HEALTH AND SAFETY ELEMENT

HEALTH AND SAFETY ELEMENT

Section 7.1

INTRODUCTION AND PURPOSE

A significant amount of the land within the Sausalito planning area is subject to a variety of natural hazards. The intent of the General Plan is to reduce the potential for injury, property damage and public expense due to natural and man-made hazards. In order to protect the public, the Health and Safety Element identifies areas where hazards to life and property may occur and sets forth protective measures to reduce risk.

This element combines two State mandated elements of the General Plan. The two mandated elements are Safety and Noise. The potential hazards discussed in the Health and Safety Element are seismic hazards, geologic hazards, flooding, fire hazards, exposure to noise and exposure to hazardous materials.

Section 7.2

OBJECTIVES, POLICIES AND PROGRAMS

The Health and Safety Element presents the City's objectives, policies and implementing programs for safety issues. The issues are grouped by the following objectives.

1.0 Minimize the impact of natural and man-made hazards on humans and property
2.0 Engage in disaster planning
3.0 Prevent exposure of people to unacceptable noise levels

Objective HS-1.0
Minimize the Impact of Natural and Man-Made Hazards on Humans and Property. *Minimize the potential for loss of life, injury, damage to property, economic and social dislocation and unusual public expense due to natural and man-made hazards.*

■ Policy HS-1.1
Seismic Hazards. Protect existing and new buildings and their occupants from seismic hazards.

Program HS-1.1.1
Earthquake Resistant Construction Standards. *Require that new buildings and additions to existing buildings be designed and constructed according to current standards for earthquake resistant construction.*

Program HS-1.1.2
Building Code (Earthquake Standards). *Regularly update the City's Building Code as is necessary to address current standards of earthquake safety.*

Program HS-1.1.3
Unreinforced Masonry Buildings Ordinance. *Adopt an Unreinforced Masonry Buildings Ordinance requiring structural evaluation and consider requiring seismic retro-fit to City specified seismic safety standards.*

Program HS-1.1.4
Seismic Safety Pamphlet. *Provide assistance by distributing the "Homeowners Guide to Earthquake Safety" and the Commercial Property Owners Guide to Earthquake Safety" pamphlets published by the California Seismic Safety Commission.*

Program HS-1.1.5
Geologic Hazard Maps. *Maintain a file of detailed geological hazard maps in the Planning Department.*

■ Policy HS-1.2
Other Geologic Hazards. Require that all geologic hazards be adequately addressed and mitigated through project development.

Program HS-1.2.1
Zoning Ordinance (Geologic Feasibility Reports). *Amend the zoning ordinance to require the submittal of geologic and/or geotechnical feasibility reports for development of new buildings or significant additions to existing buildings requiring discretionary approval.*

Program HS-1.2.2
Zoning Ordinance (Geotechnical Reports). *Amend the zoning ordinance to require the submittal of design level geotechnical reports for all grading and building permits.*

Program HS-1.2.3
Geotechnical Review Procedures. *Adopt guidelines establishing geotechnical review procedures, including but not limited to, the content of geologic feasibility reports and design level geotechnical reports, and the credentials of the authors of such reports.*

Program HS-1.2.4
Building Code (Runoff). *Continue to enforce the Building Code to require all runoff and down spout water collection from new construction be discharged into the City storm drain system or other appropriate facility.*

Program HS-1.2.5
Grading Ordinance. *Consider developing and adopting a grading ordinance that will establish review and performance standards for excavation, cuts and fills and project monitoring.*

Program HS-1.2.6
Detailed Geologic Map and Report. *Consider preparing a detailed geologic map and geotechnical report on geologic conditions and hazards in the City, including all landslides, to provide a more detailed data base for planning and evaluation of individual projects.*

Program HS-1.2.7
Erosion Control. *Continue to enforce the standards for erosion control contained in Title 8 of the Sausalito Municipal Code.*

Program HS-1.2.8
New Parcel Slope. *New lots should be graded so that the lot drains toward the street at a minimum of two percent (2%) grade.*

■ Policy HS-1.3
Flooding. Protect all existing and future structures, and their occupants, from the threat of potential flooding.

Program HS-1.3.1
100-Year Flood Zone. *Continue to require that new construction and substantial improvement of any structure, other than accessory structures, within the 100 year flood zone on the Flood Insurance Rate Map be designed to withstand impacts of potential flooding.*

Program HS-1.3.2
Zoning Ordinance (Tsunami Hazards). *Continue to review the effect of tsunamis on parcels that have an elevation of 20 feet or less above Mean Lower Low Water level datum through the environmental review process.*

Program HS-1.3.3
100-Year Flood Zone Mapping. *Update the "100-year" flood area map, as shown on map GP-18, as new information becomes available from the Federal Emergency Management Agency or the U.S. Department of Housing and Urban Development.*

Program HS-1.3.4
Zoning Ordinance (Shoreline Development). *Amend the zoning ordinance to require that the lowest point of the lowest structural member of new construction in shoreline areas subject to flooding maintain a height consistent with the City's Federally mandated Flood Plain Management program.*

Program HS-1.3.5
Creek Drainageway Monitoring. *Periodically monitor the City's creek drainageways in order to keep them clear and prevent blockage of storm waters (see Policy EQ-3.9).*

■ Policy HS-1.4

Shoreline Safety. Minimize the potential for personal injury and damage to shoreline property from waves and flooding.

Program HS-1.4.1

Rise in Sea Level. *Continue to support studies by appropriate State agencies which monitor the rise in sea level.*

Program HS-1.4.2

Shoreline Flooding Identification. *Require site plans of shoreline development to identify areas of the parcel subject to flooding, wave action, and BCDC review.*

Program HS-1.4.3

Wind Waves. *Support BCDC in exploring ways to reduce the effects of wind waves on the shoreline and waterborne uses.*

Program HS-1.4.4

Vertical Land Motion Survey. *Support the US Geological Survey and BCDC vertical land motion survey program.*

■ Policy HS-1.5

Fire Safety. Minimize the risk of property damage and personal injury resulting from structural and wildland fires.

Program HS-1.5.1

Building and Fire Codes Application. *Require that all new construction and upgrading of existing structures adhere to the fire safety standards contained in the Building and Fire Codes.*

Program HS-1.5.2

Building and Fire Codes Amendment. *Amend the Building and Fire codes as necessary to address fire hazard conditions unique to Sausalito.*

Program HS-1.5.3

Plant Materials List. *Develop a list of plant materials selected to minimize fire hazards to residential structures as a resource to potential applicants.*

Program HS-1.5.4

Water Fire and Rescue Equipment. *Continue to study the potential location of a boathouse or other means to house City water based fire and rescue safety equipment.*

Program HS-1.5.5

Roofing Material. *Continue to require that all roofing material used in new construction be fire rated "A".*

Program HS-1.5.6
Removal of Brush. *Establish a program for the removal of brush, certain trees, and other excess fuel materials on public and/or lands in coordination with open space management programs (see Policy EQ-1.4).*

Program HS-1.5.7
Public Awareness of Fire Safety. *Develop and initiate a public awareness educational program about fire safety through the Disaster Preparedness Committee.*

Program HS-1.5.8
Use of Treated Water for Fire Fighting. *Investigate the use of treated waste water for fire fighting.*

Program HS-1.5.9
Mapping of Fire Hazard Areas. *Initiate a mapping program which identifies and maps fire hazard areas.*

Program HS-1.5.10
Fire Suppression Plans. *Develop fire suppression plans and strategies for those areas that are mapped as fire hazard areas.*

Program HS-1.5.11
Water Deficient Areas. *Develop a plan to correct the fire suppression water supply deficiencies for the areas designated on map GP-20.*

Program HS-1.5.12
Inter-Jurisdicitional Cooperation. *Cooperate with local and regional jurisdictions to maintain adequate water capacity for fire protection.*

Program HS-1.5.13
Floating Homes. *Require that all floating home areas, whether in the City or within the Sphere of Influence, have a dedicated fire main at MMWD pressure.*

Program HS-1.5.14
Construction Requirements. *Require that all floating homes have the same fire construction requirements as land based homes.*

Policy HS-1.6
Hazardous Materials. Minimize the risk of property damage and personal injury resulting from the production, use, storage, disposal and transporting of hazardous materials and waste by adopting the Marin County Hazardous Waste Management Plan which includes the following policies.

(1) **Waste Reduction.** Reducing hazardous waste is the top priority of the Marin County Hazardous Waste Management Plan.

(2) **Public/Private Partnership.** Marin County and its cities and towns will continue to develop a strong public/private partnership to further develop and implement the goals and objectives identified in the Marin Hazardous Waste Management Plan.

(3) **Public Involvement.** Marin County and its cities and towns will encourage active public involvement in continuing review and implementation of the Marin Hazardous Waste Management Plan.

(4) **Management Hierarchy.** Marin County and its cities and towns will require and/or encourage all hazardous waste generators - including large quantity generators, small quantity generators, local governments and districts, and households - to adopt and implement the following hierarchy of hazardous waste management practices to the maximum extent feasible:

a. Source Reduction
b. On site recycling
c. Off site recycling
d. On site treatment
e. Off site treatment, and if necessary,
f. Disposal in residuals repositories.

(5) **Ongoing Education.** Marin County and its cities and towns will develop and promote widespread, on going education regarding the use, treatment, and disposal of hazardous materials and waste.

(6) **Small-Quantity Generators.** Marin County and its cities and towns will actively assist commercial small quantity generators in meeting the goals, policies, and objectives of the Marin Hazardous Waste Management Plan.

(7) **Household Wastes.** Marin County and its cities and towns will develop an effective program for managing household hazardous wastes generated in the county. This will include the investigation of possible sites in Sausalito for the periodic disposal of household hazardous wastes.

(8) **Enforcing Standards.** Marin County and its cities and towns will assist local, regional state, and federal authorities with enacting and enforcing hazardous materials and waste regulatory standards.

(9) **Emergency Response.** Marin County and its cities and towns support the development and maintenance of adequate response capabilities for hazardous materials and waste emergencies. This support will include coordination among all local jurisdictions and appropriate state and federal agencies.

(10) **Safe Transportation.** Marin County and its cities and towns will work within their limits to ensure safe transportation of hazardous wastes in the county.

(11) **Siting Needed Facilities.** Marin County and its cities and towns will support efforts to develop needed facilities to transfer, store, recycle, treat, or dispose of hazardous wastes generated in Marin County. In siting these facilities, Marin County and its cities and towns will participate in cooperative efforts with jurisdictions within and beyond the county.

(12) **Contaminated Sites.** Marin County and its cities and towns will promote programs to prevent site contamination resulting from the use of hazardous materials and wastes. Timely cleanup of contaminated sites will also be encouraged.

(13) **Inter-county Information Exchange.** Marin County and its cities and towns will share with other counties information pertaining to inter-county movement of hazardous wastes. this information will include: (a) Quantities and types of hazardous wastes imported to and exported from Marin County; (b) offsite commercial transfer, storage, and disposal capacity in Marin County, and impending actions that would significantly reduce or expand such capacity; (c) changes in hazardous waste generation patterns, such as new industries or changes in local regulations that would result in a significantly increased need for out-of-county disposal. Marin County will request and encourage the State Department of Health Services to develop a program to provide annual summaries of the hazardous waste manifest data that will provide counties with import/export data necessary to meet inter-county information sharing requirements.

Program HS-1.6.1
Marin County Hazardous Waste Management Plan. *Work with Marin County, other Cities in Marin County and other jurisdictions as necessary on implementation measures described in Chapter 10 of the Marin County Hazardous Waste Management Plan.*

Program HS-1.6.2
Subsurface Contamination Investigations. *Through the environmental review process, require subsurface contamination investigations at potentially contaminated sites prior to development approval.*

Program HS-1.6.3
Use of Potentially Harmful Materials on Public Lands. *Continue to enforce the personnel regulation that requires the use of potentially harmful materials on public lands be done by qualified professionals only.*

Program HS-1.6.4
Eliminate Use of Harmful Materials. *Work to eliminate the use of potentially harmful materials on public land.*

Program HS-1.6.5
Coordination of Recycling Efforts. *Coordinate and expand local recycling efforts and publicity efforts with those of the County to promote safe disposal and recycling of household hazardous waste. (See Program EQ-3.14.2.)*

Program HS-1.6.6
Public Awareness of Toxic Materials. *Initiate public awareness programs to minimize the use of toxic garden and lawn sprays for both private and public purposes (see Program EQ-3.11.4).*

Program HS-1.6.7
Phase I Reports. *Require, at minimum, a Phase I hazardous materials assessment for all future development or redevelopment projects on sites located within the Marinship area or on sites with a known history of industrial uses such as gas stations.*

Program HS-1.6.8
Hazardous Materials Business Plan. *Continue to require that all businesses that store more than fifty five (55) gallons of hazardous materials on site file a Hazardous Materials Business Plan with the County Office of Waste Management.*

Program HS-1.6.9
Inspection. *Require the Fire Inspector to inspect the types, amounts, and storage facilities of all hazardous materials located on all business sites during the Occupancy Permit process.*

Program HS-1.6.10
Use of Harmful Materials. *Place signage notifying the public of the use of pesticides and herbicide when on public lands.*

■ Policy HS-1.7
Police Safety. Maintain a crime free environment while minimizing increases in police service needs.

Program HS-1.7.1
Crime Prevention Design. *Require that crime prevention design be considered in construction through appropriate project referrals to the Police Department.*

Program HS-1.7.2
Lighting Along Bridgeway and the Waterfront. *Study options to provide low key lighting and access for patrol purposes on pathways and steps along Bridgeway and the waterfront.*

Objective HS-2.0
Engage in Disaster Planning. *Ensure appropriate disaster preparedness planning and response.*

■ Policy HS-2.1
Emergency Preparedness. Ensure that the City, its citizens, businesses and services are prepared for an effective response and recovery in the event of emergencies or disasters.

Program HS-2.1.1
City Emergency Response Plan. *Implement and publicize the City's emergency response plan.*

Program HS-2.1.2
Disaster Preparedness Coordination. *Coordinate City-wide and neighborhood disaster preparedness planning efforts through the Emergency Preparedness Committee with the Fire and Police Departments, the American Red Cross, and the County.*

Program HS-2.1.3
Citizen Training. *Support the American Red Cross citizen training in how to respond to emergencies.*

Program HS-2.1.4
Specific Action Plan. *Develop an emergency response action plan to address identifiable risks in the case of an emergency or disaster.*

■ Policy HS-2.2
Public Facilities. Locate and design emergency buildings, vital utilities, communication systems, and other public facilities so that they remain operational during and after a major earthquake or other disaster.

Program HS-2.2.1
Emergency Coordination Center. *Locate and develop an emergency coordination center in one or more public buildings.*

■ Policy HS-2.3
Access for Emergency Vehicles. Provide adequate access for emergency vehicles and equipment, particularly fire-fighting equipment.

Program HS-2.3.1
Street Encroachment Permit Process. *Develop a temporary street encroachment permit process so that construction and other large pieces of equipment or vehicles occupying the public right-of-way may be regulated.*

Program HS-2.3.2
Street Frontage Improvement. *Require frontage improvements which include road widening for on street parking when private development is proposed and where neighborhood compatibility concerns can be addressed (see Policy CP-2.4).*

■ Policy HS-2.4
Overhead Utilities. Minimize the risk to public health and safety from overhead utilities.

Program HS-2.4.1
Priority Undergrounding. *Prioritize the undergrounding of those overhead utilities which hinder the movement of emergency vehicles and other Health and Safety risks such as PCB's, falling wires, and electromagnetic fields.*

Program HS-2.4.2
District Formation. *Encourage the formation of undergrounding districts at the neighborhood level to realize the benefits of undergrounding.*

Program HS-2.4.3
Community Design. *Refer to Policy CD-3.3.*

Objective HS-3.0
Prevent Exposure of People to Unacceptable Noise Levels. *Minimize excessive sound intrusions in the City of Sausalito and prevent exposure of residents to unacceptable noise levels.*

■ Policy HS-3.1
Noise Guidelines. Establish noise level guidelines to direct the siting, design and insulation of new residential, commercial and industrial development.

Program HS-3.1.1
Land Use Compatibility Standards. *Apply the Land Use Compatibility Standards (see Table 7-4 in the Background section) along with the noise contours shown on GP Map 19 when reviewing the siting and design of new or substantially remodeled structures.*

Program HS-3.1.2
Noise Insulation Standards. *Adopt and continue to enforce the noise insulation standards of the State of California Administrative Code, Title 24 and the Uniform Building Code, Chapter 35 for residential development.*

Program HS-3.1.3
Interior Noise Guidelines. *Rely on the interior noise guidelines in Table 7-5 when considering the feasibility of new or substantially remodeled commercial and industrial structures.*

Program HS-3.1.4
Environmental and Design Review Assessment of Noise. *Identify conditions which should be imposed to achieve desired noise levels specified in the Background section of this element through environmental and development review.*

■ Policy HS-3.2
Impacts on Existing Developed Areas. Prohibit unnecessary, excessive and annoying noise in existing developed areas.

Program HS-3.2.1
Noise Ordinance Review. *Review the existing Noise Ordinance and consider changes including the provision of realistic quantifiable noise standards and effective enforcement.*

■ Policy HS-3.3
Traffic Noise. Strive to reduce traffic noise levels in existing residential areas.

Program HS-3.3.1
Enforcement of Vehicle Noise Standards. *Continue enforcement of vehicle noise standards through noise readings and enforcement actions.*

Program HS-3.3.2
Purchase of New City Vehicles. *Consider noise criteria in the purchase of new City vehicles, their components and other equipment.*

Program HS-3.3.3
Coordination with CalTrans. *Work with CalTrans to explore alternatives to the construction of sound walls along Highway 101.*

■ Policy HS-3.4
Single-Event Noise. Allow single-event occurrences at specific sites per Policy EQ-2.2 subject to special permit conditions which alleviate noise to the greatest extent possible.

Program HS 3.4.1
Special Events Permits. *Continue to require special permits for special events.*

Program HS-3.4.2
Special Events. *Limit the number of special single events that are allowed to take place a year.*

■ Policy HS-3.5
Construction Noise. Strive to reduce noise levels associated with construction activities.

Program HS-3.5.1
Equipment Noise. *Require noise baffling devises to be installed on heavy equipment during site excavation, grading, or construction.*

Program HS-3.5.2
Construction Noise. *Continue to restrict construction activities to acceptable time periods.*

Program HS-3.5.3
Sound Walls. *Consider constructing temporary sound walls surrounding construction sites during the course of construction.*

Section 7.3

HEALTH AND SAFETY BACKGROUND

The Health and Safety Background section describes conditions which exist in Sausalito which may result in hazards to the community. Potential health and safety hazards must be considered in planning the location, design, density, intensity and type of land use in a given area. Also addressed within this section of the Plan is the intent behind health and safety policies and their implementing programs.

General Geological Conditions

The City of Sausalito is located along the eastern shore of Marin County, at the base of the foothills southeast of Mount Tamalpais. Marin County lies within the central portion of the Coast Range Geomorphic Province of California, a region characterized by northwest-trending valleys and mountain ranges. These topographic features are generally parallel to the major geologic structures such as the San Andreas system of active faults.

Bedrock in the area consists mainly of the Franciscan Assemblage, a diverse and structurally complex group of igneous, metamorphic, and sedimentary rocks of Upper Jurassic to Cretaceous age (140 to 65 million years old). These rocks underlie most of the Coast Ranges east of the San Andreas fault, which is located approximately 6.5 miles southwest of Sausalito. In southern Marin County, the Franciscan rocks are overlain by alluvium, colluvium and bay mud deposits of Plio-Pleistocene to Holocene age (less than 2 million years old).

The geology of the region has been mapped by several previous investigators including Lawson (1914), Ver Planck (1955), Schlocker (1974), Bedrossian (1974), Blake, et al., (1974) and Rice, et al. (1976). These maps differ in scale and detail, but they generally agree that Sausalito is underlain by bedrock units of the Franciscan Assemblage. (See separate technical report for map of geologic units and detailed descriptions of various rock types). Three major bedrock units are exposed within the City. The southwestern end of the City is underlain by Franciscan greenstone, an altered volcanic rock, and chert, a fine-grained siliceous rock. Chert is the dominant rock type above the approximately 100 foot contour in the southern part of the City. The base of the chert is shown by Rice, et al. (1976) to be thrust fault, below which the dominant rock type is melange, a mixture of shale, sandstone locally containing masses of a variety of other rock types rocks. Melange is the dominant bedrock type in the northern half of the City.

Many of the hillside swales and small valleys that characterize the City contain varying thickness' of colluvium, a thick soil deposit that forms as the result of erosion, soil creep and sloughing of the adjacent slopes. This unit may include deposits of alluvium (stream sediments) in the more flat lying valley bottoms. The relatively flat land along the bay margin is underlain by a combination of natural bay mud and man-made fill. There are also a number large fills along Highway 101 (see separate technical report). Many smaller fills, are also present in the developed hillside areas throughout the City.

Faults

The most significant geologic structure in the region is the active San Andreas fault, which trends northwestward through western Marin County and the adjacent Pacific Ocean. At its nearest point, the fault lies approximately 6.5 miles southwest of Sausalito in the Pacific Ocean. The fault comes on land at Bolinas Lagoon, about 9.5 miles northwest of Sausalito. The San Andreas is an active, right-lateral strike-slip fault (i.e. the land west of the fault generally moves north with respect to the land east of the fault during large earthquakes) and has been the source of many earthquakes during historic time. The San Andreas is the only active fault known to be present in southern Marin County (Brown, 1970; Fox, 1983). It is the only fault in southern Marin County that has been zoned by the California Division of Mines & Geology (1974) under the provisions of the Alquist-Priolo Special Studies Zone Act of 1972.

Other major active faults in the north bay region include the Hayward fault, and the Rodgers Creek fault 13 miles east and 22 miles northeast of Sausalito, respectively. Other, more distant, active faults in the region include the San Gregorio, Calaveras, West Napa, Greenville, Concord, and Green Valley faults.

A thrust fault (a fault were one terrain overrides another along a gently inclined fault plane) was mapped at the contact between chert or sandstone and melange member of the Franciscan Assemblage Rice, et al. (1976) and is described as inactive. That fault is shown by Jennings (1975) to be a pre-Quaternary fault, or one that has not moved within the last 2 million years.

Seismicity

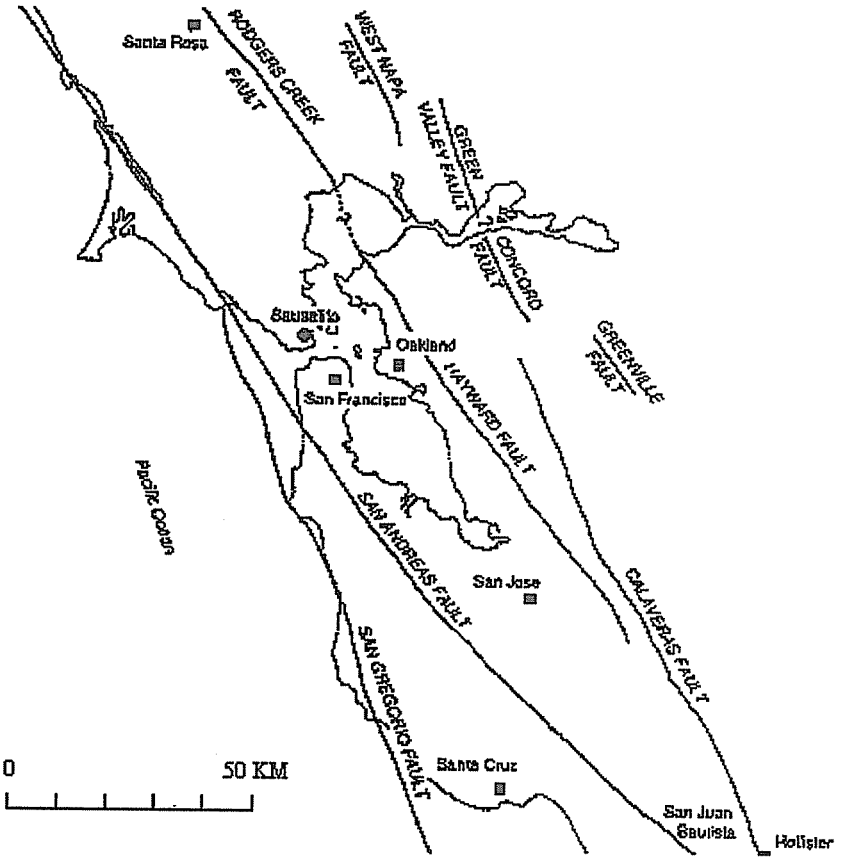
The San Francisco Bay Region has been affected by several large earthquakes. Information on these faults is presented in Table 7-1 and map on the next page. The largest of these was the great San Francisco earthquake of April 18, 1906, that occurred on the San Andreas fault near San Francisco. This earthquake caused strong to violent ground shaking throughout much of west central California and caused widespread damage. Ground shaking intensities in Sausalito were approximately VIII-IX on the Modified Mercalli Scale (see Table 7-2). In southern Marin County, damage was extensive to the poorly engineered structures of that time (Lawson, 1908). Other large earthquakes occurred in 1836 and 1868 on the Hayward Fault in the East Bay. The most recent large earthquake to effect the area was the Loma Prieta earthquake which occurred on October 17, 1989, on the San Andreas Fault near Santa Cruz and registered 7.1 on the Richter scale. Although ground shaking and associated structural damage occurred in the south bay area, little damage occurred in Sausalito.

The recent increase in earthquake activity in the San Francisco Bay Region suggests that the region is entering a period of increased seismic activity that could include one or more large and destructive earthquakes. Recent estimates prepared by the U.S. Geological Survey's Working Group on California Earthquake Probabilities (1990) indicate that the overall probability of one or more large earthquakes (magnitude 7.0 or greater) in the Bay Area is approximately 67% in the next 30 years. Such earthquakes are considered most likely to occur on the San Andreas, Rodgers Creek or Hayward faults. Although less information is available for the San Gregorio fault, it is also considered active and capable of generating large earthquakes. Assuming that the earthquake epicenter is located on a nearby segment of one of the principal active faults, ground shaking intensities of approximately VIII-X could be expected in Sausalito.

Table 7-1
Principal Active Faults

Fault	Distance (Miles)	Largest Historical Earthquake (Year)	Maximum Credible Earthquake 1,2 (MCE)	Peak Bedrock Acceleration at Sausalito
San Andreas	6.5	8.3 (1906)	8.5	1.00
San Gregorio - Seal Cove	9.0	-	7.5	0.40
Hayward	13.0	7.0 (1836) 6.7 (1868)	7.5	0.35
Rodgers Creek	2.0	5.7 (1969)	7.5	0.20

1. Expressed as Richter Scale Magnitudes.
2. The Maximum Credible Earthquake is the largest earthquake considered possible under present geological conditions.
3. Rock accelerations expressed as a fraction of g, acceleration due to gravity; values are approximate.



Source: James Joyce Associates (1992)

Table 7-2
Modified Mercalli Intensity Scale

I	Not felt by people, except under favorable circumstances.
II	Felt indoors by a few people, especially on upper floors of multi-story buildings, and by sensitive persons.
III	Felt indoors by several people, usually as a rapid vibration that may not be recognized as an earthquake at first. Vibration is similar to that of a light or lightly loaded truck, or heavy truck passing some distance away.
IV	Felt indoors by many, outdoors by a few. Awakens a few individuals, particularly light sleepers, but frightens no one except those apprehensive from previous experience. Vibration like that due to passing of heavy or heavily loaded truck.
V	Felt indoors by practically everyone, outdoors by most people. Direction can be estimated by those outdoors. Awakens many, or most sleepers. Frightens a few persons, with slight excitement.
VI	Felt by everyone, indoors and outdoors. Awakens all sleepers. Frightens many persons; general excitement.
VII	Frightens everyone, general alarm and everyone runs outdoors.
VIII	General fright, and alarm approaches panic
IX	Panic is general. Evidence of ground disturbance. Considerable damage to masonry buildings. Wood frame buildings shift out of plumb or fall off foundations.
X	Panic is general. Considerable ground disturbance, most masonry and wood frame structures are destroyed.
XI	Panic is general. Widespread ground disturbance, severe structural damage.
XII	Panic is general. Structural damage is total.

Source: James Joyce Associates (1992)

Geologic Hazards

Within Sausalito, the most significant geologic hazards are those associated with landslides, debris flows, and ground shaking during earthquakes. Other significant hazards include the potential for settlement of structures constructed on filled bay land, expansive soils, and flooding. These and other possible hazards are discussed below.

Landslides

Several types of landslides are common in southern Marin County. Sausalito has been impacted many times by slope failures that began near and within the City limits. Several landslides have been mapped within or near the City by Schlocker (1974), Bedrossian (1974), and Rice, et al. (1976). (The landslides mapped by Rice et al., 1976, are apparently based on aerial photo interpretation and is, therefore, subject to some uncertainty). Two moderately large landslides are mapped on the hillside south of City Hall by Rice et. al.(1976). A reconnaissance of these areas revealed no evidence of landslide activity and it is uncertain if these landslides exist.

The mapped landslides are mainly slow moving slump or earthflow landslides that are confined to the soil mantle and shallow, weathered bedrock. Movement on these landslides typically occurs during the winter or spring as a result of rainfall. Movement can also occur during large earthquakes. Landslides can cause extensive damage to buildings, roadways or other facilities located on the landslide and often result in large property losses. Because these types of landslides are slow moving, people are rarely injured or killed by landslide movement.

Landslides can also result where excavations (cut slopes) are made into hillsides. Depending on geologic conditions, such excavations can trigger instability. Such instability has occurred previously along several of the Highway 101 cuts in Marin County. All significant cut slopes should be investigated by a qualified engineering geologist or geotechnical engineer prior to grading to determine if the planned cuts will be stable.

Debris Flows

Debris flows are fast moving, highly fluid landslides that typically occur during periods of intense rainfall. Debris flows originate most commonly on steep slopes, within hillside swales filled with unstable colluvium and move rapidly down the swales or ravines coming to rest in the near-level valley bottom areas. Within Sausalito, many of the swales or ravines that occupy the steep hill slopes may be capable of generating debris flows. Debris flows are most likely to originate on slopes underlain by chert, greenstone and sandstone (generally the central and southern portions of the City). Areas underlain by melange, such as those in the northern portion of Sausalito, are generally characterized by earthflows or slumps and are considered less likely to generate debris flows (Ellen, et al., 1982).

Structures located in debris flow paths can be severely damaged or destroyed. During the intense storms of January 1982, several fatalities occurred in the Bay Area, including several within Marin County, as a result of residences being impacted by debris flows (Ellen et al., 1988). One such fatality occurred in Sausalito.

The risk of loss of property or life as a result of debris flows can be reduced in several ways. The most effective strategy is to avoid placing structures or facilities in debris flow paths. Where structures exist within areas at risk of debris flows several measures can be taken to reduce the risk. These strategies measures generally involve stabilizing the debris flow source areas through regrading, subdrainage or retaining walls, constructing structures to retain debris or to divert debris away from structures. Detailed geologic mapping and subsurface exploration are required to evaluate debris flow risk and provide recommendations for mitigation measures. Within developed areas, debris flows are sometimes triggered by concentrated runoff being discharged onto natural slopes, manmade slopes, or into swales filled with unstable deposits. This risk can be minimized through construction of appropriate storm drainage facilities in these areas.

Earthquake Hazards

Sausalito lies within a seismically active region that includes much of western California. Four major active fault systems, the San Andreas, Rodgers Creek, Hayward, and San Gregorio, are known to exist in the vicinity. Each of these faults is capable of generating large earthquakes that could produce strong to violent ground shaking in Sausalito. At present, it is not possible to predict precisely when or where movement will occur on these faults.

In the event of an earthquake, seismic risk to a structure will depend on the distance to the earthquake epicenter, the characteristics of the earthquake, the subsurface conditions underlying the structure and its immediate vicinity, and the characteristics of the structure. The intensity of ground shaking can be amplified by local geologic conditions. Areas most susceptible to a significant amplification of ground shaking are areas underlain by soft sediments such as Bay Mud. In several areas along the Sausalito waterfront fill has been placed over Bay Mud as a part of site development. These areas are likely to experience substantially stronger ground shaking than nearby areas underlain by bedrock at a shallow depth. The magnitude of ground shaking amplification will depend on many factors including earthquake characteristics and location and the engineering characteristics of the site. Careful geotechnical analysis is required to provide an estimate of the amount of amplification that can occur. Ground shaking amplification observed along San Francisco Bay during the Loma Prieta earthquake suggests that amplifications could be as large as a factor of two.

Experience gained during previous earthquakes has shown that the structures most susceptible to earthquake damage are older structures (those constructed before about 1950) and unreinforced masonry buildings (URMs). Within older wood frame structures structural damage occurs most frequently as a result of poorly designed foundations or a lack of structural bonding between the foundation and the building. During the recent Loma Prieta earthquake, many such structures in Los Gatos and Santa Cruz were thrown from their foundations and received moderate to severe structural damage as a result. The risk of structural damage can often be significantly reduced by securely attaching the structure to the foundation. Shear walls or other structural reinforcements within the building may also be useful in improving resistance to earthquakes.

Unreinforced masonry chimneys often collapse during earthquakes. Collapse may occur during earthquakes of moderate magnitude where the attached building receives little or no damage. The risk of collapse of unreinforced masonry chimneys can be reduced by adding structural supports to existing chimneys or incorporating steel reinforcement into new chimneys.

A large number of unreinforced masonry buildings (those constructed with brick, cinder block or stone without steel reinforcement) were constructed in California in the early part of this century. Structures of this type are prone to collapse during large earthquakes. Several unreinforced brick structures in downtown Santa Cruz and Los Gatos collapsed during the recent Loma Prieta earthquake resulting in several fatalities. Unreinforced masonry buildings can often be brought up to acceptable earthquake design standards by adding structural reinforcement.

Given the high risk of large earthquakes in the Bay Area and in Sausalito, unreinforced masonry structures should be considered a significant risk to public safety. The City has conducted an inventory of all unreinforced masonry (URM) buildings in Sausalito in response to requirements of SB 547 (Government Code § 8876) which deals with the reduction of seismic hazards in existing buildings. The City has also passed an ordinance which requires the submittal of structural analyses of all the URM buildings identifying the extent of the work needed to strengthen them.

Within the City limits, there are ten (10) unreinforced masonry buildings. All of these buildings are located in the Downtown and Caledonia Street areas of the City. In response to this current situation, the Plan proposes that the City consider adopting phase two of the URM ordinance which will ensure the timely seismic retro-fitting of the affected structures.

In addition the ten recognized unreinforced masonry buildings, Sausalito is comprised of many older structures. Although these structures are not unreinforced masonry buildings, they share similar risks. In the event of an earthquake, these older structures could potentially slip off their foundations or suffer chimney damage. To increase public awareness of the risks, the Plan provides for the City to make people aware of the pamphlets, A Homeowners Guide to Earthquake Safety and the Commercial Property Owners Guide to Earthquake Safety, published by the California Seismic Safety Commission which identify potential hazards and ways to mitigate or correct those hazards.

Fault Rupture

There are no known active faults within Sausalito. Ground rupture tends to occur along lines of previous faulting. The closest known active fault is the San Andreas Fault which lies along the western coast of Marin County. Fault related ground rupture is therefore considered unlikely within Sausalito.

Earthquake-Related Ground Failure

Various forms of ground failure often occur during or immediately following an earthquake, as a result of ground shaking. The nature and severity of these effects are determined by the magnitude and duration of shaking and the local geologic and groundwater conditions. Some localized ground cracking was noted in Sausalito after the 1906 earthquake (Youd and Hoose, 1978). Earthquake-related ground failures can be divided into several types including lateral spreading, lurch cracking, and liquefaction.

Lateral spreading is the movement of loose surficial materials over gentle slopes during an earthquake. This phenomenon occurs most often in areas underlain by thick soils or unconsolidated sediments adjacent to a slope such as a creek channel. Movements of up to several feet are possible.

Lurch cracking is the formation of various types of fissures or cracks in the ground surface resulting from the oscillatory motion of the ground during an earthquake. This usually occurs in relatively flat areas underlain by loose, unconsolidated materials, and is exacerbated by the presence of shallow groundwater.

Liquefaction occurs in granular materials as a result of ground shaking, and is often followed by local settling or slope failure. The potential for liquefaction is considered to be highest in areas underlain by saturated, unconsolidated, granular sediments. Within Sausalito, the areas most at risk from liquefaction are in the flat lying valley bottoms and along the bay margin.

Slope failure or landsliding most frequently occurs under non-seismic conditions, but can be triggered or accelerated by ground shaking. In southern Marin County, the potential for seismically induced landsliding to occur depends upon a number of factors, including the nature of

bedrock, nature and depth of soils, angle and direction of the slope, and moisture content. The most common type of earthquake-induced ground failures are small sloughs or rock slides in steep cut slopes. Movement can also occur in pre-existing landslides.

The risk of lateral spreading, lurch cracking, or liquefaction is moderate to low within the low-lying, coastal portions of Sausalito and very low in upland areas. Small rock slides are likely to occur along steep cut slopes such as along roadways during earthquakes and some movement of the larger landslides may occur.

Tsunami

Tsunamis are large, long period sea waves generated by earthquakes. Several small to moderate size tsunamis have impacted the coast of California during historical times. The highest recorded tsunami wave in San Francisco Bay resulted from the 1964 Alaskan earthquake. This wave reached about 7 1/2 feet at Fort Point, and achieved a maximum height within the Bay of 3 3/4 feet above mean high tide level. During the 1964 event, successive waves and associated currents caused damage to harbors in Sausalito and San Rafael (Rice, et al., 1976). Damaging tsunamis typically result from earthquakes located far from California in places such as Alaska or the western margin of the Pacific basin. Earthquakes occurring on strike slip faults such as those which dominate the central California coast do not typically produce large tsunamis. Waves originating across the Pacific basin will require several hours to travel to the site which allows for the warning of coastal residents. Although sufficient data are not available to precisely evaluate tsunamis risks there is a risk of tsunamis inundation within the coastal low lying portions of Sausalito. Portions of the low-lying plain along Richardson Bay are susceptible to inundation from severe storm waves, very high tides, storm flooding, and tsunami (map GP-18). Ritter and Dupre (1972) and U.S. Geological Survey (1972) show most of the area east Bridgeway to be susceptible to inundation during a 100-year flood. It must be assumed, since this area is adjacent to the Bay, that this area is also susceptible to tidal or tsunami flooding.

Expansive Soils

Portions of the City are underlain by expansive soils. Soils of this type undergo a significant volume change as a result of wetting or drying over time such volume changes can cause damage to improperly designed structures. Although the extent of expansive soils is not known, such soils occur most frequently in areas underlain by Franciscan melange bedrock. Expansive soils can be mitigated through special foundation or pavement design.

Drainage

Proper drainage is an important consideration in controlling the potential for instability (landslides, debris flows, etc.) within hillside developments. Control of runoff is also important in controlling erosion and flooding of adjacent properties. Much of the grading done within Sausalito is old and did not include drainage improvements that would be employed today. Where possible, new lots should be graded so that the lot drain toward the street at a minimum of 2%. Water from down spouts and impervious surfaces should be collected and piped to the storm drain system. Where this is not possible, such as in areas of old construction, efforts should be made to collect down spout water, lot runoff, etc. and discharge this water into improved drainage channels.

Coastal Erosion

Coastal erosion can be a significant consideration for development along the coast line. Generally, the coastline of Sausalito is protected from large ocean waves and the potential for coastal erosion is judged to be moderate to small. The majority of the coast line of Sausalito has been improved and erosion protection measures have been installed it is likely that coastal erosion can be controlled through normal engineering practices.

Flooding

Maps prepared for the National Flood Insurance program indicate that the risk of flooding is high in the low-lying portion of Sausalito, generally east of Bridgeway (GP Map 18). Another area at risk of flooding is along Coloma Street. The remaining portions of the City are generally at higher elevations and the risk of flooding in these areas is low.

Through the environmental review process, the Plan will encourage areas of historical fill to re-engineer existing fill and increase the site elevation to at least 20 feet above Mean Lower Low Water. The increase in elevation of the construction site will reduce the potential exposure of people and property to the 100 year coastal flood. If a development site cannot be improved to such an elevation, all new construction in the areas subject to flooding will be required to prove that the lowest point of the lowest structural member maintains a minimum height consistent with the City's Federally mandated Flood Plain Management program.

The City of Sausalito is one of several agencies that regulate the development of shoreline properties. The San Francisco Bay Conservation and Development Commission (BCDC) is exploring ways to reduce the risk of flooding by wind waves. The wind direction of storms on the Bay can create serious safety hazards to marinas and shoreline properties. Possible methods deserving further exploration with BCDC by which to mitigate wave action hazards include the following:

(1) Requiring engineering reports for breakwaters, including wave suppressers, wave dampers, floating breakwaters.

(2) Allowing well-designed rip-rap to prevent erosion.

(3) Requiring all new piers to be oriented to protect property from dangerous winds from standard events.

(4) Encouraging the proper maintenance and reconstruction of existing protective barriers for marinas.

Another BCDC project, jointly operated with the US Geological Survey, involves the study of the rise in sea level and the implications to safety and environmental quality that a rising sea level may have. There currently is a monitoring station in the Marinship at the Bay Model. Because this issue does have safety implications to the shoreline development in the City, the Plan calls for the City to support the program of BCDC and USGS to measure sea level rise.

Foundation Considerations

Much of the developed portion of Sausalito is in steep hillside areas. Typically, structures constructed on slopes steeper than about 7:1 (horizontal to vertical) are constructed on pier and grade beam foundations. Alternatively, deepened spread footings extending down to bedrock are often utilized. These types of foundations are also generally suitable for areas underlain by expansive surficial soils.

Geotechnical Hazard Zones

The City of Sausalito has been divided into five geotechnical hazard zones based on the existing and potential geologic and seismic hazards present in each area (Rice et al. (1976). These zones are described below and their distribution on the site is shown on map GP-17. The boundary lines between the various zones should be considered approximate. The zones are intended for planning purposes only and should not be used as a substitute for detailed geologic or soils studies.

ZONE mu: This zone corresponds to the low-lying margin of Richardson Bay that is underlain by a combination of man-made fill and Bay Mud. The slope stability hazards are low due to the lack of relief. The potential for secondary seismically-induced ground failures, including liquefaction, lurch cracking, lateral spreading and settlement, is moderate to high. This is due to the relatively unconsolidated nature of the sediments, some of which may be granular, and the very low elevation of this area. Portions of this area may undergo long term settlement as a result of consolidation of the Bay Mud or fill. The potential for inundation of this area from stream flooding, high tides, storm waves, or tsunamis is high. The potential for the presence of expansive soils is moderate to high.

ZONE 1: This zone includes gently sloping terrain in both ridge and valley areas. It includes ridge tops and gentle slopes that are underlain by relatively stable, hard bedrock and valley bottoms that are underlain by colluvium and alluvium. Slope stability hazards are low in this zone due to the low relief. The potential for flooding or secondary, seismically-induced ground failures is considered to be low to moderate.

ZONE 2: This zone includes moderately steep slopes underlain by bedrock. Slope stability hazards are slightly higher in this zone due to the increase in slope. The lack of thick soils or colluvium makes the potential for secondary seismically-induced ground failures low. The elevation and relief indicate that the potential for flooding is low. The potential for the presence of expansive soils is low to moderate.

ZONE 3: This zone includes moderately steep to steep slopes underlain by bedrock, colluvium and man-made fill. Slope stability hazards are moderate to high in this zone due to the steep topography and the presence of potentially unstable colluvium and fill. The presence of thick colluvial soils makes the potential for secondary seismically-induced ground failures low to moderate. The elevation and relief indicate that the potential for flooding is low. The potential for the presence of expansive soils is moderate.

ZONE 4: This zone includes existing landslides and steep slopes that are considered to be prone to instability (Rice, et al., 1976). Except for a low flooding hazard, all other hazards in this area are high. The potential for continued or reactivated slope failure to occur in this area is high. The potential for other secondary seismically-induced ground failures to occur is also high.

The Plan directs that the geologic feasibility of all significant projects (those involving new buildings or significant additions to existing structures) be assessed during the discretionary permit stage of project approval. For properties in zone "mu" this evaluation should be performed by a geotechnical engineer. Within Zones 1-4, feasibility should be evaluated by an engineering geologist. Subsurface investigations will be required within Zones 3 and 4 prior to granting of discretionary approvals, and will be required for all zones prior to issuance of a grading or building permit.

The Plan further directs that the City adopt guidelines for the content of the geologic feasibility studies discussed above. All submitted reports will be required to comply with those guidelines.

Foundation design for new construction and significant additions to existing structures will also be accompanied by geotechnical reports according to Plan policies. The City will adopt guidelines for the content of these reports which will require that they be prepared by a qualified geotechnical engineer, assisted by an engineering geologist in Zones 1-4.

In order to verify and refine the data (Rice, et.al. 1976) upon which the geotechnical hazard zone map is based, the Plan calls for the detailed geologic mapping of the entire City. Such mapping could either be done as a one-time, large scale mapping effort or over a longer period, utilizing the results of detailed geologic reports for development that requires such reports. Such a map would provide better information to the City and the public concerning the potential for geologic hazards on specific sites. The map would be accompanied by a geotechnical report describing geologic conditions and hazards discovered in the City and recommendations on the need for additional site specific engineering geologic and geotechnical reports.

Fire Hazards

The City of Sausalito is exposed to two types of fires: wildland fires associated with the relatively undeveloped areas of the upper slopes, canyons, and ridges; and urban fires associated with the developed residential hillsides and lower commercial areas. Fires may result from an earthquake due to the disruption of utility lines or from rupture of tanks storing flammable materials. Fires may also be caused by natural phenomenon such as lightning. However, according to City Fire Department Officials, the large majority of fires within the City are caused by humans.

In several parts of the Planning Area, conditions exist where a fire could involve several buildings, causing severe damage or loss of life. In the Downtown area, several buildings, many constructed with common walls, predate City ordinances which require fire protection devices (i.e., sprinklers and smoke detectors). Since December, 1976, City ordinance requires a smoke detection system in built-up commercial areas.

Homes located at the tops of ridges or heads of canyons may be particularly vulnerable to fires ignited from below since the community's hillside topography (steep slopes separated by dry drainage and canyons) lends itself to the creation of a "chimney effect" where the fires are drawn up the canyons and steep hillsides. Periodic high winds create an additional fire fighting problem.

Each area of the City has a different level of fire hazard potential. In order to inform the City residents of their fire hazard risk, the Fire Department has initiated a mapping program to identify and map fire hazard areas based upon criteria drawn from that of the State Division of Forestry (map GP-20). Designated higher fire hazard areas would require a higher fire rating for construction materials as appropriate. The City will continue to require that all roofing materials be fire rated class "A" or better, regardless of the fire hazard zone.

Response times from the City's two Fire Stations are quite good. Virtually, the entire City may be reached within 5 minutes from either station. Water supply and pressure are considered adequate for domestic consumption, but are inadequate for fire flow demands. The Fire Department is investigating the use of treated waste water for fire fighting, thereby conserving scarce water for domestic use. The City has 2 million gallons of water in storage and the Fire Department has equipment capable of drafting water from the Bay in emergencies.

Fire Department personnel are cross-trained in fire fighting, paramedical, and marine/boat protection. In addition, Sausalito, together with the other nearby jurisdictions, routinely engages in intra-jurisdictional mutual aid. All floating home areas, whether in the City or within the Sphere of Influence, must have a dedicated fire main at MMWD pressure. All floating homes should have the same fire requirements as land homes, i.e. fire sprinklers and use of Class 3 construction materials.

Hazardous Materials

Hazardous wastes are any chemical compound creating a threat to health, ranging from automobile oil to known cancer causing chemicals. In the 1970's and 1980's, hazards created by toxic waste spills and by contamination from former dump sites have become a subject of increasing concern. Federal and state legislation have focused on cleanup of the most hazardous dump sites, landfill monitoring programs to identify and contain potential hazards, programs to identify businesses using hazardous materials and waste water pre-treatment requirements for industries discharging hazardous waste into municipal systems.

In the last few years, several significant efforts have been made to improve Marin County's capability to deal with hazardous waste. The first actions were related to hazardous materials spills. Included was the creation of the Hazardous Materials Committee within the Marin County Disaster Council. The committee arranged for the establishment of the Hazardous Materials Response Team and prepared the Hazardous Materials Incidence Response Plan, which was made a part of the Marin County disaster plan in 1984. A Joint Powers Agreement (JPA) involving all Marin County cities, the County, California Highway Patrol, and County Fire Districts has designated a unit of the San Rafael Fire Department to contain hazardous materials spills and a unit of the County to identify the type of spill and enforce applicable health laws and regulations regarding such spills.

A second major effort is the adoption of the Marin County Hazardous Waste Management Plan by Marin County and all of its Cities. This plan is required by state law and is intended to evaluate local problems and needs and make recommendations to better protect public health and safety and the environment from the improper management of hazardous wastes. Sausalito has adopted the revised draft plan which is included by reference in this General Plan.

Sites where materials such as paint, rubber products, oil, tar, solvents, and pesticides were used have the potential for containing hazardous soils on the site or nearby. Existing or former light industrial uses located in the community, such as gas stations, machine shops, nurseries, laboratories, laundries, maintenance yards, fuel tanks or chemical storage sites, should be evaluated for potentially hazardous soils prior to development approvals.

Hazardous materials, such as paints, solvents and cleaning compounds, are also typically present in small quantities in people's homes. Proper disposal of these materials is a serious countywide and local issue. The County's Hazardous Waste Management Plan addresses issues such as the management of small volumes of hazardous waste produced by households and businesses.

Emergency Preparedness

Emergency (disaster) preparedness planning consists of three major components: government actions, private organization emergency response actions, and individual or small group actions. Emergency preparedness planning recognizes that in the first 72-hours after a major disaster, people must be self sufficient. Governments cannot provide all of the services that may be needed. Therefore, disaster preparedness involves planning efforts by local government, private organizations and local groups to identify resources, provide public awareness and formulate plans about what to do in an emergency situation.

All cities are required, by the State, to prepare and implement a community Disaster Preparedness Plan. The City has recently revised its Plan in coordination with the Police and Fire Departments and the Emergency Preparedness Committee. The revised Plan contains the Fire and Police Services response policies and evacuation routes. The Plan also calls for the development of an emergency response action plan to address identifiable risks that may occur in the event of a natural disaster or other emergency. It is envisioned that this action plan will address City responses to emergencies such as closure of the Golden Gate Bridge, collapse or closure of the Waldo Tunnel, and other regional emergencies that will directly impact the City. The action plan is to be prepared by the Disaster Preparedness Committee with the support of the Fire and Police Departments.

Overhead Utilities

The General Plan contains a policy statement specifying that overhead utilities may pose a health and safety concern. In the City's recent past, overhead utilities have been considered a problem with regard to views and design aesthetics. It has been brought to the attention of the City that there may exist overhead utilities that may hinder the movement of emergency vehicles on the public rights-of-way. Overhead utilities may also pose a risk with respect to falling wires, PCB's, and electromagnetic fields. The Plan calls for the establishment of a program which will identify locations which have low overhanging utility lines that pass over the right-of-way. The Plan further states that once utility lines which could hinder the movement of emergency vehicles have

been identified, the City shall prioritize the undergrounding of those utility lines once funding has become available.

Noise

The quiet environment of the City is a quality that makes Sausalito an attractive place to live. The maintenance of that quiet environment is a major goal of the plan. A noise analysis was done for this element which measured the existing noise conditions, identified the major sources of noise, and projected the effect of General Plan policies on the future noise conditions in the City. That analysis has shown that the land use patterns and intensities anticipated in the General Plan will not seriously deteriorate the existing noise environment.

Community Noise Rating

Noise is generally defined as unwanted sound. Whether a sound is unwanted depends on when and where it occurs, what the listener is doing when it occurs, characteristics of the sound (loudness, pitch and duration, speech or music content, irregularity) and how intrusive it is above background sound levels. In determining the daily level of environmental noise, it is important to account for the difference in response of people to daytime and nighttime noises. During the nighttime, exterior background noises are generally lower than the daytime levels. However, most household noise also decreases at night and exterior noise becomes more noticeable. Further, most people sleep at night and are very sensitive to noise intrusion.

To account for human sensitivity to nighttime noise levels, a descriptor, Ldn (day-night average sound level), was developed by the United States Environmental Protection Agency (EPA) in the early 1970's to assess the compatibility of residential development with various levels of environmental noise. The Ldn divides the 24-hour day into the daytime of 7:00 AM to 10:00 PM and the nighttime of 10:00 PM to 7:00 AM. The nighttime noise level is weighted 10 dB higher than the daytime noise level. EPA studies indicate that at an Ldn of 60 decibels, there begin to be significant problems with speech interference outdoors and activity and sleep disturbance problems indoors. Outdoor Day-Night Average (Ldn) sound levels can be as low as 30 to 40 dBA (Ldn) in wilderness areas and as high as 85-90 dBA (Ldn) in noisy industrial urban areas. The EPA has estimated that nearly half of the nation's metropolitan population live in areas exposed to levels between 55 to 60 dBA (Ldn).

Existing Noise Environment

The major noise sources in Sausalito are Highway 101, Bridgeway and the Marinship and associated operations in that area. To identify present acoustic conditions and obtain a basis for the projection of future acoustic conditions, noise level measurements were made at 13 locations within the City. Table 7-3 shows the Ldn levels, calculated from the measurement data, for each of the 13 locations at a specified distance to the centerline of the roadway.

In Sausalito, automobiles, trucks and buses on Highway 101 and Bridgeway create the primary noise environment. Noise in the vicinity of the Marinship is primarily from traffic sources on Bridgeway. Marin County conducted a study of the Richardson Bay Sea Plane Base/Heliport for the Countywide Plan that revealed that the noise exposure from these aircraft operations is below that from adjacent Highway 101 and off-ramp traffic. Other noise sources within the City are construction and other commercial activity, leaf blowers, amplified music, and barking dogs.

Table 7-3
Day-Night Community Noise Levels

SOURCE AND LOCATION	LDN (DB)	DISTANCE TO CENTERLINE OF SOURCE (FT.)
Highway 101 at:		
Sausalito Boulevard	58	450
Monte Mar Drive	71	250
Wolfback Ridge Road	73	250
Lincoln Drive	56	300
Bridgeway at:		
Richardson Street	69	30
Pine Street	67	55
Napa Street	71	60
Woodward Avenue	68	100
Ebbtide Avenue	67	100
Marinship at:		
Gate 5 Road & Harbor Drive	63	45
Foot of Spring Street	60	24

Source: Edward Pack Associates, (June, 1989)

Future Noise Conditions

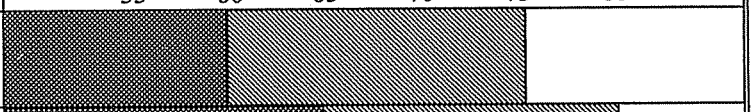
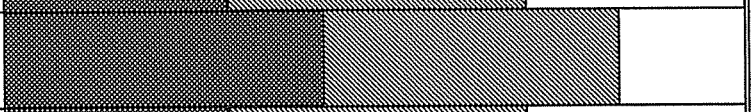
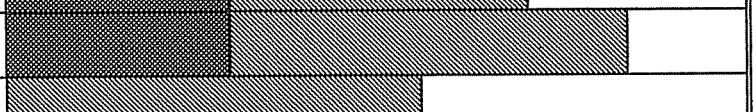
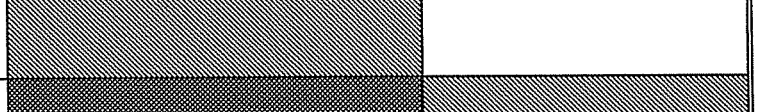
Noise contour lines on map GP-19 are projected to remain the same throughout the life of this General Plan. Traffic projections provided by Caltrans for Average Daily Traffic (ADT) on Highway 101 in the year 2005 anticipated an increase of 4% over ADT when the noise analysis was conducted. This is considered insignificant in terms of noise impacts.

Noise Standards

To provide a satisfactory noise environment and to minimize complaints about community noise, the City must establish guidelines for acceptable indoor and outdoor noise levels. The noise environment which is appropriate for various land uses must be analyzed. The California Office of Noise Control has prepared a table of land use compatibility for community noise environments. This table is reproduced as Table 7-4.

Table 7-4

Land Use Compatibility for Community Noise Environments

LAND USE TYPE	EXTERIOR NOISE EXPOSURE (LDN OR CNEL, DB) 55 60 65 70 75 80
Residential, Hotels, and Motels	
Outdoor Sports & Recreation, Neighborhood Parks & Playgrounds	
Schools, Libraries, Museums, Hospitals, Churches, Personal Care, Meeting Halls	
Office Buildings, Business Commercial, and Professional	
Auditoriums, Concert Halls, Amphitheaters	
Industrial, Manufacturing, Utilities and Agriculture	

Source: California Office of Noise Control

Normally Acceptable
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Conditionally Acceptable
Specified land use is permitted only after detailedanalysis of noise reduction requirements and needed noise insulation features included in the design.

Unacceptable
New construction or development should generally not be undertaken because mitigation is usually nor feasible to comply with Noise Element policies.

The noise exposure contours (map GP-19) will be used in conjunction with the land use compatibility table to identify appropriate land uses at various levels of noise exposure. This review will take place for both new and major redevelopment projects. The environmental review process will be used to identify potential noise problems. Acoustic studies will be required in areas where exposure to noise is deemed to have the potential to be significant. In addition, the City has established interior noise guidelines for various land uses. These guidelines are identified on Table 7-5. New development will be required to incorporate design elements and sound insulation features to meet acceptable interior noise levels.

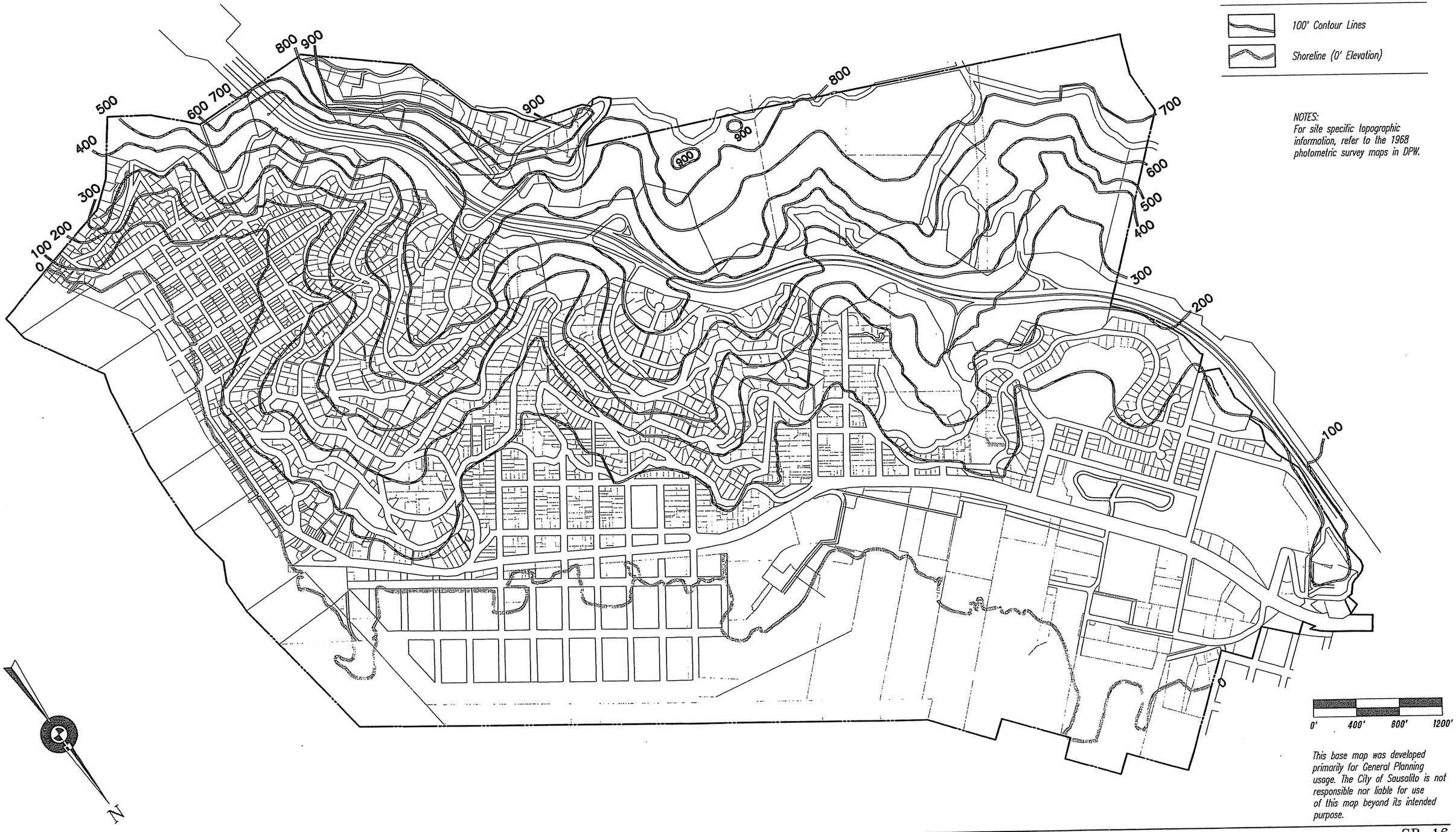
Table 7-5
Interior Noise Levels Considered Compatible for Various Land Uses

USE	INL
Residential	45
Commercial	
Hotel-Motel	45
Offices, Conference Rooms	45
Restaurant, Markets, Retail Stores	60
Sports Arena, Bowling Alley	75
Industrial	
Offices	60
Laboratory	60
Machine Shop, Assembly	75
Public or Semi-Public Facility	
Auditorium, Movie Theater & Church	45
Hospital, Nursing Home	45
School Classrooms	45
Library	40

Source: State Office of Noise Control

Noise Ordinance

The City of Sausalito has adopted a Noise Ordinance which establishes quantifiable noise standards for nuisance or single-event noise sources consistent with maintaining the health and tranquillity within residential areas and the community as a whole. The current noise ordinance is difficult to enforce because it establishes unrealistic standards, with the decibel levels being too low. Frequently, the road traffic (or ambient noise level) is louder than the permissible noise level. The ordinance should be reviewed and amended by a City appointed committee which would be supported by City staff. Specific actions related to the amendment of the Noise Ordinance include: (1) establish ambient sound levels that reflect actual conditions so that uses exceeding the ambient noise level can be cited for violation; (2) establish standards for construction equipment, and controls related to other potential nuisances such as music, dogs, special events, and mechanical/sound equipment; and (3) encourage enforcement and penalties for violations of the Noise Ordinance.



LEGEND

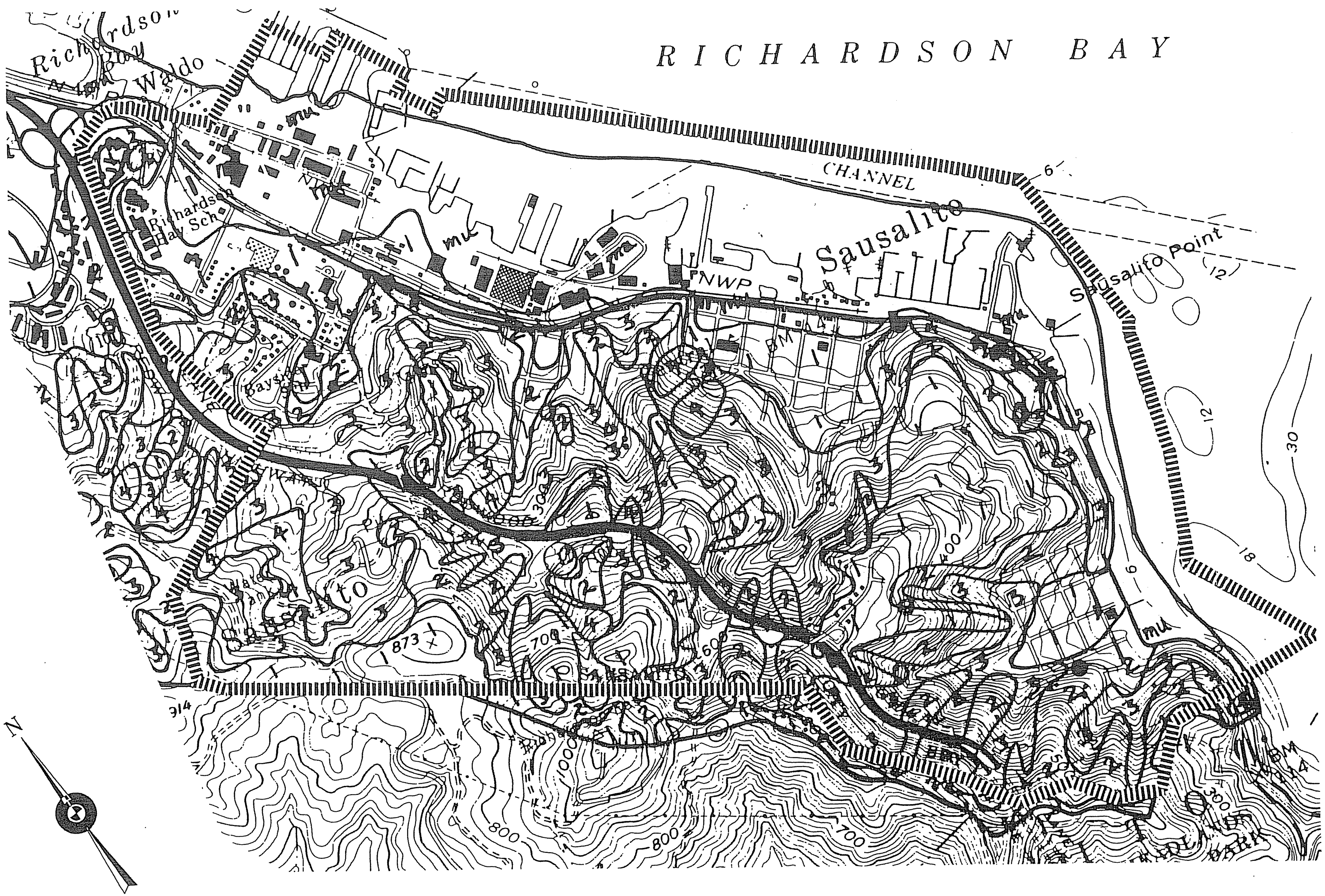
100' Contour Lines

Shoreline (0' Elevation)

NOTES:
For site specific topographic information, refer to the 1968 photometric survey maps in DPW.

0' 400' 800' 1200'

This base map was developed primarily for General Planning usage. The City of Sausalito is not responsible nor liable for use of this map beyond its intended purpose.



LEGEND

INCREASING RISK OF SLOPE INSTABILITY →

mu	1	2	3	4

AREAS OF HISTORIC LANDSLIDE DAMAGE

- ▲ *Structure destroyed or removed*
- △ *Structure damaged*
- ● *Road damaged*
- ○ *Report of landslide, extent of damange not reported*

NOTES:
Modified from Rice et al., 1976.

JOYCE ASSOCIATES
Geologic Consultants

0' 1000' 2000'

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GENERALIZED FLOODING HAZARDS
CITY OF SAUSALITO - GENERAL PLAN

LEGEND

Zone C
Areas of minimal flooding

Zone B
Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood.

Zone V1
Areas of 100-year coastal flood with velocity (Wave-action); Base flood elevations and flood hazard factors determined.

SOURCE:
Flood Insurance Rate/Map
Community Panel #060182-0001C
Effective date: September 30, 1980

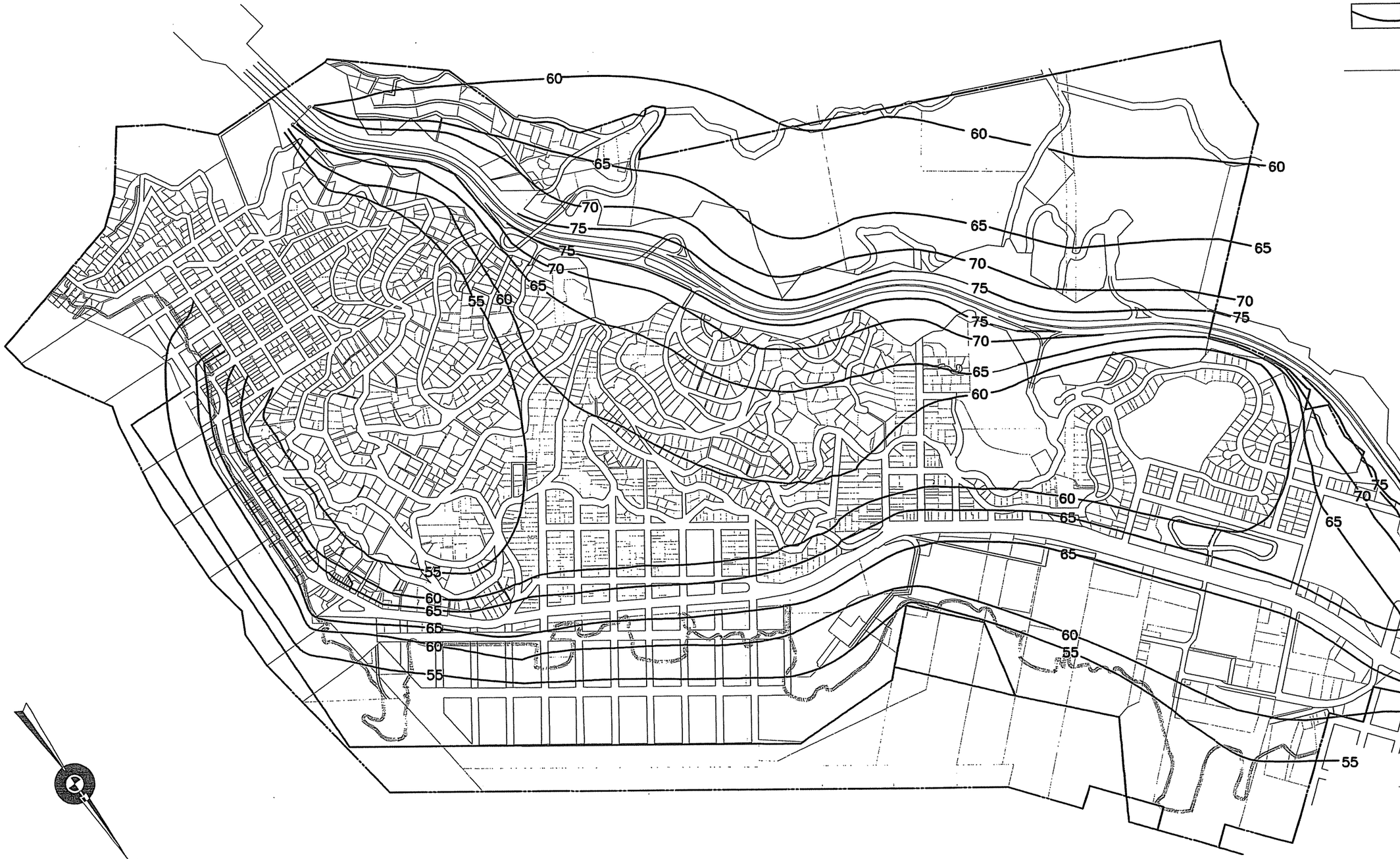
N

0' 400' 800' 1200'

This base map was developed primarily for General Planning usage. The City of Sausalito is not responsible nor liable for use of this map beyond its intended purpose.

NOISE CONTOURS

CITY OF SAUSALITO - GENERAL PLAN



LEGEND

Noise Level Contours

Measured in dB Day–Night Level (DNL) existing and year 2005

SOURCE:
Edward Pack Associates.
Acoustical Consultants, 1989

0' 400' 800' 1200'

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LEGEND

Water Deficient Zones

SOURCE:
Chief Steve Bogel
April 4, 1992

NOTES:
This map does not purport to show which streets are legally open or closed nor which streets are legally accepted or unaccepted.

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