to achieve maximum compatibility. Land use planning and development review must carefully evaluate the noise producing potential of new development. Where that potential exceeds acceptable limits, steps must be taken to minimize impacts on both existing and projected surrounding uses.

Parts of the rural Santa Clara County are developed, although at very low density. Many rural residents have chosen to live in these areas precisely for the quiet character. New uses proposed for such areas need to be carefully assessed for the noise inducing potential. Adequate distancing alone can often mitigate most noise impacts which would otherwise be intolerable in more densely developed areas. However, further measures may be necessary to ensure that the quality of life for residents is not unduly degraded.

Conversely, the noise of tractors and other farm machines are common in rural agricultural areas. In the interests of sustaining long term agriculture, a major economic as well as a land use objective for the County, it is important that noise-sensitive, non-agricultural uses be kept away from farming areas or that noise buffering measures be integrated into those non-agricultural projects.

➔ *Policies and Implementation*

R-HS 1
Significant noise impacts from either public or private projects should be mitigated.

R-HS 2
The County should seek opportunities to minimize noise conflicts in the rural areas.

R-HS 3
New development in areas of noise impact (areas subject to sound levels of 55 DNL or greater) should be approved, denied, or conditioned so as to achieve a satisfactory noise level for those who will use or occupy the facility (as defined in "Noise Compatibility Standards for Land Use" and "Maximum Interior Noise Levels For Intermittent Noise").

Implementation Recommendations

R-HS(i) 1
Project design review should assess noise impacts on surrounding land uses. (Implementor: County)

R-HS(i) 2
Where necessary, require appropriate noise mitigations. (Implementor: County)

R-HS(i) 3
Prohibit construction in areas which exceed applicable interior and exterior standards, unless suitable mitigation measures can be implemented. (Implementors: County)

R-HS(i) 4
Require project-specific noise studies to assess actual and projected dB noise contours for proposed land uses likely to generate significant noise. (Implementors: County)

R-HS(i) 5
Take noise compatibility impacts into account in developing local land use plans. (Implementors: County)

R-HS(i) 6
Incorporate acoustic site planning into the design of new development, particularly large scale, mixed use, or master planned development, through measures which may include:

a. separating noise sensitive buildings from noise generating sources;
b. using natural topography and intervening structure to shield noise sensitive land uses; and
c. adequate sound reduction within the receiving structure.

(Implementors: County, architects and developers)

R-HS(i) 7
Support continued contacts (i.e., a task force, public education, speaking opportunities) between farming and non-farming interests toward enhancing the compatibility of rural area uses.
(Implementors: County, Farm Bureau, farming interests, community and real estate industry representatives)

Strategy #2:
Minimize Exposure to Airport Noise

With regard to airports, the Airport Land Use Commission (ALUC) is charged with providing guidance to local jurisdictions to insure that land uses established in the vicinity of airports are compatible with the noise environment. The primary vehicle for this guidance is the ALUC Plan. In determining appropriate uses for areas adjacent to county airports, ALUC has given serious consideration to noise, particularly noise which might interfere with speech or sleep, and those noises which might lead to excessive stress.

State law mandates that the County's general plan be consistent with local ALUC Plans. The most effective way to ensure consistency is to defer to ALUC policies and standards for development on or adjacent to airports in the rural unincorporated area.

Policies and Implementation

R-HS 4
Land uses approved by the County and the cities shall be consistent with the adopted policies of the Santa Clara County Airport Land Use Commission's Comprehensive Land Use Plan.

Implementation Recommendations

R-HS(i) 8
Adhere to the adopted policies and standards in the Santa Clara County Airport Land Use Commission's Comprehensive Land Use Plan when making decisions regarding land use adjacent to airports.

Natural Hazards

Summary

NATURAL HAZARDS AND THE ROLE OF LOCAL GOVERNMENT PLANNING

■ Public Safety Issues Addressed in the General Plan

Protection of public safety is one of the principal, if not foremost, responsibilities of local government. The major types of natural hazards addressed in this section of the Rural Unincorporated Health & Safety chapter include those which affect physical growth and development:

- geologic and seismic hazards;
- fire hazards; and
- flood hazards.

■ Principles Guiding Land Use and Development Regarding Natural Hazards

Some kinds of hazards addressed within the General Plan are avoidable or manageable. They may only pose a risk to life and property if development is proposed in an area unsuitable for it, such as on an active or potentially landslide, or saturated soils. Other hazards, such as earthquake hazards, are inherent to life in the Bay Region, and these must be addressed in ways which mitigate but which cannot completely eliminate the risks associated with the hazard.

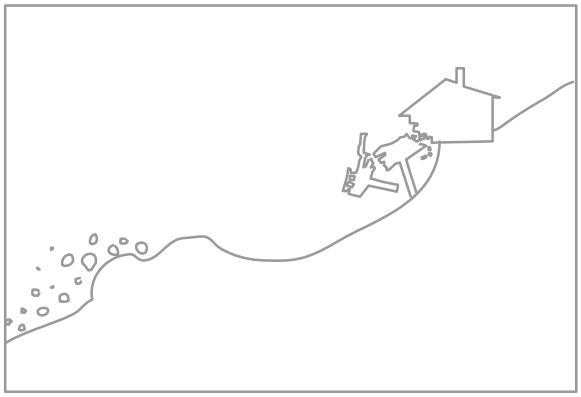
The following overall principles guide the actions and policies of the County regarding natural hazards:

- No individual or public agency should be allowed to take actions which impose significant, demonstrable risks on neighboring properties or upon the community at large.
- No individual involved in the subdivision, construction, occupancy or subsequent purchase of developed land in hazardous areas should be placed in jeopardy through failure of the County to adequately assess and mitigate the risks of a development proposal, private or public.
- Private development in hazardous areas should not be allowed to impose a fiscal burden on the general taxpayer by locating structures or improvements where they are likely to require public expenditure above that normally expected for routine maintenance to protect public safety and welfare.

STRATEGIES FOR MANAGING RISKS OF NATURAL HAZARDS

Given the variety of significant natural hazards to which Santa Clara County is subject and the aforementioned guiding principles, the general approach or strategies outlined in the General Plan for the protection of public health, safety and welfare include the following:

Strategy #1: Inventory Hazards And Monitor Changing Conditions
Strategy #2: Maintain Low Resident Population Densities Within High Hazard Areas
Strategy #3: Design, Locate And Regulate Development To Avoid Or Withstand Hazards
Strategy #4: Reduce The Magnitude Of The Hazard, If Possible
Strategy #5: Provide Public Information Regarding Natural Hazards



Background

LAND INSTABILITY HAZARDS

The most significant types of general geologic hazards, or hazards of land instability, that affect the rural unincorporated areas are:

- slope instability, such as landslides, mudslides, and soil creep;
- expansive clays;
- peat and other highly organic soils; and
- Bay muds and saturated soils.

In some instances, hazards of land instability may occur or increase in severity in association with the effects of an earthquake, saturation during prolonged heavy rains, and other factors. Each is briefly discussed below for its potential impacts upon development.

■ Slope Instability: Landslides and Soil Creep

The two major types of slope instability addressed within the General Plan are landslides and soil creep. Though related phenomena, landslide potential is generally of greater concern to land use and development planning, because it poses a greater hazard to development and infrastructure. Much of the east foothills of the Diablo Range are subject to slope instability, as are much of the Santa Cruz Mountains, which are generally steeper than the Diablo Range.

Landslide potential is one of the most significant types of land instability that affects development in the rural area, especially in the steeper areas of the county. Much of the rural unincorporated area is characterized by moderate-to-steep slopes. Depending on the steepness of the slopes, the soils, and the underlying geology, among other factors, there may be little or no tendency for slope failure, or active landslides may be fairly common.

The popular connotation of the term 'landslide' is one of catastrophic events such as debris flows or "rock slides." However, the typical active landslide may move fairly slowly, but inexorably, downhill at a rate of a few inches per year, potentially taking roads, driveways, utilities, and structures with them over the long term. In the short term, structures on active landslides may suffer foundation damage, structural separation, uneven settlement, damage to water pipes and other utilities, and other effects that cumulatively pose a major risk to life and property.

On the other hand, soil creep is a form of slope failure characterized by very slow, differential downhill settlement of a slope over a given area. Soils "creep" downhill due to differential rates of expansion and contraction and simply due to gravity. On most slopes steep enough to experience soil creep, the depth of material is not thick enough nor the rate of creep rapid enough to pose a significant hazard to development. However, creep rates of 0.5 inches per year have been observed on slopes as low as 8 degrees, or about 15%.

Active landslides may be confined to a relatively small geographic area, or consume hundreds of acres. Landslides may also vary considerably in thickness. If the overall rate of movement is significant and the mass and thickness of the slide is very great, there may be no cost effective engineering solution that can stabilize the part of the slope on which the building or improvement is located. In such cases, the only feasible and safe solution is an alternative location for development.

In other situations, such as with soil creep, geologic studies may indicate that with only a few simple engineering modifications, such as reinforcing walls and drainage improvements, it may be possible to stabilize a slope and build without jeopardizing lives, the structures themselves or potentially incurring long term maintenance costs. Nevertheless, as a general rule, active landslides have proven to be unsuitable building sites.

Slope failures can result from natural and human causes. Streams may undercut hillsides or rains may saturate an unstable area and reduce the cohesiveness of the soils. Other causes include:

- removal of vegetation;
- oversteepening of hillsides from construction or grading activity;
- undercutting a landslide area by removing earth from the bottom or 'toe' of the slide;
- saturation from septic tanks; and
- vibration, from earthquake or other causes.

Areas of existing and past landslide activity (dormant areas) are not the only areas susceptible to slope failure; landslides can also occur in areas that have not demonstrated slope instability, particularly as a result of heavy precipitation and/or seismic activity.

■ Expansive Clays

Expansive clays are a natural phenomenon often encountered in development. Engineering methods are now commonly available to overcome the effects of expansive clays, which can exert powerful forces on building foundations as they shrink and swell with the change in moisture content through the year. The so-called "shrink/swell" phenomenon can effect the foundations of even very massive structures in some cases, but generally can be mitigated satisfactorily by engineering design.

■ Peat, Organic Soils, Bay Muds and Saturated Soils

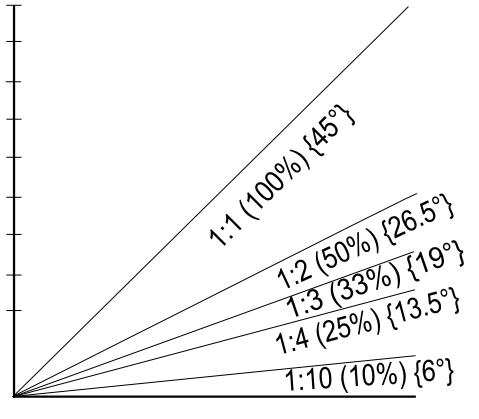
Various soil conditions can contribute to the instability of building foundations. Peat and other highly organic soils found in the Baylands areas are easily compressed or saturated by structures or earthen fills placed upon them. Unconsolidated bay muds and other saturated, fine-grained soils can also compress easily under the weight of structures and may settle at uneven rates. Most of these soils and sub-surface conditions occur within the Baylands areas of the County and in certain stream and valley areas with high water tables.

SEISMIC HAZARDS (EARTHQUAKE)

Perhaps no other natural hazard holds as much potential for catastrophic impacts as earthquakes. The Bay Area is one of the most seismically active areas in the United States. The potential for devastation is compounded by the unpredictability of earthquakes. Unlike other potentially catastrophic phenomenon, such as hurricanes, earthquakes cannot yet be accurately or reliably predicted as to their location or timing. To the extent that structures can be designed and constructed to withstand earthquakes, the risk to life and property can be somewhat mitigated. However, for older structures, structures located directly on faults or landslides, or those not built in conformance to modern building safety standards, the risks are significant.

Three major fault systems occur in Santa Clara County, the San Andreas, located in the Santa Cruz Mountains, and the Hayward and Calaveras, located within the foothills of the Diablo Range. (The Calaveras is not considered an active fault). Numerous other faults have been identified and mapped, such as the Sargent Fault and Crosley Fault. In all, 10 earthquake faults have been designated as active faults by the County.

Illustration of Slope Percent



Rise Ratio (percent) {Degree}

■ Effects of Earthquakes

When an earthquake occurs, waves of energy are transmitted through the earth, resulting in a variety of seismic effects, including:

- ground motion or shaking,
- ground failure,
- surface rupture or displacement along faults, and
- water movements due to earthquakes.

Each of these creates the potential for extensive and costly damage to buildings, infrastructure, and for loss of life. Under conditions of saturated soils, common during the winter rainy season, the effects of earthquakes and seismically-induced landslides are greatly increased.

The most recent earthquake to affect the Bay Area was the Loma Prieta quake of 1989. It measured 7.1 on the Richter scale, a moderate-to-heavy quake, and caused 62 fatalities and over $6 billion damage. It occurred near a segment of the San Andreas Fault which extends roughly from Watsonville northwest to Los Gatos. The epicenter was removed from major population centers, but it caused extensive damage to masonry structures in such places as Los Gatos, Santa Cruz, and Watsonville, as well as causing the collapse of the Cypress Structure along I-880 in Oakland, among other notable impacts.

Since that time, the United State Geological Survey, in conjunction with other scientists, have forecast that there is a 67% chance for at least one earthquake of magnitude 7 or higher in the San Francisco Bay Area between 1990 and 2020. If the forecast proves accurate, and an earthquake occurs closer to population centers, the effect on major urban areas is expected to be far more pronounced than that of Loma Prieta, and most current residents of Santa Clara County will experience it within their lifetimes.

Earthquake Magnitudes and Events

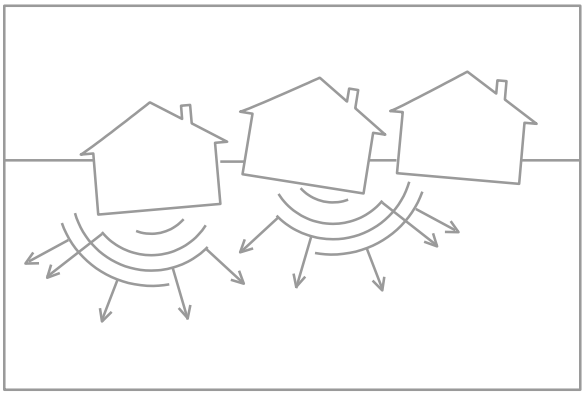
The most recent earthquake in the Bay Area to do significant damage was Loma Prieta in 1989, which registered 7.1 in magnitude on the Richter scale. Magnitude is measured by instruments which record the amplitude of various types of energy waves transmitted by the earthquake and the "g" forces of acceleration caused by the earthquake. The Richter scale is the most commonly used to describe the scale of an earthquake.

The scale is logarithmic, meaning that an earthquake of magnitude 7 creates ground motion roughly 10 times greater than one of magnitude 6, and a quake of magnitude 8, like the 1906 earthquake (8.3), creates ground motion 100 times greater than a 6. The logarithmic nature of the scale tends to obscure the fact that a magnitude 7 quake generates roughly 30 times the energy of an event of magnitude 6. Consequently, the 1906 earthquake, assumed to be well over magnitude 8, generated 900 to 1000 times the energy of a magnitude 6 earthquake. Quakes of magnitude 8 may result from fault ruptures over several hundred miles and affecting more than one segment of a fault, whereas lesser magnitude quakes tend to result from fault ruptures of more localized nature.

Forecasters predict that another quake like the 8.3 event of 1906 is not as likely in the next 30 years as one of 7.0 to 7.5 magnitude in the Bay Area. Nevertheless, even another 7.0 or 7.1 quake like Loma Prieta will cause much more damage and loss of life if the epicenter is located closer to urban areas than Loma Prieta. Loma Prieta serves notice that our preparedness and response capabilities will be severely tested by such a seismic event.

■ Ground Shaking

Ground shaking is the term used to describe the phenomenon most readily associated with earthquakes. Depending on the magnitude of the earthquake and the distance from the epicenter, shaking may be experienced as a violent shuddering or rocking motion or the gentlest of nudges. Displacement of the earth may be vertical, horizontal, in rolling waves, or in combinations given the intensity of the quake and the geology and soils of the area. The duration of the ground shaking also affects the extent of structural damage, although less so for buildings constructed to modern seismic standards. Aftershocks may occur for several days that closely approximate the energy of



the original quake, further damaging buildings and infrastructure, as the tensions within the fractured rocks along the fault are released.

Studies indicate that the most severe impacts of ground shaking occur on fine, unconsolidated soils and fills, especially those for which bedrock lies at great depths. These conditions occur in the areas of most recently deposited soils and filling near the Bay, as well as throughout the alluvial soils of the Santa Clara Valley. Valley soil deposits may be several hundred feet deep before consolidated bedrock is encountered.

The other areas that tend to be subject to the greatest acceleration forces are ridgelines in the immediate vicinity of the fault that ruptures during an earthquake. Even ridges underlain by relatively stable, unfractured bedrock may experience the most violent initial shaking in the area nearest the epicenter, but in general, the more stable the bedrock in a given area, the less prolonged the ground motion tends to be.

■ Ground Failure

Seismically-induced ground failure is a very general term including landsliding, lateral spreading, differential settling, and liquefaction of soils. Landslides are frequently triggered by earthquakes, and may be increased under saturated soil conditions which reduces the natural cohesiveness of some soils.

Soft, fine-grained alluvial and water saturated soils tend to spread and liquefy during earthquakes, such as the natural soils near creeks and streams, as well as many areas composed of earth fill around the edge of the San Francisco Bay. Building foundations may fail suddenly if located on such lands during a significant earthquake. For example, much of San Francisco's Marina District suffered extensively from the liquefaction and differential settling of the earth fills on which it is located during the 1989 Loma Prieta quake. Liquefaction and lateral spreading were reported in the South Santa Clara Valley during the 1906 quake, especially near streams.

■ Surface Rupture

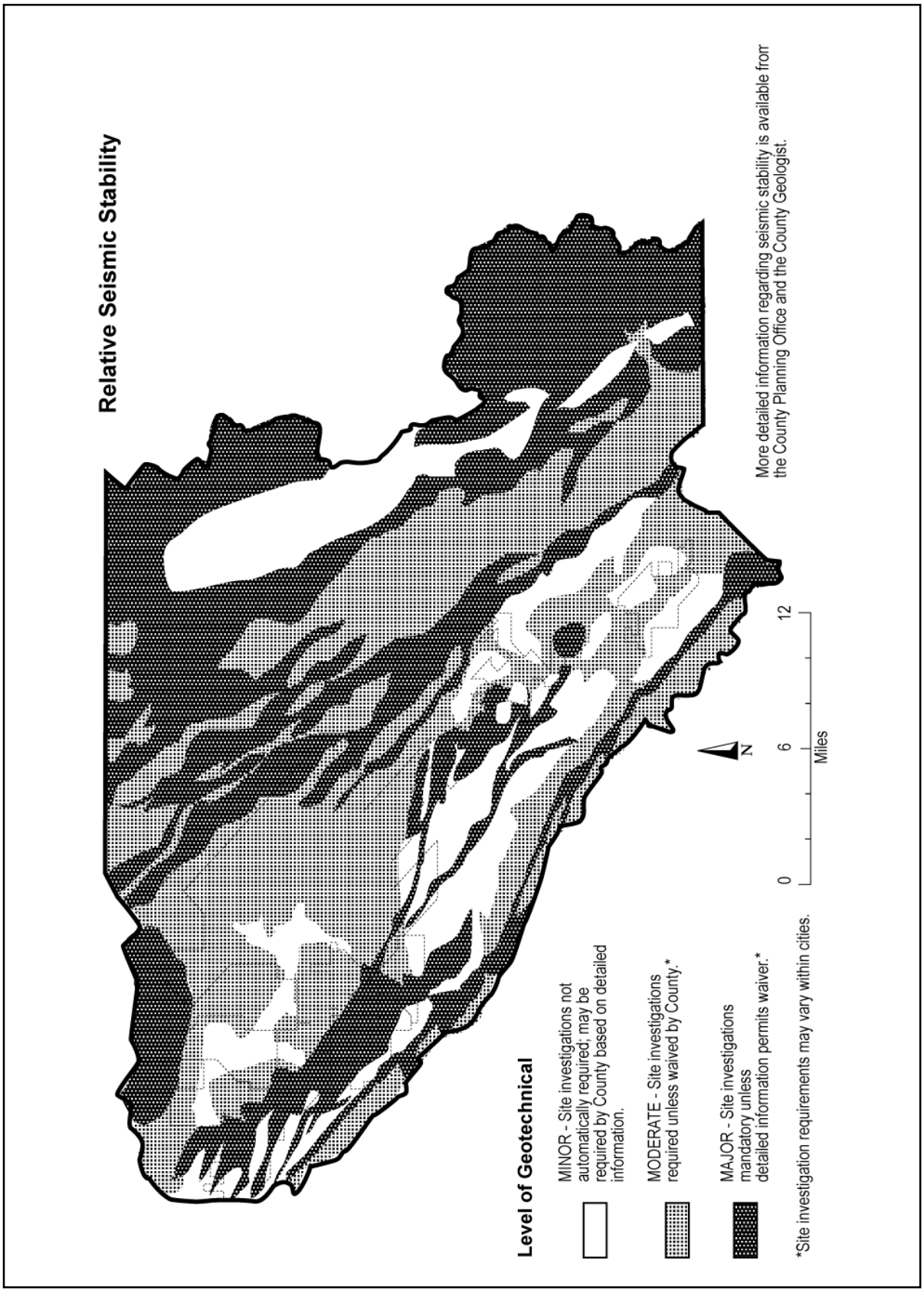
When cracks appear in the ground surface, the phenomenon is referred to as surface rupture. This effect is fairly common as a result of moderate to heavy and earthquakes and may cause structural damage to building foundations, roads and infrastructure. The phenomenon is most common within the vicinity of the main fault trace and along other faults associated with the main fault, such as thrust faults.

Cracks in pavement offer the most dramatic evidence of surface rupture, as when a road surface is displaced by several feet by a surface rupture. Even minor ruptures of this kind can make rural mountainous area roads impassable and damage other infrastructure.

■ Water Movements and Potential Dam Failure

The threat to Santa Clara County of a tsunami originating from an earthquake at sea is minimized by the distance of the tidal areas of South San Francisco Bay from the Golden Gate. However, landslide-induced splash waves and oscillatory waves called 'seiches' within closed water bodies such as reservoirs may pose a danger to the impoundment structure and to nearby structures.

Most all the impoundments in Santa Clara County are of compacted earthfill construction, which should withstand the impact of a moderate earthquake. For dams which were not originally constructed to withstand an 8.5 magnitude quake, the Santa Clara Valley Water District continues its ongoing program to test dam safety and provide appropriate retrofitting. Structural modification to the dam, enlarging


Relative Seismic Stability
More detailed information regarding seismic stability is available from the County Planning Office and the County Geologist.
Level of Geotechnical
MINOR - Site investigations not automatically required; may be required by County based on detailed information.
MODERATE - Site investigations required unless waived by County.*
MAJOR - Site investigations mandatory unless detailed information permits waiver.*
*Site investigation requirements may vary within cities.
N
0
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Miles

spillways, and even reducing the maximum water level are means being employed to assure dam safety.

FIRE HAZARDS

Fire is a naturally-occurring phenomenon with a constructive role to play in the natural ecology of much of California. It regulates understory brush and vegetation growth, provides new growth on which many wildlife may feed, and in the case of some conifers, is required in order for cones to release their seeds and allow reproduction. Most fires in Santa Clara County's rural areas are the result of human causes, such as arson, careless cigarette disposal, or even sparks from motor vehicles or other power tools or equipment.

■ Relative Fire Hazard Ratings for the Rural Unincorporated Areas

Much of the mountainous areas of Santa Clara County are considered "high or extreme fire hazard areas," due to a variety of factors, including:

- climatic factors, such as rainfall, humidity, and wind patterns,
- the amount of naturally-occurring "fuel" for fires, such as brush, dead trees, and grasses that ignite easily and burn hotly;
- steepness of slopes; and
- inaccessibility and lack of available water supplies for fire suppression.

The "fire season" in California usually begins in May or June, when vegetation has dried out from winter rains and growth, and it extends through November or such time as the first seasonal rains occur. The time of greatest danger is usually during the late summer and early fall, when heat and very low relative humidity create conditions ideal for the spread of wildfire. During this period, daily alerts or warnings may be issued of high fire danger, cautioning the public to curtail activities which could cause damaging wildfires.

Many existing residential communities in the rural unincorporated areas are located in areas of extreme fire hazards. In the Bay Areas, the most recent event to demonstrate the awesome destructive potential of wildfire in high hazard areas was the Oakland Hills fire of 1991. In addition to the many fatalities, over 3,000 homes were destroyed. The fires were of such a magnitude and ferocity they were beyond the control of local fire-fighting capabilities.

Several areas of Santa Clara County are also similarly situated, including the Lexington Hills residential area above Lexington Reservoir. Although population and building densities in these rural communities are less than in the Oakland Hills area, the hazard potential is similar, and in some of the more remote mountainous areas of the county, access and water supply are even more restricted.

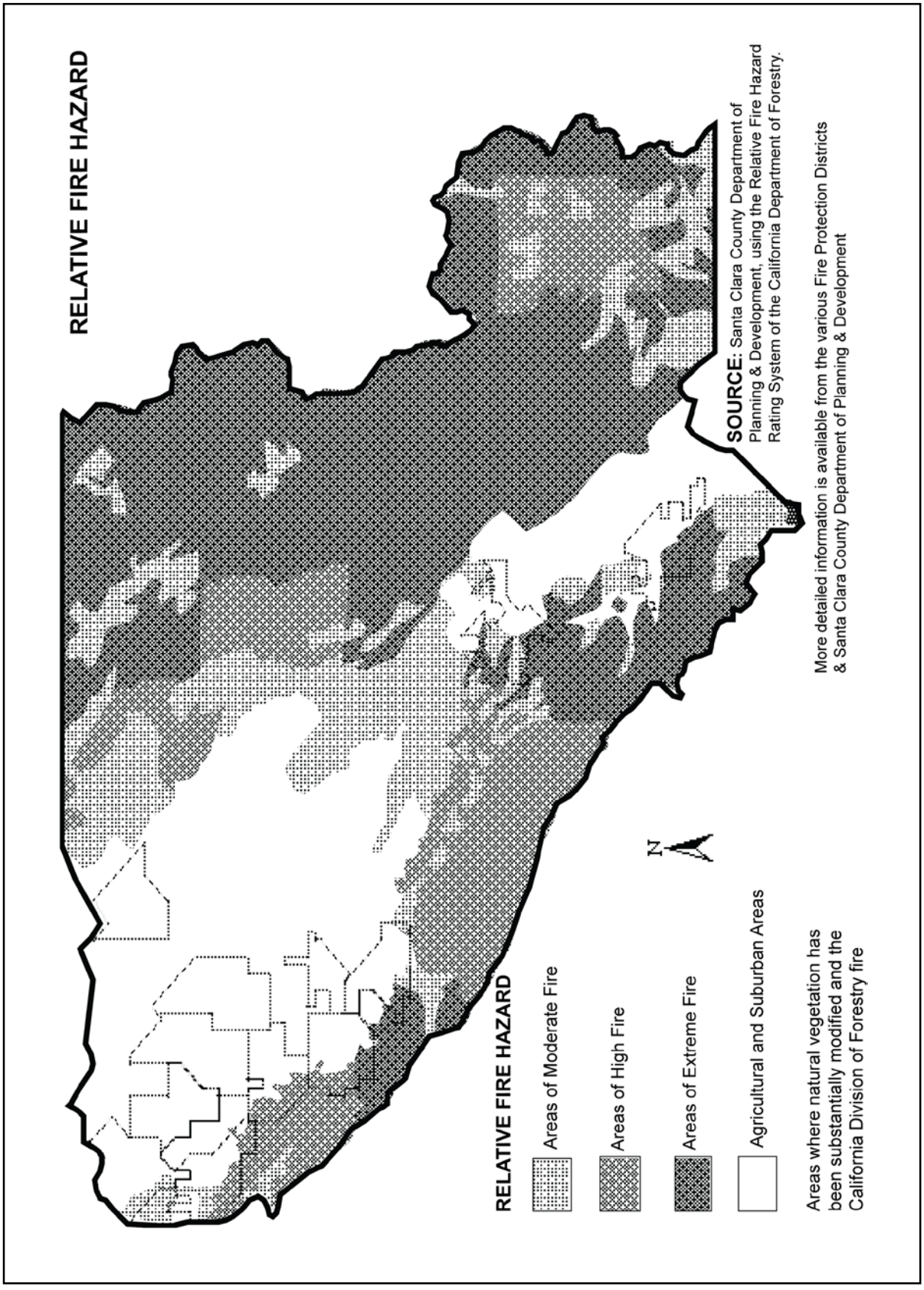
■ Fire Protection Services

The major fire hazard scenarios of concern to protection agencies are residential fires that start in the home with potential to spread to outlying areas and neighboring structures, and wildfires in natural areas which may pose a threat to life and property. The major limitations upon fire-fighting capabilities within the rural areas are limited accessibility, long travel distances and response times, and water supply limitations.

Protection services are distributed among five main service providers:

- Saratoga Fire District;
- Central Fire District;
- Los Altos Fire District;
- South County Fire District; and
- the California Department of Forestry, who provides services from approximately May through November of each year for areas unprotected by service districts. These areas are referred to as "State Responsibility Areas", or SRAs.

In addition, the County administers the Weed Abatement program as part of the overall effort to reduce fire potential.


RELATIVE FIRE HAZARD
SOURCE: Santa Clara County Department of Planning & Development, using the Relative Fire Hazard Rating System of the California Department of Forestry.
More detailed information is available from the various Fire Protection Districts & Santa Clara County Department of Planning & Development
RELATIVE FIRE HAZARD
Areas of Moderate Fire
Areas of High Fire
Areas of Extreme Fire
Agricultural and Suburban Areas
Areas where natural vegetation has been substantially modified and the California Division of Forestry fire
N

FLOOD HAZARDS

A variety of flood hazards pose a threat to public safety and property, such as:

- stormwater flooding,
- tidal flooding along the Bay, and
- inundation due to dam failure.

■ Stormwater Flooding

Stormwater flooding has been a long and continuing problem for much of the County ever since permanent settlement of the valley floor began. In the rural unincorporated areas, the most extensive flood problems occur in the South County, where well over half of the valley floor would be inundated by a 100-year, or 1% flood, including much of San Martin. Flood waters do not have to resemble torrential flows to produce great economic losses. The damage to utilities, roads, building foundations, crops and other properties can be significant from even a foot of standing water.

Generally poor drainage in local areas has also been a major issue over time. Drainage and flood control facilities for the South County continue to be constructed by the Santa Clara Valley Water District as funding permits, but many areas still experience persistent drainage problems.

■ Tidal Flooding

Part of the North County is subject to saltwater flooding from the Bay. Tidal flooding may occur due to levee failure or overtopping as a result of exceptionally high tides, and/or excessive precipitation. Its severity may be increased in areas that have subsided due to overdrafting of groundwater basins. The levees used to create salt evaporation ponds provide some protection from tidal flooding, and historically, there has been little impact from tidal flooding as far inland as Alviso or the San Jose/Santa Clara Water Pollution Control Plant. Over the long term, were sea levels to rise due to global warming, the potential for tidal flooding could become more significant.

■ Inundation Due to Dam Failure

Inundation due to dam failure may create major life and property losses in the area immediately downstream from the dam. The areas affected by such catastrophes have been mapped by the Santa Clara Valley Water District. Strengthening and modifications to dams and spillways that will ensure the structural safety of the reservoirs in Santa Clara County is an ongoing effort of the Water District. For the rural areas, open space uses, such as agriculture, are generally prescribed for areas subject to potential inundation from dam failure.

MAJOR PUBLIC POLICY OBJECTIVES REGARDING NATURAL HAZARDS

■ Protecting Public Safety and Property

Chief among public policy objectives is of course the protection of life and property from natural hazards. Primary examples include building codes intended to increase the ability of structures to withstand earthquakes; flood control projects; and public safety agencies' capability to respond adequately to hazards when they occur.

■ Minimizing Fiscal Impacts of Hazards

Of secondary but considerable importance is the issue of fiscal impacts of natural hazards to the County and the taxpayers. In times of fiscal strain, local governments are placed under even greater burdens by the costs of responding to major fires, floods, or earthquake-induced damages. Therefore it is important that land use policies help minimize the potential fiscal impacts of natural hazards, which are of several types:

- ongoing maintenance and repair costs, such as the costs of maintaining roads that are located in areas repeatedly impacted by landslides;
- emergency response costs, such as rescue operations, fire suppression activities, equipment costs, and staff overtime costs; and
- post-emergency or disaster costs, such as building inspection operations, rebuilding public infrastructure, and loss of governmental revenue from reduced sales and property tax.

Strategies, Policies and Implementation

Given the prevalence of natural hazards common to many portions of the rural unincorporated areas of Santa Clara County, the General Plan contains the following strategies or major policy directions to protect public health and safety:

Strategy #1: Inventory Hazards And Monitor Changing Conditions
Strategy #2: Maintain Low Resident Population Densities Within High Hazard Areas
Strategy #3: Design, Locate And Regulate Development To Avoid Or Withstand Hazards
Strategy #4: Reduce The Magnitude Of The Hazard, If Possible
Strategy #5: Provide Public Information Regarding Natural Hazards

➔ ***Policies and Implementation***

R-HS 5
Strategies for reducing the threat of natural hazards to life and property within rural unincorporated areas shall be to:
1. Inventory hazards and monitor changing conditions.
2. Maintain low resident population densities within high hazard areas.
3. Design, locate and regulate development to avoid or withstand hazards.
4. Reduce the magnitude of the hazard, if possible.
5. Provide public information regarding natural hazards.

➔ ***Strategy #1: Inventory Hazards And Monitor Changing Conditions***

Adequate documentation of natural hazard areas, such as flood plains, active landslide areas, fault traces, and high fire hazard areas is essential for purposes of determining appropriate densities for general areas and for determining the appropriate placement of structures such as schools, homes, landfills, and other land uses.

Although some natural features change very little over time, such as the location of fault traces, others must be regularly updated. For example, as new flood control projects are completed, some areas previously subject to a 100 year flood may be removed from that classification. As conditions change, the County's inventories and mapping must be updated to provide an adequate basis for decision-making.

➔ ***Policies and Implementation***

R-HS 6
Inventories and mapping of natural hazards shall be adequately maintained for use in planning and decision-making, including:
a. Relative Seismic Stability Map;
b. Composite Geologic Hazards Map;
c. Soil Creep;
d. Saturated, Unstable Soils;
e. Slope Maps;
f. Flood Hazards maps;
g. Relative Fire Hazard Rating;
h. Dam Failure Inundation Areas maps;
i. Airport Safety Zones; and
j. closed Solid Waste Disposal Sites.

Flood Hazards mapping includes those required by AB 162 as developed from required sources, including FEMA flood maps, California Department of Water Resources (DWR), and the Santa Clara Valley Water District (SCVWD).

Implementation Recommendations

R-HS(i) 9
Support ongoing efforts to develop and convert hazard-related spatial data to GIS digital format.

Strategy #2: Maintain Low Resident Population Densities Within High Hazard Areas

Given the hazards and topography of the more mountainous regions of the County, it is not uncommon to find that an individual parcel in the rural areas is subject to a variety of natural hazards. For example, most of the mountainous areas are classified as high or extreme fire hazard areas and many areas also contain geologic or seismic hazards. In the South Valley, areas are prone to regular flooding or poor localized drainage that are also least stable during earthquakes.

To minimize risks to resident populations in high hazard areas, the General Plan prescribes relatively low densities of development throughout the rural areas. Limited accessibility is a primary factor. Access in some of the more remote areas is often limited to narrow, dead end roads. In the event of a wildfire or earthquake which closes access roads, large areas may be isolated from assistance other than by air. Emergency response times are increased, and evacuation plans may be impossible to implement. Other concerns, as mentioned in the Summary of this section, involve public financial responsibility for maintaining and repairing roads and other infrastructure which may traverse hazardous areas, such as fault traces or active landslides. In the event that such roads or utilities suffer major damage and have to be repaired or relocated, major unplanned public expenses may be the result.

Policies and Implementation

R-HS 7
Areas of significant natural hazards, especially high or extreme fire hazard, shall be designated in the County's General Plan as Resource Conservation Areas, with generally low development densities in order to minimize public exposure to risks associated with natural hazards and limit unplanned public costs to maintain and repair public infrastructure.

R-HS 8
Areas of persistent flooding and areas of potential inundation from dam failure shall generally be designated for agricultural land uses or other suitable open space use.

Strategy #3: Design, Locate And Regulate Development To Avoid Or Withstand Hazards

Beyond the issue of general land use densities, the design, construction, and location of development can in many cases significantly reduce the risk associated with some natural hazards. Building codes play a major role in assuring the safety of structures from seismic hazards, and subdivision design can avoid placement of building sites within areas subject to slope failure or other geologic constraints. The general policies of the County listed below provide the basis for more detailed policies that follow which address specific types of hazards.

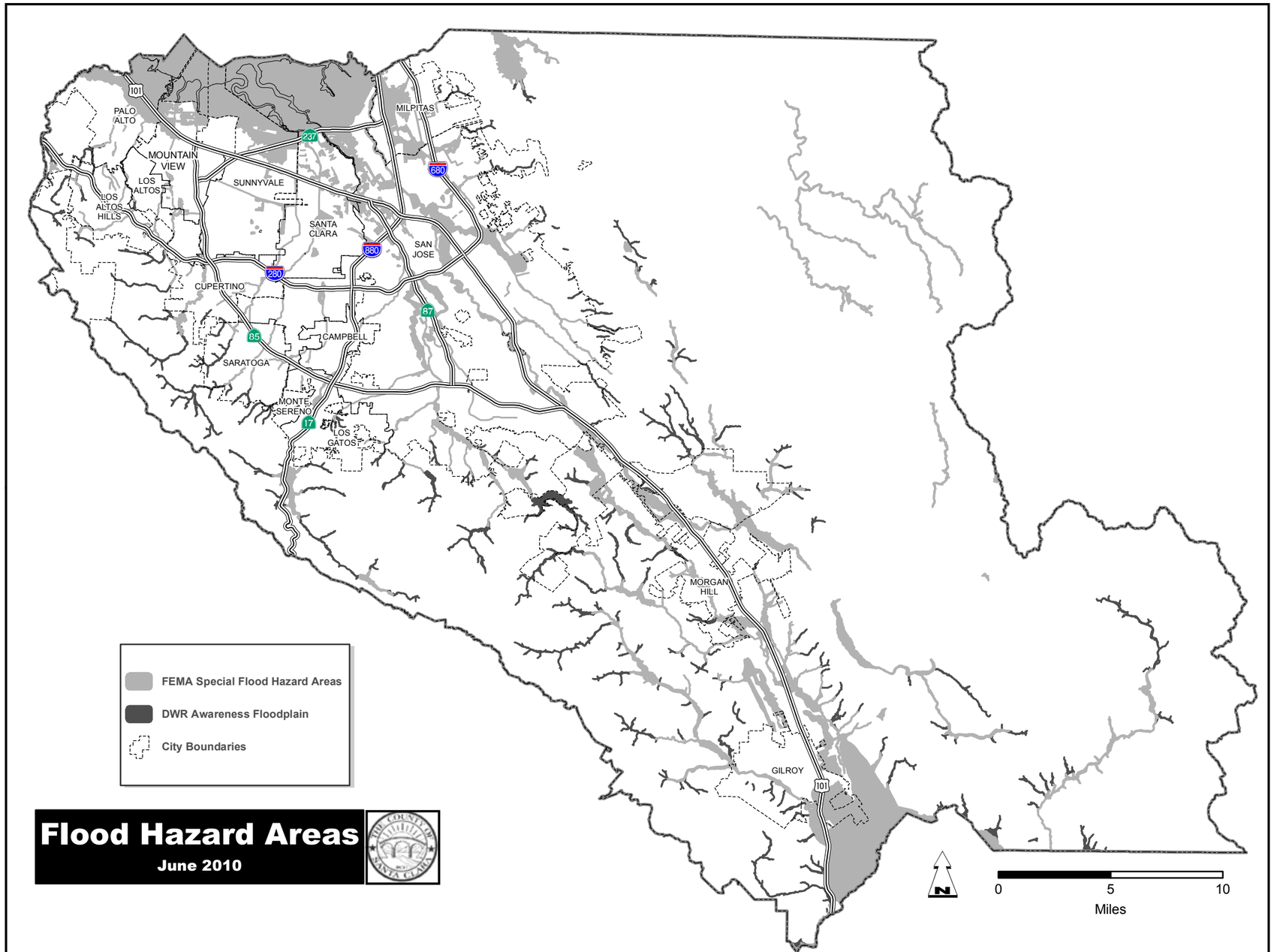
Policies and Implementation

R-HS 9
Development in rural unincorporated areas affected by natural hazards should be designed, located, and otherwise regulated to avoid or reduce associated risks to an acceptable level:

1. In areas of highest potential hazard, such as floodways, active landslides, fault traces, and airport safety zones, no new habitable structures shall be allowed.
2. In other areas of lesser hazards, there shall be no major structures for involuntary occupancy, such as schools, hospitals, correctional facilities or convalescent centers.

R-HS 10
In all hazard areas, projects shall be designed and conditioned to avoid placement of structures and improvements where they would:

a. be directly jeopardized by hazards;
b. increase the hazard potential; and/or,
c. increase risks to neighboring properties.



Flood Hazard Areas

June 2010

Federal Emergency Management Agency Special Flood Hazard Areas

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year, and a 26% chance of flooding over the life of a 30-year mortgage. Areas of Special Flood Hazard include Zones A, AE, AH, AO, and VE. Mandatory flood insurance purchase requirements apply to all of these zones, which is administered by the National Flood Insurance Program (NFIP).

Department of Water Resources Awareness Floodplain

Created by the California Department of Water Resources, the intent of the Awareness Floodplain Mapping project is to identify all pertinent flood hazard areas that are not mapped under the FEMA NFIP. The awareness zones identify the 100-year flood hazard areas using approximate assessment procedures and are shown simply as flood prone areas without specific depths and other flood hazard data. These zones are not FEMA regulatory floodplain maps.

Sources:

The GIS data used for the FEMA Special Flood Hazard Areas was obtained April 2009 from the FEMA Map Service Center (msc.fema.gov). The Effective Date of the data is May 18, 2009

The GIS data used for the DWR Awareness Floodplain was obtained April 2009 from the California Department of Water Resources at (www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/awareness_floodplain_maps/santa_clara/). Thirteen of the 34 quadrangles that comprise the County were not available as of this map publication. These include Mountain View, Milpitas, San Jose West, and 10 other quads located in the far east portion of the County.

This map is available online at sccplanning.org

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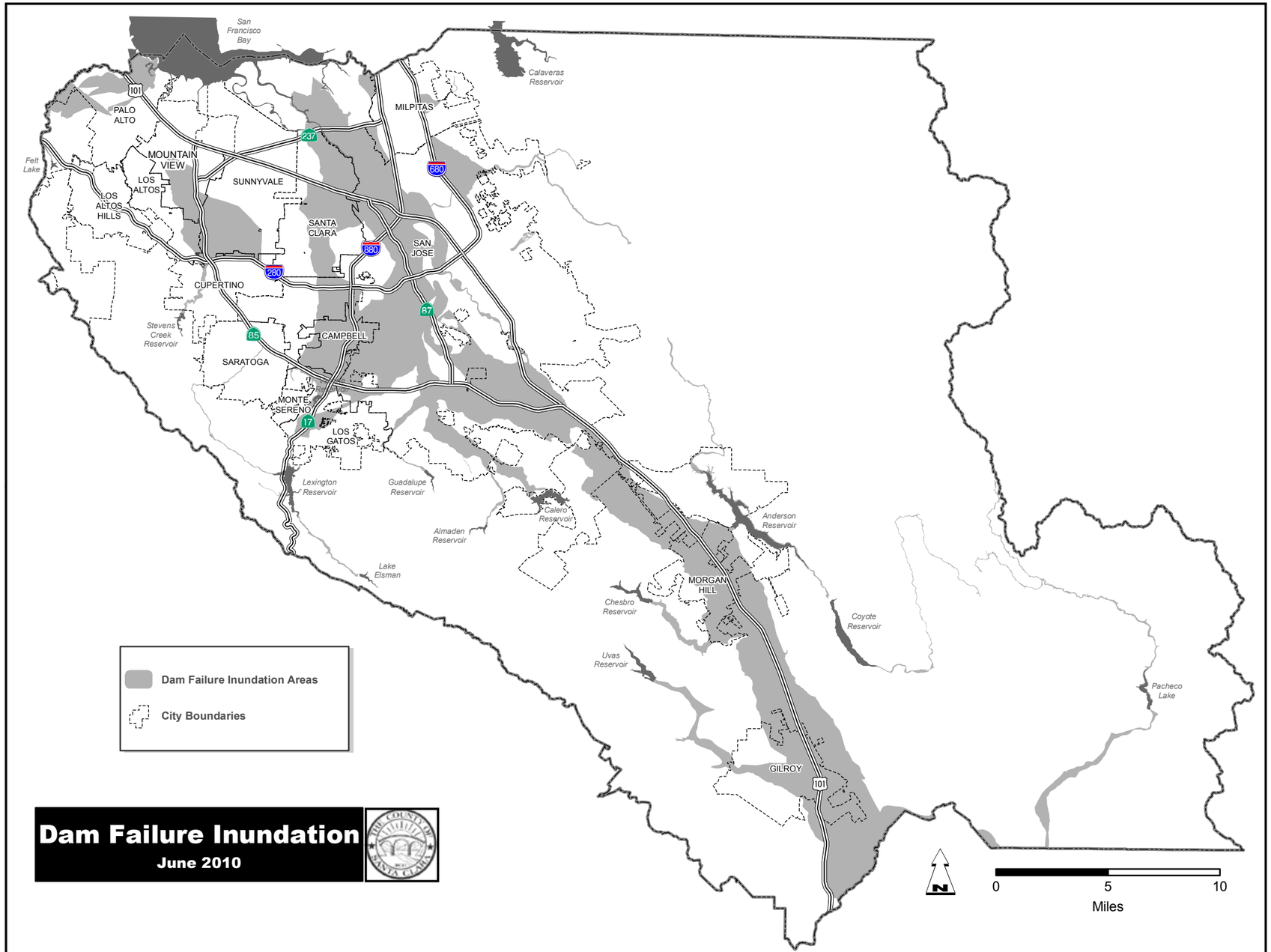

Dam Failure Inundation
June 2010

Dam Failure Inundation
June 2010

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This map created by the Santa Clara County Planning Office. The GIS data files are compiled from various sources and while deemed up to date and reliable through publication date indicated, the Planning Office assumes no liability.

Dam Failure Inundation

June 2010

Dam Failure Inundation Areas

As a result of the 1971 San Fernando earthquake, and the subsequent near failure of the Lower San Fernando Valley Dam, the Dam Safety Act was passed into law. This law required dam owners to create maps showing areas that would be flooded if the dam failed. The California Office of Emergency Services approves the maps and distibutes them to local governments, who in turn adopt emergency procedures for the evacuation and control of areas in the event of a dam failure.

Source:

The Dam Failure Inundation Data used in this map were obtained February 2010 from the California Emergency Management Agency.

This map is available online at sccplanning.org

R-HS 11
Proposals for General Plan amendments, zone changes, use permits, variances, building site approvals, and all land development applications subject to environmental assessment shall be reviewed for the presence of hazardous conditions, utilizing the best, most up-to-date information available. If a development proposal would require a major investment or addition to public infrastructure in areas subject to high hazards, objective estimates of the probable public costs of maintaining and repairing the infrastructure should be provided to decision-makers.

R-HS 12
Proposals shall be conditioned as necessary to conform with County General Plan policies on public safety. Projects which cannot be conditioned to avoid hazards shall be conditioned to reduce the risks associated with natural hazards to an acceptable level or shall be denied.

R-HS 13
Where needed to adequately assess the hazards of a proposal, the County shall require on-site investigations and analysis by certified professionals.

GEOLOGIC AND SEISMIC HAZARDS

The policies of the General Plan regarding the design, location and regulation of development to withstand geologic and seismic hazards take into consideration the following concepts:

- The more critical the structure is to public safety, such as police stations, or the more intense the land use, such as hospitals or other high occupancy structures, the greater are the restrictions on appropriate design and location.
- When land characteristics are present which may compound the risk associated with geologic and seismic hazards, such as steep slopes, saturated soils, or other factors, the design, location and construction of development must address the site-specific conditions identified through the review process.

➔ *Policies and Implementation*

R-HS 14
Critical structures and infrastructure vital to the public health, safety, and general welfare, such as water supply facilities, other utilities, police and fire stations, and communications facilities, shall not be located in areas subject to significant impacts from geologic or seismic hazards unless there is no feasible alternative site. Projects shall be designed to mitigate any seismic hazards associated with their sites.

R-HS 15
No structure proposed for involuntary occupancy, such as schools, hospitals or correctional facilities, and no structure proposed for high voluntary occupancy, such as theaters, churches, or offices shall be approved in areas of high geologic or seismic hazard.

R-HS 16
No new building site shall be approved on a hazardous fault trace, active landslide, or other geologic or seismic hazard area that poses a significant risk.

R-HS 17
Subdivisions shall be designed to minimize placement of road and other improvements on unstable lands and shall demonstrate suitable, stable building sites approved by the County Geologist.

R-HS 18
Clustered development projects shall concentrate home sites on lands not subject to geologic or seismic hazards.

R-HS 19
In areas of high potential for activation of landslides, there shall be no avoidable alteration of the land or hydrology which is likely to increase the hazard potential, including:
a. saturation due to drainage or septic systems;
b. removal of vegetative cover; and
c. steepening of slopes or undercutting the base of a slope.

R-HS 20
Lands where soils are in a continually saturated condition should not be used for structural purposes or filled with heavy earth fills due to their inherently weak and unstable nature. Uses requiring septic systems in such areas should not be allowed.

R-HS 21
Proposals involving potential geologic or seismic hazards shall be referred to the County Geologist for review and recommendations.

FIRE HAZARDS

Access, water supply, building materials, and vegetation removal are the four main areas of concern in protecting development from fire hazard in the rural unincorporated areas. Each has a critical role to play in fire safety.

■ Access Issues

Adequate access has several key dimensions. Lack of alternative access to development located on dead end roads may result in fire-fighting equipment being unable to reach its destination entirely. Roads that are impassable to firefighting equipment due to substandard surfaces, tight corners, steep grades, or bridges of inadequate structural integrity are also problematic.

Private roads are less likely to meet County standards for these aspects of road design and construction, and even if rural roads are passable, response times are generally longer due to the lower average speeds possible on rural roads. Response times to some of the more steep and remote areas even in the best of conditions may be 30 minutes to an hour and a half, far too long for fire-fighting services to be of any help to a residential fire.

■ Water Supply Issues

Water supply is the second major issue. The amount of water that can be brought to a site in a tanker truck is very limited. Rural private development most often utilizes on-site wells and storage tanks for water supply, for both domestic use and fire protection. Seasonal variation in water supply, broken or leaking water lines, and electrical failures can render homes defenseless if fire fighters arrive only to find there is no water supply with which to combat the fire. Making matters worse, some older homes and structures may not meet present development standards and safety code requirements.

■ Building Requirements

Currently, rural unincorporated area development must comply with the County's fire code and safety code requirements for, among other things, minimum water delivery rates and pressure for fire suppression purposes. If development in high fire hazard areas is unable to demonstrate that it can meet the County's flow requirements, mitigation measures, such as automatic sprinkler systems in particular, are required, especially in light of the typically excessive emergency response times. Other mitigation measures may also be required.

Using fire retardant building materials and clearing flammable vegetation from the vicinity of the structure or residence are also extremely important. Uniform building codes now require fire retardant roofing materials in high fire hazard areas, but siding materials and decks also provide opportunities for fires to spread from surroundings to structures, and vice-versa.

■ Clearances and "Defensible Space"

Equally critical is the concept of "defensible space." In the case of a wildfire that threatens a rural hillside home, the presence of overhanging tree limbs, dead or overgrown brush close by, and flammable landscaping increase the structure's vulnerability to fire and provide no space within which fire fighters may work to prevent the house from catching fire. In the case that a fire starts within the home, built up vegetation immediately surrounding the structure increases the likelihood that the fire may spread to the surrounding area. County fire codes require that vegetation be cleared and managed within approximately 30-50 feet of a residence or other development, and that overhanging branches be removed.

■ Earthquakes and Fire Hazards

Finally, it should also be noted that earthquakes pose the single greatest threat to rural areas subject to high fire hazards, because the ground shaking and other seismic effects may sever water connections, topple or empty storage tanks, and break natural gas lines. Inspections following the Loma Prieta earthquake in 1989, for example, discovered that many storage tanks were emptied as a result of broken connections and other causes, rendering structures defenseless to fire hazards.

➔ ***Policies and Implementation***

R-HS 22
Adequate access and water supplies for fire safety shall be required for all new development, including building sites, subdivisions, and clustered development.

R-HS 23
Areas for which inadequate access is a general concern, either due to lack of secondary access, dead-end roads of excessive length, and substandard road design or conditions, should be examined to determine if there are means by which to remedy the inadequacies. Such means may include:

a. specific local area circulation plans to establish alternative access;
b. specific roadway improvements to remedy hazardous situations, financed by those most benefited by the improvements; and
c. traffic routing and controls to discourage the use of such roads by non-residents.

R-HS 24
Dead-end roads shall not be extended unless in the judgment of the Fire Authority, such extensions will serve to reduce the risks from fire hazards in the affected area.

R-HS 25
High intensity uses, such as theaters, motels, restaurants, schools, etc. and uses requiring the handling, transfer, storage or disposal of significant amounts of flammable or hazardous materials shall be allowed only in areas having year-round fire protection and adequate water supply systems.

R-HS 26
For communities in areas of high or extreme fire hazard that have developed under development densities greater than generally allowed under current General Plan policies, water systems with hydrants should be provided wherever feasible.

R-HS 27
The County should encourage the use of fire-retardant building materials and landscaping not already required by County development and building codes when new development and rebuilding are proposed in areas of high or extreme fire hazard.

R-HS 28
Development projects shall be reviewed by the County Fire Marshall's Office for safety code compliance and should also be referred if necessary to the appropriate fire protection authority or district for further review and recommendations.

FLOOD HAZARDS

Flooding can cause hazards to structures, costly property damage, interruptions of public services, and malfunctioning of septic systems, among other impacts. To minimize such impacts, the County and the Santa Clara Valley Water District regulate development in flood prone areas in conformance with Federal flood insurance program requirements.

➔ ***Policies and Implementation***

R-HS 29
Land uses in federally-designated flood plains shall be restricted through development regulations, and regulation of development in flood plains shall require structures for human occupancy to minimize the risks associated with flood hazards.

R-HS 29.1
New public facilities should not be located in flood hazard zones, or if located in flood hazard zones, should be designed to:
a. effectively minimize the flooding hazard,
b. ensure continued access during flood events, and
c. maintain operations during flood events.

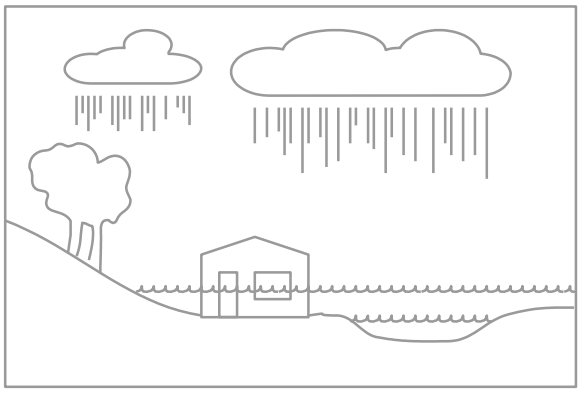
R-HS 30
Proposals involving potential flood hazards shall be referred to the Santa Clara County Valley Water District for review and recommendations.

Strategy #4:
Reduce The Magnitude Of The Hazard, If Possible

Flood control improvements and engineering can help reduce the magnitude of flood hazards to development in flood prone areas, while, controlled burning and other measures may be possible in some areas to reduce the amount of fuel available to wildfires. Levees along the baylands are used to protect low-lying areas adjacent to the Bay. With regard to geologic hazards such as landslides, engineering to improve slope stability is possible, through drainage systems, reinforcing walls, and buttressing, but can be quite expensive for individual homeowners.

FLOOD HAZARD CONTROLS

The Santa Clara Valley Water District (SCVWD) is the principal governmental entity responsible for planning, developing, and maintaining the county's system of flood control improvements.



Two major concerns of the SCVWD involve:
a. the amount of ongoing rural hillside development in Santa Clara County, which may impact flood control capability downstream in urban areas; and
b. the overall amount of development in rural unincorporated areas lacking adequate drainage facilities, which has potential to overwhelm the capacity of planned flood control improvements both in the area and downstream.

Flood control improvements are predicated upon a given or projected amount of development in an area, and if development and its associated impervious surfaces exceed projections, planned flood control capacity is rendered inadequate. Costs to the general public are increased if additional improvements are necessitated.

A major disadvantage of past flood control engineering such as channelization has been the elimination of natural stream channels and riparian vegetation. More emphasis is now being given to the concepts of combining flood control and riparian restoration, while also providing for recreation and beautification. One example of a flood control technique which incorporates these concepts is the "modified flood plain." It seeks to retain natural stream channels, hydrology, and vegetation as much as possible while also assuring protection from the 100 year flood. In order to implement modified flood plain engineering and similar methodology, it is important to retain an adequate setback of development from the stream so that concrete channelization is not the only available alternative.

Policies and Implementation

R-HS 31
Flood control measures should be considered part of an overall community improvement program and should advance the following goals, in addition to that of flood control:
a. resource conservation;
b. preservation and enhancement of riparian vegetation and habitat;
c. recreation; and
d. scenic preservation of the county's streams and creeks.

R-HS 32
Flood control improvements should be designed to maintain streams channels and environments in their natural state wherever possible and restore the natural environment where it has been altered by past activities. Wherever possible, adequate setbacks should be maintained to allow for flood control engineering which maintains the natural environment as much as possible.

FIRE HAZARD REDUCTION AND RISK MANAGEMENT

It is also possible to reduce area wide fire hazards to a limited extent. With over 80-150 tons of fuel per acre in portions of rural Santa Clara County, the natural fire hazard is substantial. Controlled burning is one way to reduce fuel loads and the magnitude of the fire hazard to a given area. Ironically though, as population and development increase in a given area, controlled burning becomes less feasible, and increased fuel loading in turn serves to increase the threat to life and property from wildfire. The densely vegetated areas of the central Santa Cruz Mountains are an example, where the communities of residential development have developed over time on lots much smaller than would be allowed under current development policies.

Other means of reducing the fuel load available to wildfire, such as brush clearance by mowing and other mechanical means, are often cost-prohibitive, but may become necessary to reduce fire hazards. In other areas where livestock grazing is an allowed use, grazing can also serve to control the amount of fuel available to fires that occur in grasslands areas. Weed abatement on private lands is currently a service of the County Fire Marshall's Office. It provides additional risk reduction by ensuring that vegetation is adequately controlled.

➔ ***Policies and Implementation***

R-HS 33
For areas where it may be appropriate, fire protection agencies and districts should utilize controlled burns and other forms of vegetation management to reduce the build up of vegetative matter and the potential fire hazard within an area.

➡ ***Strategy #5: Provide Public Information Regarding Natural Hazards***

As a public service of vital importance, local governments and public safety agencies should strive to maintain public awareness of the threat of natural hazards. This service may be accomplished through information publications, emergency preparedness events, involvement of local media, and through the system of public education. Many of the activities which best protect the public must be the responsibility of individuals, such preparing ones' home in the event of major earthquake; however, it is also important that the general public understand and support infrastructure improvements, emergency response capability, and land use planning which enhance public safety.

In addition, the County has the obligation to try to ensure that future property owners are aware of hazards of residing in the rural unincorporated areas. Real estate transaction disclosure requirements help inform subsequent property owners of the risks, regulations and obligations they may face, depending on the location.

➔ ***Policies and Implementation***

R-HS 34
Public awareness of the prevalence and risks of natural hazards should be maintained and enhanced by activities and programs of the County, safety service providers, and through the educational system.

R-HS 35
Known hazard information should be reported as part of every real estate transaction in accordance with state law.

Aviation Safety

Summary

Aviation for both commercial and general civilian purposes is important to the economy and general public of Santa Clara County. Each airport in the County has an airport-specific Comprehensive Land Use Plan that provides policies for safety, height, and noise for the populations in the vicinity of airports.

The Santa Clara County General Plan and any development proposals governed by it must be consistent with ALUC Plans and recommendations unless specifically overridden by two-thirds vote of the legislative body. These major strategies include the following:

Strategy #1: Limit Population Densities and Land Uses within Designated Safety Zones
Strategy #2: Regulate Structures and Objects Which Could Be Hazardous or Distracting to Air Navigation

Background

AIRPORTS IN RURAL UNINCORPORATED SANTA CLARA COUNTY

The San Martin Airport (formerly named South County Airport) lies within the community of San Martin, and along with Moffett Field, is the only airport located in unincorporated Santa Clara County. It is located west of Highway 101 between San Martin Avenue to the north and Church Avenue to the south. It provides primarily for general civilian recreational aviation.

Although aviation is a relatively safe mode of travel, especially commercial aviation, accidents do occur, threatening the safety of travelers and the population on the ground. However, aviation accidents tend to occur in predictable patterns, which makes it possible to afford a greater measure of safety to the general public through protective land use planning.

MOST COMMON TYPES OF AVIATION ACCIDENTS

Most aviation accidents are the result of adverse meteorological conditions, pilot error, and/ or mechanical failures. The principal types of accidents occur for the most part on approach and landing; upon takeoff and immediately thereafter; and in a pattern clustered along the center line of the runway, whether in takeoff or landing. Accidents in mid-air during other phases of air travel are far less common.

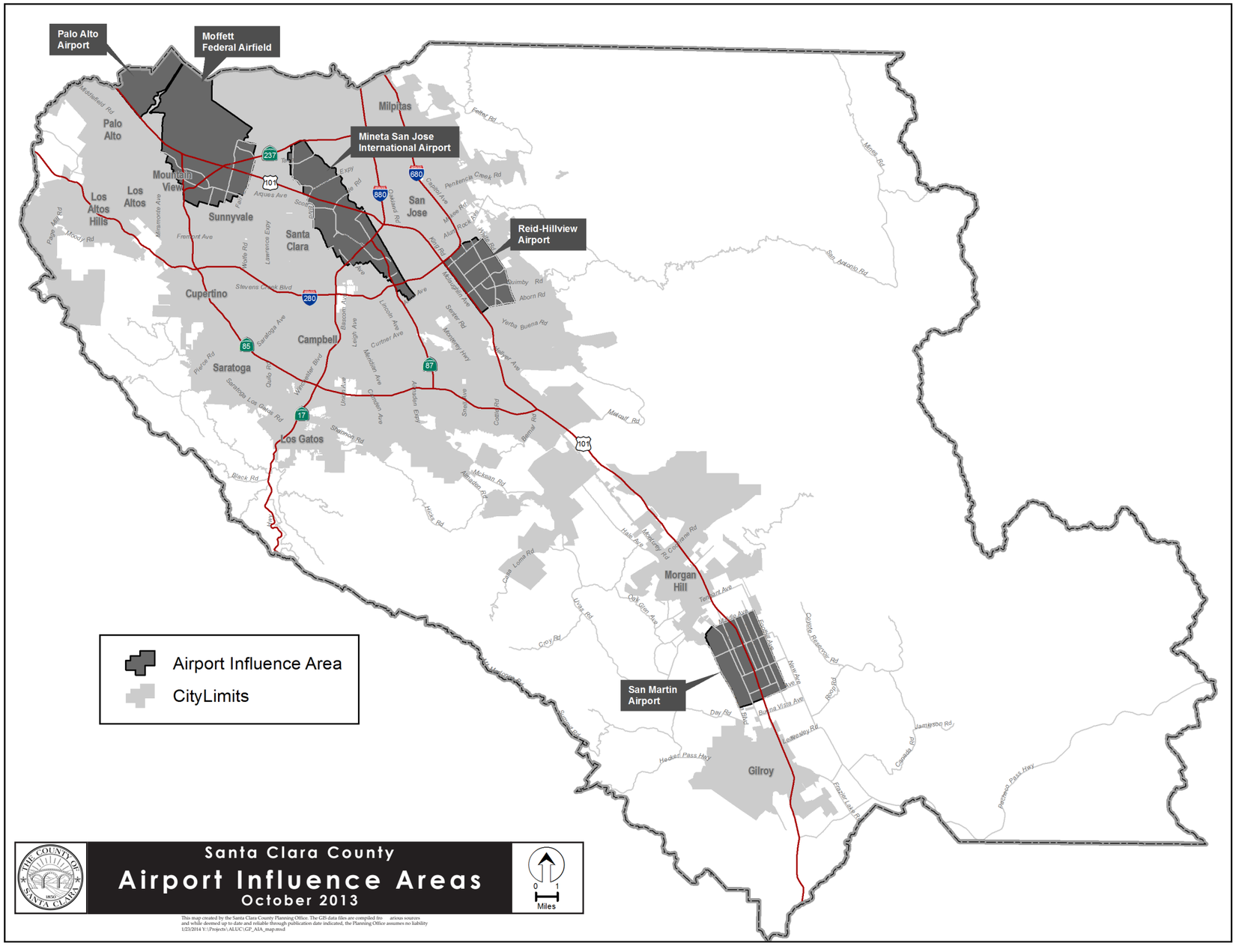
ROLE OF THE ALUC CLUP FOR LAND USE SURROUNDING AIRPORTS

Airport Land Use Commissions, or the ALUCs, were established by state legislation in 1970 for all counties having airports both public and private, including the Federal Airport at Moffett Field, with a military tenant. One of the main responsibilities of the ALUC is to minimize the risks to the general public from aviation hazards through land use planning and development review for areas included in "airport influence boundaries (AIA)."

The General Plan Land Use element of Santa Clara County and any other jurisdiction with airports must be consistent with the adopted ALUC Comprehensive Land Use Plans for land use surrounding airports. The principal strategies to increase aviation safety employed by ALUC plans involve:

• limiting population densities and types of land uses in designated safety zones extending from each end of a runway; and • regulating the height of structures or objects which could pose hazards to air navigation, especially those in the direct flight path of aircraft.

Other areas of the ALUC's regulatory authority involve minimizing potential distractions to pilots, such as sources of light or glare, and limitations on above-ground storage of hazardous materials.

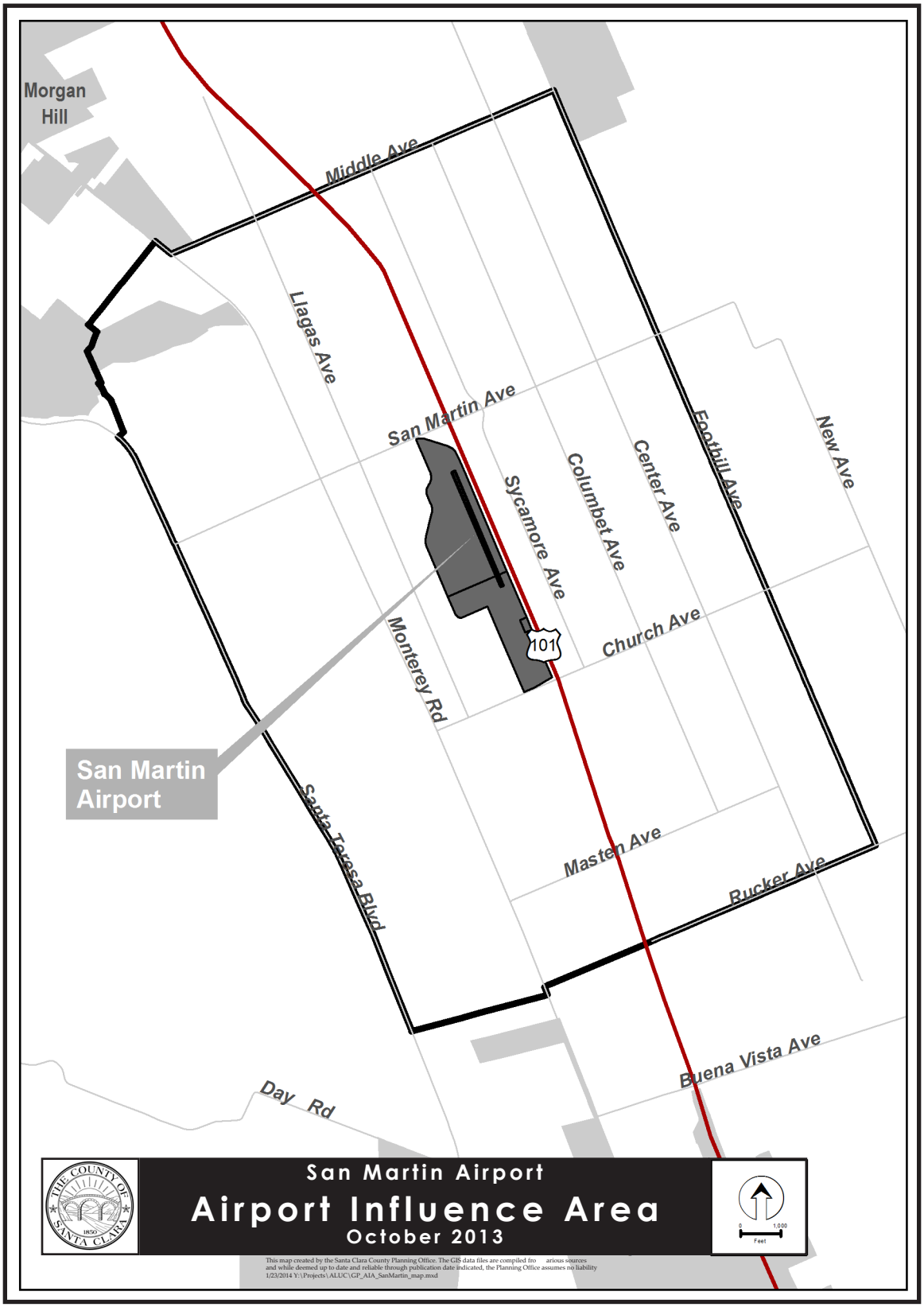


Santa Clara County
Airport Land Use Commission

PUC Section 21675 requires the Airport Land Use Commission (ALUC) to formulate and maintain a comprehensive land use plan (CLUP) for the area surrounding each public-use airport within Santa Clara County. A CLUP may also be developed for a military airport at the discretion of the ALUC. The CLUPs provide policies for safety, height and noise for land uses surrounding Santa Clara County airports. The County has four public-use airports, San Jose International, Palo Alto Airport, Reid-Hillview Airport and South County Airport, and one federally owned airport used by the Department of the Navy, Moffett Federa Airfield. Moffett Feder Airfield is defined as a Air Carrier Airport for the purposes of a CLUP due to the type of aircraft that use this airport.

The California State Aeronautics Act {Public Utilities Code: Division 9, Part 1, Chapter 4, Article 3.5, Section 21670 et seq} places the responsibility for implementing and enforcing Comprehensive Land Use Plans (CLUP's) on the local governmental agencies responsible for land use planning within each airport's Airport Influence Area (AIA). Once the ALUC has adopted or revised a CLUP, and transmitted that CLUP to an affecte local agency, the local agency is mandated to incorporate the CLUP's provisions into its General and/or Specific lan(s) within 180 days {Government Code 65302.3(b)}. Implicitly, the local agency is then encouraged to adopt zoning ordinance(s) that implement the policies of their General/Specific lan(s).

Effecti e January 2013, the ALUC has adopted airport – specific CLUPs for all ai - ports / airfield in Santa Clara County. The County has included the relevant policies of the CLUP's by reference into the Health and Safety chapters of the General Plan. South County Airport and Moffett Field are locate in unincorporated land.


Morgan Hill
Middle Ave
Llagas Ave
San Martin Ave
Sycamore Ave
Columbet Ave
Center Ave
Foothill Ave
New Ave
Monterey Rd
Church Ave
101
San Martin Airport
Santa Teresa Blvd
Masten Ave
Bucker Ave
Buena Vista Ave
Day Rd
San Martin Airport
Airport Influence Area
October 2013
0 1,000 Feet
This map created by the Santa Clara County Planning Office. The GIS data files are compiled fro arious sources and while deemed up to date and reliable through publication date indicated, the Planning Office assumes no liability
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Although the ALUC reviews land use and development of each affected jurisdiction within the "Airport Influence Areas (AIAs)" for conformity with ALUC policies, recommendations to the jurisdictions have only advisory authority. If a jurisdiction wishes to "override" the decision of the ALUC, it may do so only with a two-thirds vote of its legislative body.

Once the CLUP is adopted, local jurisdictions must incorporate the CLUP into its General Plan. The Santa Clara County ALUC has prepared and adopted five airport-specific Comprehensive Land use Plans, including one for Reid Hillview Airport (2007), South County (San Martin) Airport (2008), Palo Alto Airport (2009), San Jose International Airport (2011), and Moffett Field (2012).

In 2013, the County of Santa Clara amended the General Plan to be consistent with the adopted San Martin Airport CLUP, including amendments updating appropriate sections of the General Plan following adoption of all five of the CLUPs.

To achieve consistency, as recommended by the ALUC in each of the CLUP's, the County has incorporated the San Martin Airport AIA into the General Plan and the CLUP policies by reference. The map on P-28.1 shows the location of each of the Airports located within Santa Clara County. The map on P-28.2 shows the Airport Influence Area (AIA) for San Martin Airport, located within the rural unincorporated area.

Strategies, Policies, and Implementation

As outlined in the ALUC's Comprehensive Land Use Plans for airport safety, the general approaches to minimizing aviation hazards include the following strategies:

Strategy #1: Limit Population Densities And Land Uses Within Designated Safety Zones
Strategy #2: Regulate Structures And Objects Which Could Be Hazardous Or Distracting To Air Navigation

➔ ***Policies and Implementation***

R-HS 36
General strategies for airport safety in Santa Clara County include the following:

a. Limit population densities and land uses within designated safety zones.
b. Regulate structures and objects which could be hazardous or distracting to air navigation.

Strategy #1: Limit Population Densities And Land Uses Within Designated Safety Zones

Limiting the number of people exposed to typical aviation accidents is the primary objective of the first strategy. The larger the zone designated for limited population and land uses the greater the degree of protection. In fact, ALUC-established safety zones extend beyond the areas required by FAA regulations with the intent not only to protect aircraft on approach and departure, but to provide maximum protection to ground populations.

Low density land uses, such as agricultural lands, parks, storage areas, parking lots, single-story warehousing, and similar uses are those generally allowed in designated safety zones.

➔ ***Policies and Implementation***

R-HS 37
Land use designations and development proposals within the ALUC Airport Influence Areas for the rural unincorporated areas of Santa Clara County shall be consistent with ALUC's Comprehensive Land Use Plans for airport safety.

Strategy #2: Regulate Structures And Objects Which Could Be Hazardous Or Distracting To Air Navigation

Ensuring that aircraft have a safe space to operate in and that persons occupying nearby structures are equally protected are the primary objectives of the second strategy. To that end, height restrictions are imposed in areas surrounding airports affected by takeoff and landing. These restrictions provide an extra margin of safety and minimize potential distractions to pilots. The ALUC-established restrictions are based on FAA regulations.

Other types of land uses that may be regulated are those which could result in significant distraction or confusion of pilots. These include land uses that may create reflections, glare, dust or steam, hazardous lighting, electrical interference, attract large flocks of birds, or other visibility-reducing or distracting phenomena.

Policies and Implementation

R-HS 38
Santa Clara County shall comply with ALUC height restrictions and other regulations intended to ensure operational safety of aircraft and the safety of those occupying nearby buildings.

R-HS 39
Land uses, structures, and objects which could distract, confuse, or otherwise contribute to pilot error shall not be allowed within the vicinity of airport operations.

Waste Water Disposal

Summary

The vast majority of County residents and businesses located within the County's urban areas rely on municipal sewers and special sanitary districts to provide centralized wastewater treatment and disposal services. However, the majority of the unincorporated County is located outside city Urban Service Areas and sanitary districts, where wastewater disposal is achieved by means of on-site wastewater treatment systems. Consistent with countywide urban growth management policies, lands outside cities' Urban Service Areas and sanitary districts will continue to rely upon on-site wastewater treatment systems indefinitely. The most common conventional systems are also known as septic systems or on-site wastewater treatment systems (OWTS), using tanks and drain lines to dispose of and treat effluent.

A septic system is an underground wastewater treatment system used to treat and disperse wastewater on-site. With some exceptions, most homes, farms, and businesses in rural unincorporated Santa Clara County treat and disperse waste water through a conventional OWTS. Construction standards and performance expectations for these standard tank and drain field systems have evolved over time because they are no longer seen as a temporary means of achieving sanitary wastewater treatment and dispersal. Furthermore, alternative OWTS technologies provide additional options to serve community needs where conventional OWTS may not be feasible due to certain kinds of site constraints, or where modifications are necessary to repair failing systems.

This section of the Rural Unincorporated Health and Safety Chapters identifies issues regarding on-site wastewater treatment and disposal systems, protection of water quality, and the policies with which those concerns may be addressed.

STRATEGY DIRECTIONS

Several chapters in the General Plan include development policies intended to protect watersheds, and surface and groundwater supplies. The strategies in this section focus on the long term maintenance of a safe and clean supply of water by:

- Ensuring the Long Term Reliability of On-Site Wastewater Systems;
- Preventing Waste Water Contamination of Surface and Groundwater Supplies; and
- Monitoring Surface and Groundwater Quality.

GROUNDWATER PROTECTION IN RURAL UNINCORPORATED AREAS

The integrity of the groundwater system is a countywide concern. The County identifies the protection of groundwater aquifers as a major issue in rural, unincorporated area development. Interested readers should refer also to the Resource Conservation Chapter: Rural Unincorporated Area Issues and Policies for additional discussion of groundwater protection strategies.

Background

LONG-TERM RELIANCE ON SEPTIC TANK SYSTEMS

In years past, septic tank systems were seen as a temporary wastewater disposal solution. It was perceived that eventually municipal sewer services would replace septic systems as development expanded outward from previously urbanized areas, particularly valley lands. For some parts of rural unincorporated Santa Clara County, this may still prove to be true, particularly for those undeveloped areas adjacent to city urban service areas, where managed urban expansion may occur through urban service area expansion approvals. However, most rural properties will continue to rely upon on-site wastewater treatment systems (OWTS) for a variety of reasons, described further below.

Chiefly, countywide growth management policies provide for only low density, non-urban uses outside city urban service areas. Secondly, many of the lands outside cities and urban service areas are mountainous, and the sheer size of this geographic area, over 500,000 acres, makes traditional municipal sewer services impractical and cost-prohibitive. Geologic and other natural constraints have reinforced policy and public sentiments toward curbing urban sprawl, creating more compact urban communities and maintaining the agrarian, rural character of the remaining largely undeveloped open spaces. Consequently, if rural development occurs at all in what are now the farms and ranch lands of South County, the Diablo Range, and the Santa Cruz Mountains, it will be very low density and widely dispersed.

This perspective of future rural area development potential has led environmental health professionals and policy makers to rethink the purpose, design and long term operational requirements for on-site waste water treatment facilities in those areas. The intent is to ensure that policies and standards are in place which will assure that OWTS function reliably over the long term to adequately safeguard public health and environmental health.

NATURAL CONDITIONS AFFECTING SEPTIC SYSTEMS

■ Challenges to Treatment System Engineering

There are many parts of the rural county with geologic, hydrologic and other natural characteristics that challenge OWTS designers and engineers. Soil texture and structure on a site can significantly affect the operation of some OWTS. Similarly, leachfield systems on steep slopes greater than 20% can present problems for slope stability and system operation. Areas that have a high seasonal or year-around groundwater table have the potential to saturate the leachfield trenches, which can compromise the operation and effectiveness of the OWTS and possibly contaminate surface and subsurface water.

Conventional On-Site Wastewater Treatment Systems

The typical conventional on-site wastewater treatment system consists of a 1,500 gallon tank and a series of drain lines (leach lines). Sanitary wastes from a residence or other use drain into the tank, where solid material settles to the bottom, and other materials, such as grease or oils that are lighter than water, float to the surface. The mass of solids is retained and stored in the tank, where microbes decompose it and reduce its volume. The non-degradable residues that accumulate over time must be periodically removed by pumping, usually once every 3-5 years. The effluent drains through the outlet of the tank into the drain lines, where it undergoes further treatment by microbes and filtration as it percolates through the soil. The area occupied by the drain lines is also referred to as a leach field.

The drain lines are configured and constructed according to regulations and standards in a series of parallel lines down slope from the tank, making up the drain field. The actual length of drain lines, their depth, the amount of separation required between them, and the number of lines depends on the amount of wastewater generated by the use, the nature of the soils, and the slope of the land.

Each drain line consists of a level trench which is at 18-36 inches wide and 3-8 feet in depth. At least 12 inches of clean drain rock is placed in the bottom of the trench, and a 4 inch diameter perforated drain pipe is placed on top of the rock, with an additional 2 inches of drain rock added over the pipe. Filter fabric is placed over the rock and pipe assembly to prevent soil from clogging the rock or the trench bottom, and at least 12 inches of earthen fill is placed on top of the paper or fabric. There is flexibility in the design and configuration of a drainfield, given site-specific constraints and the technology and materials to be used.

When design specifications are met, the system should be capable of accommodating the maximum volumes of effluent expected to be generated from the residence or other land use, and the microorganisms in the leach field and soil should provide effective treatment and removal of wastes from the effluent.

The County maintains stringent standards for percolation rates and for all aspects of drain field design, construction and location on a building site in order to assure that (a) effluent is adequately treated; (b) that groundwater basins are not contaminated; (c) that the effluent does not contaminate the ground surface or surface waters; and that (d) effluent introduced into sloping areas does not result in slope instability or failure. Areas with high water tables, unsuitable percolation rates, or unstable geology are considered unsuitable for development with conventional on-site wastewater treatment systems, and permits are not granted for use of conventional on-site wastewater treatment systems under those conditions. However, such parcels may be able to utilize a form of alternative wastewater treatment technology. [see sidebar on Alternative OWTS]

For conventional systems, the County further requires that dual leaching systems be installed, each of which is 100% of the total size required to serve the use. A diversion valve is installed so that the flow of effluent may be directed from one field to the other. This allows each field to “rest” while the other field is in use. During this resting period, the microbes that tend to accumulate and clog the soil have time to decompose. The result is that the field recovers much of its ability to effectively treat and dispose of the effluent.

Proper care of conventional OWTS requires that (a) the leachfields are alternated annually to provide the proper “rest” period; (b) excessive water usage, such as that caused by interior plumbing leaks or excessive irrigation over the drain field, is avoided; and (c) that the septic tank is pumped every 3-5 years as needed. The sparing use of household chemicals and the installation of water saving devices, such as low flow shower heads and toilets, will also extend the life of the system, as well as improve performance.

In conclusion, adherence to County regulations and proper routine maintenance should ensure that conventional on-site wastewater treatment systems can continue to be relied upon to serve the wastewater disposal needs of most of the land uses allowed within the rural unincorporated areas.

On-Site wastewater treatment systems require careful design and installation, and periodic maintenance to ensure consistent effective operation. Certain soil conditions may affect the siting of the system and post-installation routine maintenance requirements, and may impact the effective lifespan of the system.

■ Soil Permeability

Rural area soil permeability varies dramatically from one location to another. Soil permeability can be measured by calculating percolation rates. These rates define the ability of soils to absorb and transmit water, critical factors in determining appropriate system design and siting standards.

Soil percolation rates slower than 120 minutes per inch or faster than one minute per inch are considered unsuitable for any type of OWTS. Rates slower than 120 minutes per inch result from soils with poor permeability, potentially allowing minimally treated wastewater to reach the surface and be exposed to human or animal contact. Soils with rates faster than an inch per minute transmit waste water too quickly for natural biologic and chemical filtration processes to remove harmful contaminants. This raises the possibility that untreated waste water could reach groundwater aquifers.

The U. S. Soil Conservation Service has defined and mapped general percolation rates for soils throughout the county. Portions of the rural unincorporated area contain soils which have either undesirably slow or fast percolation rates, requiring alternative design requirements or prohibiting the use of conventional OWTS. Soil percolation testing is performed on proposed development sites to more accurately determine percolation rates for individual parcels.

■ Slope and Soil Characteristics

The slope of the property is another site characteristic which can impact proper leach field functioning. Additionally, soils in mountainous areas are more likely to contain large amounts of impervious rock and less depth of soil to bedrock than flatter, valley areas.

Under certain conditions, if a leach field is constructed on steep slopes where there is an underlying layer of dense clay, rock, or other impervious material near the surface, the effluent may flow above the impervious layer to the surface and run unfiltered down the slope face. The effluent could potentially contaminate any surface waters with which it may come into contact. To address this issue, leach fields proposed on steep slopes require a slope stability and/or geotechnical analysis to ensure there would be no break-through of effluent or degradation of the hillside if an OWTS were installed.

■ High Groundwater

Parts of the rural unincorporated area experience high groundwater and/or poor seasonal drainage. These areas include parts of South County, particularly those areas south and east of Morgan Hill and Coyote Valley. Water tables are frequently very high along the sides of creeks, particularly in the early spring. Protection of seasonal high groundwater is extremely important since water quality in general can be degraded when untreated waste water is mixed directly with surface or near-surface water and is drawn into any of the numerous aquifer recharge areas located along rural area creeks.

MONITORING RURAL AREA WATER QUALITY AND CONTAMINATION

■ Well Testing Programs

Several studies have found that nitrate levels in some wells exceed the federal drinking water standard of 45 parts per million of nitrate. Nitrate concentrations exceed 100 ppm in several rural area locations. Most of those wells are clustered toward the southern end of the Llagas Basin. While the data is inconclusive with regard to the exact source of the nitrate contamination in each well, there is adequate data to prompt local officials to intensify well testing programs throughout the South County area.

The Santa Clara Valley Water District (District) has primary responsibility for managing the groundwater basin to ensure its viability as a long term potable water supply. The District,

working with other local agencies, is concerned with the elevated nitrate levels in the Llagas Basin and, as a result, has implemented a comprehensive program to identify the scope, extent and sources of contamination in South County groundwater supplies.

■ Tracking the Sources of Contamination

For the rural area population now served by OWTS, most of these systems are outcomes of County-regulated design, permits, and installation. Therefore, most can be assumed to be functioning satisfactorily. However, there have been and will likely continue to be instances of system failure, as systems age, if they are neglected, or when they are compromised. The variable nature of soil composition and the unpredictability of the movement of water within groundwater aquifers can complicate efforts to identify the sources of water contaminants.

For example, contaminants from a failing OWTS may never actually impact the property owner's well, while adjoining or even distant property owners may experience contamination in their wells. Variables which complicate tracking down the source of contaminating agents include site-specific soil conditions, existence of perched groundwater, weather events, and the rate that specific pollutants move through the soil. Pollutants found in a well today may actually be the result of contaminants released into the environment long ago.

The uneven distribution of contaminated wells and the vagaries of subsurface groundwater and contaminant movement are among two primary factors which figure heavily in current and planned District programs to identify the sources and extent of groundwater contamination in the Llagas Basin.

■ Health Threats Posed By Waste Water Contamination

To operate effectively, on-site wastewater treatment systems must be designed to utilize either the intrinsic properties of the soil or be augmented with some other mechanism for removing potential pollutants from the wastewater. Pollutants present in wastewater include suspended solids, pathogenic organisms, oxygen-demanding organic chemicals, phosphates, sulphates, chlorides, and nitrates. Design of the leach field to capitalize on bacterial decomposition (which takes place in the upper few feet of the soil) is critical to system effectiveness. The design objective is to remove all disease-causing pollutants before they can contact ground or surface waters.

Contaminants associated with septic system failure include nitrate salts, fecal microorganisms and viruses. Bacteria and viruses can cause many human diseases. Fecal coliform is an indicator that there is a problem with human or warm-blooded animal waste (from pets, wild animals, human sewage) present in the water. Viruses are highly persistent in wastewater and may remain a viable means of infection for months after their entry into the wastewater.

Another potential contaminant that can come from septic systems is nitrogen. Nitrogen can also be introduced into the environment in from fertilizers and manure. If the nitrogen level of well water is too high, the water can potentially be hazardous to infants in their first six months of life. Nitrogen in lower concentration levels can also contribute to contamination that leads to increased enrichment of nutrients in rivers, streams, or estuaries. This can cause algae blooms and loss of dissolved oxygen, detrimental to plants and animals in estuarine waters.

EVOLUTION OF ON-SITE WASTEWATER TREATMENT SYSTEMS

■ Conventional On-Site Wastewater Treatment Systems (OWTS)

OWTS technology has evolved significantly since sealed tank and drain-field systems began replacing cesspools in the 1950s and 1960s. Not only has conventional system design been improved, but alternative wastewater treatment design and technologies have improved in design and reliability. The predominant design for most rural properties is the conventional tank and drain field, commonly known as a septic system [see sidebar, "Conventional Residential Septic Systems"].

The design for conventional OWTS is relatively simple, reliable, and works on most parcels that do not have geologic or hydrologic constraints. Permitting by the Department of Environmental Health involves a review of site conditions, soils testing, and system design consistent with prescribed standards, with no requirement for an operating permit. The only recommended maintenance is to utilize the diversion valves installed on most systems to "rest" each independent leach field area annually, and to pump the solids from the septic tank every 3-5 years. For these reasons, conventional OWTS will likely remain the most common on-site means of disposing of wastewater for both residential and non-residential uses in the rural unincorporated area.

■ Alternative Waste Water Disposal Systems

Where the land area available for a conventional OWTS on a parcel of land is limited, or soil conditions are poor (e.g., high seasonal groundwater table or bedrock), property owners may need to consider a modified on-site wastewater treatment system, also known as an alternative on-site wastewater treatment system. Alternative OWTS use pre-treatment of septic tank effluent before it is discharged to the soil of a drain field or mound. These pre-treatment systems include either the use of sand, peat, or textiles as a medium where filtration and biological degradation of fine solids, pathogens, and nutrients occur. Other types of pre-treatment units use oxygen to break down organic matter. Because these aerobic treatment units decompose organic solids quickly, the wastewater leaving the system is cleaner.

With either of these alternative technologies, filters or aerobic treatment units, more contaminants are removed prior to dispersal in the drain field. Consequently, the size of the drain field may be reduced. Alternative OWTS also include a variety of approaches to drain field design, which offer flexibility in where the drain field can be located on a parcel [see sidebar, "Alternative Waste Water Systems"].

Alternative Systems for On-Site Wastewater Disposal

Alternative on-site wastewater treatment systems include supplemental treatment systems and various types of dispersal methods used in place of or as a variation of a conventional gravity leaching trench located on a parcel. The most common types of supplemental treatment are intermittent and recirculating sand filters and various types of proprietary systems, including media filters and aerobic treatment units. Alternative dispersal methods include shallow pressure distribution trenches, mound systems, at-grade systems, raised sand beds, and subsurface drip dispersal. Compared to conventional on-site systems, alternative systems generally have additional mechanical and electrical equipment (such as pumps, blowers, timers, alarms, etc.), that increase the need for inspection and maintenance. Some, but not all, alternative systems can provide a means of reducing the total footprint of an on-site wastewater treatment system where suitable land area is a significant constraint.

The County's On-Site Wastewater Treatment Systems ordinance permits alternative systems authorized by the Director of Environmental Health for the repair or upgrading of any existing on-site system and for new construction on any legally created parcel where: (a) it is determined that sewage cannot be disposed of in a sanitary manner by a conventional septic tank–disposal field system; or (b) the Director determines that an alternative system would provide equal or greater protection to public health and the environment than a conventional septic tank-disposal field system. Types of alternative systems permitted are limited to those identified in the On-Site Systems Manual for which siting and design standards have been adopted. All alternative systems can only be installed by a contractor licensed by the State Contractors License Board qualified to install OWTS. Final approval of alternative system proposals are at the discretion of the Director in cases where a serious question is raised concerning public health hazards or water quality degradation which may result from the proposed installation. This allows the Director to exercise additional discretion on the side of caution in special cases.

Community Wastewater Treatment Systems

Another type of wastewater treatment system, more similar to a centralized sanitary sewage treatment facility, is a "Community Wastewater Treatment System." These are sometimes referred to as a "small engineered" waste water system or "package treatment plant," which is designed to serve larger groups of residences or non-residential uses, as opposed to an on-site system designed to serve a single residence or other non-residential use. Most "package treatment plants" are usually designed to handle more than 2,500 gallons of effluent per day (roughly equivalent to the output of five single family homes) and are considerably more costly and complex than the conventional or alternative on-site wastewater systems designed to serve an individual property. Due to their complexity, engineered or "package" systems are regulated by the State and may require oversight by a state-certified wastewater treatment facility operator.

Unlike large-scale, municipally operated sewage plants, engineered or "package" plants are typically privately financed and maintained through a form of special district, such as a community services district. They may also employ a range of water treatment technologies other than those normally found at municipal facilities. Unlike on-site septic systems, package treatment plants are directly regulated by the Regional Water Quality Control Boards, which issue waste discharge permits per state requirements (WDRs). In Santa Clara County, particularly for rural unincorporated areas, policies strictly limit the use of such package or engineered systems to situations remedying areawide failures of on-site wastewater treatment systems on existing residentially developed parcels, to ensure consistency with overall countywide land use and development policies. Otherwise, on a case-by-case basis, where all other land use and development policies are met, a non-residential use may be approved for utilization of a small engineered system, where conventional or alternative on-site systems are constrained or may not prove as effective or long-lasting as necessary.

There are many undeveloped rural area parcels that will never be able to meet standards for conventional OWTS. Generally, these are substandard parcels on steep slopes, some with bedrock at or very close to the surface. Others may have high groundwater, drainage problems, or limited space. Still more may be composed entirely of soils that do not percolate properly. Those who wish to develop such sites, whether for residential or non-residential purposes, may be able to overcome these physical limitations by taking advantage of a variety of alternative on-site wastewater treatment technologies. In addition, because most alternative system designs can remove contaminants from effluent prior to dispersal to the drain field, they can be used to augment conventional OWTS design in cases where either the drain field is losing effectiveness or where the OWTS may have been constructed prior to the requirement for setbacks to groundwater and surface water bodies, such as lakes and creeks.

Alternative OWTS also provide environmental benefits that can make them attractive to property owners, even in cases where a conventional OWTS system is feasible. As noted above, alternative systems can remove contaminants from effluent prior to dispersal to the drain field, providing added assurance that groundwater quality will not be degraded. In addition, alternative systems may require less land area and offer flexibility in drain field design, potentially reducing ground disturbance and helping to avoid impacts to environmental resources, such as creeks and trees.

Because alternative OWTS are more complex than conventional OWTS, and involve additional components such as electric pumps, filters, and electronic controllers that can fail, they require routine monitoring, maintenance, and reporting by a person certified in inspecting these systems. Unlike conventional systems, the Department of Environmental Health requires an operating permit to provide the basis for verifying system performance and ensuring ongoing maintenance.

Strategies, Policies, and Implementation

The strategies, policies and implementation measures described below are intended to prevent or minimize wastewater contamination of the County's water supplies. Given the vast scale of the County's rural areas, and the diverse nature and age of development in many parts of the rural county, preventing adverse impacts to groundwater and surface waters can be a challenge. However, with proper standards for conventional systems and alternative system technologies, additional groundwater protection can be achieved, furthering the goal of protecting public and private drinking water sources.

Strategy #1: Ensure The Long-Term Reliability Of On-Site Wastewater Systems

There are a number of important factors that impact the reliability of on-site wastewater treatment systems over the long term, such as comprehensive design standards and County Ordinance Code provisions. These standards and provisions are periodically reviewed and updated utilizing current scientific studies and for consistency with requirements of the State Water Resources Control Board, to ensure that systems are installed with the most reliable design standards available. Requiring appropriate OWTS monitoring and maintenance are also important, as is property owner knowledge of ongoing operation and maintenance responsibilities.

For most properties, conventional OWTS will be utilized for their lower cost of installation, permitting, and ongoing maintenance and inspection needs and are a proven technology that is reliable and safe to public health and the environment. However, both conventional and alternative system technologies play a role in ensuring that OWTS can function reliably for the foreseeable future where urban services such as municipal wastewater systems are neither prescribed nor feasible for the more sparsely populated rural areas of the county.

Strategy #2: Prevent Wastewater Contamination of Groundwater Supplies

For Santa Clara County, a primary responsibility is ensuring the continued safety of rural area residents, farms and businesses who are, by and large, completely dependent on wells for fresh water supplies. Beyond the needs of rural area users, residents and businesses countywide are also highly dependent for their drinking water supplies on the integrity and quality of the system of groundwater aquifers beneath Santa Clara and Llagas Valleys. These aquifers serve as groundwater water conduits and storage for a substantial portion of the urban population. The county has a responsibility to maintain the quality of this water supply resource to the greatest extent feasible through its land use and development policies.

EFFECTIVE PROTECTIVE MEASURES

To maintain water quality, the cities, County, State Department of Public Health, Regional Water Quality Control Boards and the Santa Clara Valley Water District already have many laws, policies, standards, and enforcement procedures in place to safeguard this critical supply of water. Implementing and enforcing County regulations necessarily impose certain financial and other obligations on individual property owners and businesses, such as OWTS permitting and maintenance costs.

While these obligations may be unavoidable, the objective of protecting public health is one of the County's highest priorities. The County's responsibility is to develop the most fair and effective regulatory measures. By continuing to work closely with concerned citizens, affected business and farming interests, and water quality professionals; practical and cost-effective regulations can be implemented and unnecessary or unduly burdensome measures avoided. For example, making greater provision for alternative on-site wastewater treatment systems is a positive development. However, with those allowances there are additional oversight, permit, and maintenance requirements to ensure the County balances public and private interests.

PREVENTING WASTE WATER CONTAMINATION

One very effective way to ensure long term protection of surface and ground water supplies is to minimize the opportunities for wastewater to contaminate those supplies in the first place. The County's fundamental urban development policy, that urban development should occur within cities and be served by community municipal wastewater systems, is key to achieving that objective.

Some development is appropriate for and will occur in the rural area. As long as that development is appropriately located and is low density and low intensity in character, cleansing and filtering actions of the natural environment will safely treat the wastewater from conventional and alternative treatment systems. To achieve this, certain conditions will need to be met. Sites with geologic, soil or hydrologic conditions that impair efficient septic system operation must be avoided. The design and construction of septic systems must assure effective long term operation.

Equally important to the long term effectiveness of septic systems is proper maintenance by property owners. Failure to periodically maintain septic systems can result in poor performance and increased pollutant output. (see sidebar on conventional system design requirements). The County should periodically take measures to ensure adequate awareness and understanding of property owners' obligations for proper long term care of on-site wastewater treatment systems. The following policies help serve the mutually reinforcing strategies of ensuring long term reliability of OWTS and protecting groundwater quality.

➔ ***Policies and Implementation***

R-HS 40
Urban land uses shall be located only in cities and served by centralized wastewater treatment systems.

R-HS 41
To minimize the likelihood of surface or groundwater contamination, and to avoid the need for urban levels of services and infrastructure, allowable density of development in the rural unincorporated area will be maintained at very low density.

R-HS 42
All new conventional on-site wastewater treatment systems shall be located only in areas where:

a. there is reasonable assurance that they will function effectively over a long period;
b. they can be designed to have a minimum negative impact on the environment; and
c. they will not contaminate wells, or surface and groundwater supplies.

R-HS 43
No on-site wastewater treatment system, either conventional or alternative systems, shall be allowed where site characteristics impede their operation, including:

a. a. high seasonal groundwater conditions;
b. soils with wastewater percolation rates less than one minute per inch or greater than 120 minutes per inch;
c. limited depth to bedrock; or
d. slopes in excess of 20% without appropriate studies.

R-HS 44
Alternative on-site wastewater treatment systems may be allowed for residential and non-residential uses appropriate for the rural areas, providing:

a. a. the County has approved a program and ordinances which ensures that the system's long term maintenance, operating, monitoring and permitting costs are provided for by the owner of the property;
b. the system is approved by the Department of Environmental Health demonstrating safe and effective long term operation;
c. the system includes adequate measures to prevent malfunction or environmental damage in the event of system or electrical failure, if dependent on electrical power supply for pumps or other equipment;
d. the system is appropriate to the site for which it is proposed;

e. the system is in compliance with all the other pertinent County policies and regulations, as well as Regional Water Quality Control Board waste water discharge requirements; and,
f. the density or intensity of allowable use is otherwise consistent with the County's General Plan, Zoning Ordinance, and other applicable ordinances and development standards.

R-HS 45
On individual rural parcels where conventional on-site wastewater treatment systems have failed and cannot be replaced or repaired, alternative on-site wastewater treatment systems shall be choice of remedial technology, provided system standards can be met and required permits are obtained.

R-HS 46
Conventional, alternative, or other engineered wastewater treatment systems shall not be allowed to serve two or more individual residential properties, except for those circumstances where they are determined to be the only possible solution to an area-wide pattern of on-site wastewater treatment system failures in an area of existing residences on existing legal parcels. In such circumstances, where an existing or expected public health emergency has been determined, and appropriate administrative procedures have been followed, the County may authorize the establishment of a community-serving conventional or other type of wastewater treatment system to remediate the area's pattern of system failure, provided that the use of individual on-site wastewater treatment systems have been evaluated and conclusively found to provide an insufficient remedy.

Implementation Recommendations

R-HS(i) 10
Periodically review land development and onsite wastewater treatment system ordinance and technical standards for areas which must rely on conventional or alternative on-site wastewater systems so as to ensure proper design and functioning, take advantage of improvements in technology and professional practices, to minimize potential for negative environmental impacts, and to maximize the useful life of such systems. (Implementors: County Department of Environmental Health and Department of Planning and Development)

R-HS(i) 11
Monitor and report the number of new alternative on-site wastewater systems permitted on a periodic basis as part of program implementation and ongoing evaluation of such technologies. . (Implementors: County Department of Environmental Health and Department of Planning and Development)

R-HS(i) 12
Encourage proper use and long term maintenance of conventional and alternative on-site wastewater treatment systems through educational means and real estate transfer disclosure of property owner responsibilities, including publications and educational programs. (Implementors: County Department of Environmental Health, and Department of Planning and Development)

Strategy #3:
Monitor Groundwater Quality

On-going programs to monitor groundwater quality will enhance the likelihood that contaminants will be identified before they enter the aquifers or before substantial damage to water quality has occurred. . Monitoring programs will also aid local agencies in identifying the source of contaminants and take the appropriate steps to mitigate them.

Long-term monitoring of groundwater quality will enable the County and other agencies to implement programs to protect and enhance water quality in areas threatened by pollution. Understanding the source or cause of water contamination may also enable officials to develop effective remediation strategies to restore groundwater sources which have been compromised.

INTER-AGENCY COOPERATION

County staff has established positive working relationships with the staff of the Regional Water Quality Control Board, the Santa Clara Valley Water District, and local water suppliers. This spirit of cooperation makes the work of all these agencies more effective and more productive, thus serving the interests of all county residents. County staff should continue to look for opportunities to enhance these working relationships with the objectives of developing more consistent standards and regulations and ultimately maximizing the productivity of each agency.

➔ ***Policies and Implementation***

R-HS 47
The long-term viability and safety of surface and groundwater supplies countywide shall be protected from contamination to the highest degree feasible.

R-HS 48
To enhance the effectiveness of each agency's efforts to protect local surface and groundwater quality, the County should encourage cooperation between the regional and local water agencies, sharing of information, and appropriate ongoing water quality monitoring efforts.

Implementation Recommendations

R-HS(i) 13
Collaborate among County departments and state and local agencies to ensure current surface and groundwater monitoring complies with applicable state laws and standards regarding on-site wastewater treatment systems, including AB885. (Implementors: County Dept. of Environmental Health, Dept. of Public Health, Regional Water Quality Control Boards, Santa Clara Valley Water District)

R-HS(i) 14
Maintain and enhance agency efforts to develop or convert to GIS digital format all data relating to soil and groundwater characteristics which affect the operation of conventional or alternative on-site wastewater treatment systems. (Implementors: County Department of Environmental Health and Department of Planning and Development)

R-HS(i) 15
Offer low cost laboratory access for groundwater and well-water testing. (Implementors: County Public Health Laboratory)