CITY OF SARATOGA

Updated Noise Element of the General Plan

Prepared for:

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TABLE OF CONTENTS

List of Tables

List of Figures

I. INTRODUCTION

The Noise Element of the General Plan provides a basis for comprehensive local programs to control and abate environmental noise and to protect citizens from excessive exposure. The Noise Element has been prepared to meet the requirements of California Planning law Section 65302 (f), which requires a Noise Element as one of the seven mandatory elements. The Noise Element has been prepared in recognition of the guidelines adopted by the State Office of Noise Control pursuant to the Health and Safety Code. The Noise Element quantifies the community noise environment in terms of noise exposure contours for both the near and long-term levels of growth and traffic activity.

Purpose and Goal of Noise Element

The purpose of the Noise Element is to characterize existing and potential future environmental noise levels for use in various land-use planning processes. The Noise Element is intended to be used by the community in the goal of preserving the quiet residential environment of Saratoga. This is done by controlling noise in all zone districts to levels that are compatible with existing and future land uses.

II. ENVIRONMENTAL NOISE FUNDAMENTALS

Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Noise is usually defined as unwanted sound. Environmental noise is a part of modern society, such as noise from transportation vehicles, machinery, people, and other devices. Some sounds that are desirable to one person might be noise to another individual. Therefore, objective measures have been developed to characterize noise environments. These measures include the following aspects of sound:

- The frequency spectrum of the sound
- The time-varying character of the sound
- The intensity or level of the sound

Frequency Spectrum

The "frequency" of a sound refers to the number of complete pressure fluctuations per second in the sound. The unit of measurement is cycles per second (cps) or hertz (Hz). Most of the sounds we hear in the environment do not consist of a single frequency, but rather of a broad band of frequencies, differing in level. The frequency and level content of a sound is called its sound spectrum.

To permit comparisons of sounds having quite different spectra, frequency weighting methods have been devised to correlate with human response (i.e., perceived loudness). "A-weighting" progressively de-emphasizes the importance of frequency components below 1,000 Hz and above 5,000 Hz. This frequency weighting reflects the fact that human hearing is less sensitive at low frequencies and at extreme high frequencies relative to the mid-range. The unit of A-weighted sound levels is sometimes abbreviated "dBA."

Variation of Sound with Time

Although a single sound level value can adequately describe environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise is a conglomeration of distant noise sources, which results in a relatively steady noise having no identifiable source. These distant sources could include traffic, wind in trees, or continuous industrial processes and are relatively constant from moment to moment but usually vary from hour to hour with community activities (e.g., traffic levels). Superimposed on this slowly varying background is a succession of identifiable noisy events of brief duration. These might include nearby activities such as single vehicle passbys, train horns, or aircraft flyovers that cause the environmental noise level to vary from moment to moment.

To describe the time-varying character of environmental noise, statistical noise descriptors were developed. "L_{10}" is the A-weighted sound level equaled or exceeded during 10 percent of a stated time period and is considered a good measure of typical maximum sound levels caused by discrete noise events. The "L_{90}" is the A-weighted sound level equaled or exceeded during 90 percent of a stated time period and is commonly used to describe the noise.

A single number called "L_{eq}" is also widely used. The term "L_{eq}" originated from the concept of a so-called Equivalent Sound Level that contains the same acoustical energy as a varying sound level during the same time period. In other words, the L_{eq} is the average A-weighted sound level in a stated time period.

In determining the daily measure of environmental noise, it is important to account for the different response of people to daytime and nighttime noise. During the nighttime, exterior noise levels are generally lower than in the daytime. However, most household noise also decreases at night; thus, exterior noise intrusions become noticeable. Further, most people trying to sleep at night are more sensitive to noise. To account for human sensitivity to nighttime noise levels, a special descriptor was developed. The descriptor is called the DNL (Day-Night Average Sound Level), which represents the 24-hour average sound level with a 10 dB "penalty" for noise occurring at night.

Level of Sound

It has been found that the human ear responds logarithmically to changes in sound pressure levels. Therefore, sound levels are usually measured and expressed in decibels (dB), with 0 dB corresponding roughly to the threshold of hearing. A decibel is a logarithmic unit used to describe the intensity or level of a sound with respect to a standardized reference sound level.

With regard to increases in noise level, knowledge of the following relationships will be helpful in understanding the quantitative sections of this report:

1. Except in carefully controlled laboratory experiments, a change of only **1 dB** in sound level cannot be perceived.

2. Outside of the laboratory, a **3 dB** change is considered a just-noticeable difference.

3. A change in level of at least **5 dB** is required before any noticeable change in community response would be expected.

4. A **10 dB** change is subjectively heard as approximately a doubling in loudness, and would almost certainly cause an adverse community response.

5. Sound levels do not combine arithmetically. Instead, they sum logarithmically, in a manner similar to the Richter scale, which is used for measuring the intensity of earthquakes. The following two examples illustrate this:

   - If the existing noise level at a particular location is 60 dB, and a new source of sound with a similar spectrum is introduced that also measures 60 dB, the result is not 120 dB; it is 63 dB.

   - If the existing noise level at a particular location is 60 dB, and a new sound source with a similar spectrum is introduced that measures 50 dB, the result is not 110 dB; it is still 60 dB. The new source is so much quieter than the existing one that it does not significantly contribute to the resulting sound level.

Additional definitions of acoustical terms are listed in Appendix A. Common sound levels found in the environment are identified in Figure NE-1.

FIGURE NE-1: HOW LOUD IS IT?

Sound Level in A-weighted Decibels (dB)

Jet takeoff (at 200')	– 120 –	Threshold of pain
Rock music band	– 110 –	
Jackhammer (at 25')	– 100 –	
Motorcycle accelerating (at 25')	– 90 –	
Power lawn mower (at 20')	– 80 –	
Steady urban traffic (at 25')	– 70 –	
Normal conversation (at 3')	– 60 –	
Daytime street, no nearby traffic	– 50 –	
Inside average residence	– 40 –	
Inside quiet home	– 30 –	
Rustling leaves	– 20 –	
Mosquito (at 3')	– 10 –	
	– 0 –	Threshold of hearing

Propagation of Sound

As sound propagates away from a source, the level is attenuated with increasing distance. In general, sound radiating from a single object (called a "point" source), like a train horn or rooftop fan, is reduced by 6 dB for every doubling of distance. Noise radiating from a long single source or long continuous series of similar sources (called a "line" source) is attenuated by 3 dB for every doubling of distance. A roadway with varying levels of continuous traffic behaves similar to a line source with noise levels attenuated by between 3 and 4.5 dB per doubling of distance in typical conditions.

Noise levels can also be reduced by intervening structures. For example, a noise barrier wall or even a single row of buildings between the receptor and the noise source reduces the noise level by about 5 dB to 10 dB. Structures also act to insulate people inside these structures from exterior noise. Common home construction methods generally provide a reduction of exterior-to-interior noise levels of about 20 dB to 30 dB with closed windows.

Effects of Noise on People

The typical effects of noise on people are summarized below. The sound levels associated with environmental noise usually only produce effects in the first four categories.

- **Annoyance** is the most difficult of all noise responses to describe. Annoyance is a very individual characteristic and can vary widely from person to person. What one person considers acceptable can be intolerable to another of equal hearing capability. For example, some people like the sound of trains, while others do not.

- **Physiological responses** are those measurable noise effects on the human body, such as changes in pulse rate, blood pressure, etc. While such effects can be induced and observed, the extent to which these physiological responses cause harm or are a sign of harm is not known.

- **Sleep interference** is a major concern with respect to transportation-generated noise. Sleep disturbance studies have identified interior noise levels attributed to transportation noise as a key factor of sleep disturbance. However, sleep disturbance does not necessarily equate to awakening from sleep; rather, it can refer to disruption of the sleep pattern and stages of sleep. Train and aircraft noise is a major source of complaints.

- **Speech interference** is one of the primary concerns associated with environmental noise. Normal conversational speech is in the range of 60 to 66 dB. Steady elevated noise levels can interfere with speech. Depending on the distance between the speaker and the listener, raised voice levels may be required to overcome the background noise.

- **Potential hearing loss** is commonly associated with occupational exposures in heavy industry or very noisy work environments. Noise levels in neighborhoods, even near very noisy airports, are not considered sufficiently loud to cause hearing loss.

III. NOISE ENVIRONMENT IN SARATOGA

Noise exposure in the City of Saratoga is principally generated by vehicular traffic on highways and arterial roads. Other sources of noise include a spur rail line, distant aircraft, and commercial activities.

Road Traffic

Traffic noise levels depend primarily on vehicular speed and total traffic volume, but also the type of vehicle. The primary source of noise from automobiles is high-frequency tire noise. Trucks, older automobiles, and motorcycles produce significant engine and exhaust noise, and trucks can also generate wind noise. Descriptions of major roadways in the City of Saratoga are found in the Circulation Element of the General Plan.

Rail

The Southern Pacific rail network includes a spur line extending from San Jose, across Saratoga from Prospect Road in the north to Quito Road in the southeast. Train passbys occur occasionally. For example, during a one week survey in 2013, only two train passbys were identified. Often the loudest noise source associated with rail lines is horn blasts at grade crossings which occur at Arroyo De Arguello, Saratoga-Sunnyvale Road, Cox Avenue, Glen Brae Drive, and Quito Road. Locomotive, rail car, and wheel contact are other sources of noise during passbys.

Aircraft

Occasional aircraft flyovers are generated by facilities such as San Jose International Airport, San Francisco International Airport, and Moffett Field. Aircraft noise in Saratoga is a relatively small part of the City's noise environment. Flyovers of large aircraft from San Jose International Airport are at altitudes that make their noise noticeable, but not intrusive at ground level.

Commercial

Commercial concentrations and community and neighborhood shopping centers are located on Saratoga Avenue and Saratoga-Sunnyvale Road at intersections with other arterial streets. There is also a neighborhood center on Cox Avenue. The Village is also a concentration of business activities and is the historic commercial core. Activities such as truck unloading, trash collection, landscape maintenance, HVAC equipment, and events are sources of environmental noise associated with commercial and community centers. Facilities located in the Saratoga hills are also associated with event-related noise that contributes to the noise environment in the City.

Existing Traffic Noise Levels

Existing traffic noise levels in the City of Saratoga are assessed via noise measurements and computer-generated noise contours. The contours are based on both traffic data and noise measurement results.

A noise measurement survey was conducted in Saratoga during July 2013 to determine noise levels throughout the community. The noise survey consisted of long-term (seven-day) noise measurements at six locations along major roadways. The noise monitors were installed at a height of 12 feet above grade. Additional short-term (15-minute) measurements were conducted at an additional six associated locations along the subject roadways to compare various roadway segments. Results of the survey are listed in Table NE-1 below. Measurement locations are shown in a map in Appendix B.

TABLE NE-1: NOISE MEASUREMENT LOCATIONS AND RESULTS

Location No.	Location Description	DNL at 50 feet From Centerline
ST-1	Along Prospect Road between Saratoga-Sunnyvale Road and Miller Avenue	70 dB
ST-2	Saratoga-Sunnyvale between Prospect Road and Cox Avenue	71 dB
LT-3	Saratoga-Sunnyvale between Cox Avenue and Saratoga Avenue	70 dB
ST-4	Cox Avenue between Saratoga-Sunnyvale Road and Saratoga Avenue	66 dB
LT-5	Saratoga Avenue between Cox Avenue and Highway 85	72 dB
ST-6	Saratoga Avenue between Fruitvale Avenue and Saratoga-Sunnyvale Road	68 dB
LT-7	Big Basin Way between Saratoga-Sunnyvale Road and Pierce Road	68 dB
ST-8	Quito Road between Saratoga Avenue and Allendale Avenue	68 dB
ST-9	Saratoga-Los Gatos Road between Saratoga Avenue and Fruitvale Avenue	67 dB
LT-10	Saratoga-Los Gatos Road between Fruitvale Avenue and Quito Road	71 dB
LT-11	Highway 85 between Prospect Road and Cox Avenue	At nominal 100-foot distance: 67 to 71 dB with barrier shielding
LT-12	Along railway between Saratoga-Sunnyvale Road and Cox Avenue	At nominal 100-foot distance: 56 dB

Notes: Unless noted, DNL values are normalized to a measurement distance of 50 feet from the roadway centerline.
'LT' and 'ST' indicates long-term and short-term measurement locations, respectively.
DNL at short-term measurement locations are estimated based on comparison with long-term data.

Source: Charles Salter Associates, 2013

The Federal Highway Administration's Highway Traffic Noise Model (FHWA-RD-77-108) was used to calculate traffic noise levels along major roadways in Saratoga using traffic data from Circulation Element traffic study. Appendix C provides a summary of the results and calculated nominal distances to several noise contour levels for the existing condition. The analysis of city-wide traffic noise levels and associated policies were primarily based on these annualized average daily traffic data. The noise measurement results were used to verify these calculations. The measurements were in-line with calculation results.

The noise contour map of existing conditions generated for highways and major arterials in Saratoga is contained in Appendix C. The map indicates the noise exposure levels associated with these roadways. Actual conditions on each property will vary from the contours, particularly at longer distances, due to such factors as elevation, terrain, noise barriers, and screening. In establishing noise contours for land-use planning, it is customary to ignore noise attenuation afforded by such factors. The result is a worst-case estimate of the noise environment. The assumption is that it is preferable to overestimate the potential noise at a site than to underestimate the noise environment and allow for potentially incompatible land-use development. However, Saratoga noise contours do account for the depression of Highway 85 and the virtually continuous noise barriers flanking the roadway since these features have a significant effect on the traffic noise levels in the surrounding areas.

Future Traffic Noise Levels

Projected future traffic noise levels in the City of Saratoga were calculated based on projected traffic volume data for major roadways. Estimated future traffic volume data for City roadways in 2030 are published in the Circulation Element of the General Plan. Estimated future traffic volume for Highway 85 are based on a Caltrans estimate for growth of 3-percent per year. Appendix D provides a summary of the results and calculated nominal distances to several noise contour levels for the future (2030) condition and also a map illustrating the noise contours. From existing conditions, traffic noise levels are expected to increase by between 1 and 3 dB.

IV. ACOUSTICAL STANDARDS

A. Land-Use Compatibility (Exterior Noise Impacts)

The exterior noise land-use compatibility guidelines shown in Table NE-2 are those recommended as being environmentally acceptable for approval of new development in the City of Saratoga, consistent with the previous noise element, and in line with communities similar to the City of Saratoga and State guidelines.

Noise in the City of Saratoga is generated by a variety of sources. Land-use compatibility for new development may take into account the nature of the sources and receivers under consideration. For example, community uses and events within residential neighborhoods are commonly desirable features even though such facilities may have a noise characteristic that varies from typical residential areas.

TABLE NE-2: NEW DEVELOPMENT LAND-USE COMPATIBILITY GUIDELINES

Outdoor Day-Night Average Sound Level (DNL), in dB			
Land-Use Category	**Normally Acceptable[1]**	**Conditionally Acceptable[2]**	**Normally Unacceptable[3]**
Residential			
- Single-family	up to 60	> 60 to 70	> 70
- Multi-family	up to 65	> 65 to 70	> 70
Open Space[4]/Parks	up to 60	> 60 to 70	> 70
Commercial/Office	up to 65	> 65 to 75	> 75
Public and quasi-Public Facilities	up to 60	> 60 to 65	> 65

TABLE NOTES

Sound levels above are as measured at the exterior of the proposed location of the new development (e.g., residential unit, commercial building, etc.) rather than at the property boundary of the source or the property to be developed. Refer to Table LU-1 (Land-Use Element) for detailed descriptions of land-use categories and land-uses for which these guidelines apply. These guidelines are derived from the California Department of Health Services, Guidelines for the Preparation and Content of the Noise Element of the General Plan, 2003. The State Guidelines have been modified to reflect standards for the City of Saratoga.

[1] **Normally Acceptable** – Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction. There are no special noise insulation requirements.

[2] **Conditionally Acceptable** – New construction should be undertaken only after a detailed analysis of the noise reduction requirement is conducted and needed noise insulation features included in the design.

[3] **Normally Unacceptable** – New construction should be discouraged and may be denied as inconsistent with the General Plan and City Code. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

[4] Outdoor open space noise standards do not apply to private balconies/patios.

Land-use planning can provide an effective means of mitigating adverse noise impacts by separating noise-sensitive areas from noise sources. Site-specific noise mitigation structures, such as sound walls or structural soundproofing, can then be avoided or reduced. In developed areas, however, there is not always sufficient land to allow adequate separation of population concentrations from transportation systems, which are the major sources of noise. Site-specific noise abatement measures must be taken in these instances.

Control of noise can be accomplished by controlling noise at the source in the new development, buffering the pathway of sound waves with barriers or increased distance, controlling the transmission of noise through structures, and by enclosing or protecting the receiver of noise.

B. Land-Use Compatibility (Interior Noise Impacts) - Standards Related to State Regulations

Traditionally, the State of California Building Code has included sound insulation standards to reduce exterior-to-interior noise intrusion to habitable rooms of multi-family residential buildings. An interior noise level standard of DNL 45 dB is established for the City of Saratoga as the maximum allowable noise level in all residential buildings including single-family homes (due to outdoor noise sources).

The State of California Green Building Standards Code (CALGreen) includes interior noise standards for non-residential buildings. Currently, the CALGreen Code prescribes an interior noise level standard of $L_{eq(h)}$ 50 dB as the maximum allowable hourly average noise level during any hour of operation in certain commercial/office buildings (due to outdoor noise sources). This standard is established for the City of Saratoga as the maximum allowable noise level in all non-residential buildings (due to outdoor noise sources).

C. Municipal Regulations for Existing Noise Sources

Community responses to existing noise sources have centered on equipment, animals, and events. The City of Saratoga City Code includes regulations on sources of noise to limit noise transfer across property lines and administrative controls regarding animals. Typical limits address operating levels and restricted hours. Further restrictions on equipment noise might be appropriate as improved technology is developed.

Noise control standards are incorporated into the City Code to limit the level of noise from a source which may be transferred at the property plane between adjoining properties in the City and are described in greater detail below.

Noise control standards of the City Code (*e.g.*, the Noise Control Ordinance at City Code Article 7-30 are applied two ways. They are used to address potential noise from new/proposed equipment that is submitted for permit. In addition, the standards are to address complaints of noise transfer between properties. The objective limits contained in the Noise Control Ordinance are developed to establish standards for unacceptable noise levels generated by equipment, animals, amplified sound systems and other sources.

Zoning Standards The principal use of zoning standards is related to noise compatibility and separating incompatible land-uses for new development.

In addition, zoning standards can regulate specific details of development design or construction, such as limiting building heights, and requiring buffer strips, noise barriers, and sound-insulating constructions. Physical noise reduction techniques that can be utilized fall into the four major categories shown below. These physical techniques vary widely in their noise reduction characteristics, their costs, and in their applicability to specific locations and conditions

D. Noise Reduction Techniques

Education should be made available to increase awareness of noise compatibility issues and noise control measures.

Acoustical site planning uses the arrangement of buildings on a tract of land to reduce noise impacts by capitalizing on a site's natural characteristics. Opportunities for successful acoustical site planning are determined by the size of the lot, the terrain, and the zoning restrictions. Acoustical site planning techniques include:

- Placing as much distance as feasible between the noise source and the noise sensitive activity.
- Placing noise-compatible activities such as parking lots, open space, and commercial facilities, between the noise source and the sensitive activity.
- Using buildings as noise barriers.
- Orienting noise-sensitive buildings to face away from the noise sources.

For example, houses placed near the front of long narrow lots can have deep rear yards available to act as noise buffers from a neighboring noise source.

Acoustical architectural design incorporates noise-reducing concepts in the layout of individual buildings. The areas of architectural concern include building height, room arrangement, window placement, and balcony and courtyard design. For example, in some cases, noise impacts can be reduced if the building is limited to one story and if bedrooms and living rooms are placed in the part of the building farthest from the noise source, while kitchens and bathrooms are placed closer to the noise source.

Acoustical building construction is the treatment of the various parts of a building to reduce interior noise impacts. It includes the use of walls, windows, doors, roof assemblies, and penetrations in the building envelope that have been treated to reduce sound transmission into a building. The use of dense materials, structural isolation, and air-spaces within assemblies are primary noise reduction techniques. Acoustical construction is one of the most effective ways of reducing interior noise.

Noise barriers can be erected between noise sources and noise-sensitive areas. Barrier types include berms made of sloping mounds of earth, walls, fences, and combinations of these materials. The choice between these depends on a variety of factors including the desired level of sound reduction, space, cost, safety, privacy, and aesthetics. Solid wall barriers might reflect sound from one side of a highway to the other, slightly increasing sound levels. Earth berms deflect sound upward and tend to eliminate this condition; a combination of the two is usually recommended where possible for this reason.

V. GOALS, POLICIES, AND IMPLEMENTATIONS

Goal #1 Maintain or reduce noise levels in the City to avoid exposure to unacceptable or harmful noise.

Policy 1.1 The City shall maintain an up-to-date Noise Element in accordance with State regulations.

Implementation 1.1.1 The City should periodically measure and monitor noise levels in the City to identify changes.

Policy 1.2 The City shall use the planning and code enforcement processes to discourage activities, practices, or land uses that create or result in excessive noise exposure.

Implementation 1.2.1 The City should review and revise the Noise Ordinance and enforcement processes to appropriately reflect changing conditions and technological developments.

Policy 1.3 The City shall require that all City-owned and operated equipment and equipment operated under contract with the City meet City noise standards.

Implementation 1.3.1 New purchases of City fleet equipment should be considered if there are significant advances in equipment noise reduction technology.

Implementation 1.3.2 City contracts should encourage use of equipment that incorporates the latest noise reduction techniques.

Policy 1.4 The City shall encourage public awareness and education of noise issues and acoustical standards as key ingredients in controlling unwanted noise and its effects on the quality of life in Saratoga.

Implementation 1.4.1 The City should provide a resource (e.g., a website) devoted to public awareness of City noise standards, policies, and procedures.

Goal #2	Promote land-use compatibility by addressing noise exposure from existing noise sources.

Policy 2.1	An acoustical analysis is to be conducted for proposed Residential and Quasi-Public development where the existing noise level exceeds Outdoor DNL 60 dB to determine measures needed to reduce noise impacts to meet City noise standards.	
Policy 2.2	New residential development shall be designed and constructed to provide an interior noise level of DNL 45 dB or less in habitable rooms (due to outdoor sources).	
Policy 2.3	Residential outdoor open space intended for use and enjoyment shall be designed to meet Outdoor DNL 60 dB. This policy does not apply to private exterior balconies. Where this level cannot feasibly be met by incorporating reasonable measures, such as strategic site layout and noise barriers, DNL 65 dB may be approved.	
Policy 2.4	New office/commercial development shall be designed and constructed to reduce daytime interior noise levels in accordance with State CALGreen standards prescribing an interior noise level standard of $L_{eq(h)}$ 50 dB as the maximum allowable hourly average noise level during any hour of operation.	
Policy 2.5	Parks and recreational areas should be protected from excessive noise to permit the enjoyment of sports and other leisure time activities. Parks and other recreational areas which are impacted by outside noise sources should be provided with noise protection devices, including barriers and landscaping. Park design should locate passive recreation areas away from noise sources.	
Policy 2.6	The City recognizes that certain community uses and events are inherent to a suburban environment.	
	Implementation 2.6.1	Update City Noise Control Ordinance to specifically address sources that would have an impact on the community, such as noise generated by equipment, animals and amplified sound.
Policy 2.7	Noise generated by equipment, animals and amplified sound shall meet adopted standards as amended from time to time.	
	Implementation 2.7.1	The City should continue to enforce the restrictions in the Noise Ordinance of the Saratoga City Code.

Policy 2.8	The City shall enforce regulations pertaining to home occupations and not permit those that create noise beyond the property boundaries.	

Goal #3 Promote land-use compatibility by addressing noise exposure from new noise sources.

Policy 3.1	Changes in use and development shall be reviewed for noise impacts to neighboring land uses.	
Policy 3.2	New development shall be required to utilize appropriate measures to reduce noise impacts to the adopted noise standards; and acoustical analysis may be required by the approving authority.	

Goal #4 Maintain or reduce noise levels generated by the ground transportation system.

Policy 4.1	The City should work with other agencies to mitigate the effect of existing and future transportation noise sources.	
Policy 4.2	The City should consider the implementation of alternative transportation methods in order to reduce cumulative traffic levels and noise generation.	
	Implementation 4.2.1	The City should continue traffic reduction programs outlined in the goals, policies, and implementation actions in the Circulation Element.
Policy 4.3	The City should design new or improved roads in Saratoga with careful consideration given to both long and short-term noise impacts.	
	Implementation 4.3.1	Noise abatement measures should be considered in the design of new and improved roadways.
Policy 4.4	The City should discourage through traffic in residential neighborhoods to reduce noise impacts.	
Policy 4.5	The City should continue to designate truck routes in order to direct truck traffic away from noise-sensitive land uses.	
Policy 4.6	Municipal speed limits and State of California Vehicle Code noise regulations are intended to reduce traffic noise in the City.	
	Implementation 4.5.1	The City should continue to coordinate enforcement of speed limits and State regulations related to vehicles that generate unacceptable noise.

APPENDIX A: DEFINITIONS

Average Daily Traffic (ADT): The total volume during a given time period in whole days greater than one day and less than one year divided by the number of days in that time period, commonly abbreviated as ADT.

A-Weighting: A frequency weighting applied to sound pressure levels to better correlate with the loudness of sounds as perceived by the human ear. All sound levels discussed in this Element are A-Weighted. The unit of A-weighted sound levels is sometimes abbreviated “dBA”.

Continuous Noise: On-going noise, the intensity of which remains at a measurable level (which might or might not vary) without interruption over an indefinite period or a specified period of time.

Day-Night Average Sound Level (DNL): An A-Weighted sound level averaged on the basis of sound energy for a 24-hour noise exposure including a 10 dB penalty added to sound levels occurring during nighttime hours.

dB (Decibel): A standardized unit of sound pressure level. Increasing values related to louder sounds. Decible represents the logarithm of the ratio of measured acoustical energy and a standard reference of 20 microPascals.

Frequency: The time rate of repetition of a periodic phenomenon (in cycles per second or hertz).

Hours, Daytime: Between the hours of 7:00 a.m. and 7:00 p.m.

Hours, Evening: Between the hours of 7:00 p.m and 10:00 p.m.

Hours, Nighttime: Between the hours of 10:00 p.m. and 7:00 a.m.

Land-Use Area: Reasonably homogenous and identifiable areas composed of similar general types of land uses such as residential, commercial, or industrial districts.

L_{10} and L_{90} Sound Levels: The sound level that is exceeded, cumulatively, during 10, 50, or 90 percent of a specified time period, respectively. “L_{10}” is the A-weighted sound level equaled or exceeded during 10 percent of a stated time period and is considered a good measure of typical maximum sound levels caused by discrete noise events. The “L_{90}” is the A-weighted sound level equaled or exceeded during 90 percent of a stated time period and is commonly used to describe the noise level.

L_{eq}, Equivalent Sound Level: The average A-weighted noise level over a stated time period.

Loudness: The attribute of an auditory sensation relating to its intensity or magnitude. Loudness depends primarily upon the sound pressure of the stimulus, but it also depends upon the frequency and wave form of the stimulus.

Noise Exposure Contours: Lines drawn about a noise source indicating constant levels of noise exposure. DNL is the metric utilized herein to describe community exposure to noise.

Sound Insulation: (1) the use of structures and materials designed to reduce the transmission of sound. (2) The degree by which sound transmission is reduced by means of sound insulating structures and materials.

APPENDIX B: METHODOLOGY AND REFERENCES

Methodology

The Noise Element was prepared to accomplish two tasks. One was to comply with Section 65302 (f) of the Government Code which states that a Noise Element is a mandatory element of a General Plan. The other task is to establish a City-wide policy document that stipulates that the preservation of the City of Saratoga's "relatively quiet" acoustic environment is necessary and beneficial for the General health and welfare of all residents.

To accomplish both of these tasks, the following methodology was utilized. During the writing of the Noise Element some parts of the methodology were emphasized more than others due to the acoustical characteristics inherent to the City of Saratoga.

- Preliminary identification of problem noise areas
- Collection of data on existing and proposed transportation sound sources
- Collection of information on general sound levels throughout the City
- Review of information from published sources regarding effects of sound on human activities, health, and well-being
- Survey of noise control regulations from other jurisdictions
- Preparation of standards that relate sound levels to types of land use and environmental factors
- Formulation of policy statements and implementation alternatives
- Citizen input and awareness

To update the Noise Element, additional transportation noise measurements were conducted throughout the City, revised models of existing and projected future noise contours were generated, content was refined to reflect updated State Guidelines on the preparation of Noise Elements, and updated community feedback was gathered. The following notes summarize input received at two community meetings:

Noise Issues from 20 August 2013 meeting at Fireman's Hall

- Noise levels may be too low in current ordinance, needs to be real and practical
- Motorcycles engines are too loud
- Construction Noise – Sunday work, better information should be provided to contractors
- Maintain existing noise standards for residential
- Look at noise emitted from community functions – Schools, Clubs, Hakone
- Leaf Blowers – compare with other cities (popular issue)
- Garbage Trucks – time of pick up, too noisy in the morning
- Barking Dogs – need better regulations and enforcement (popular issue)
- The volume of outdoor music in the village is better this year than last
- Review strict dB levels – children playing can exceed allowable noise levels
  Not all noise is the same – the type of noise can make a big difference
  Amplified noise vs. voices
- Construction Noise – compressor can be less noisy than a hammer

Noise Issues from 27 August 2013 meeting at Saratoga Library

- Create Noise Web Page
- Animal Noise – Turkeys, chickens, roosters
- Community uses – schools can be sources of noise

- Barking Dogs (popular issue)
- Home Occupation Noise – home based businesses creating too much noise
- Resurface Highway 85 to reduce noise
- Leaf Blowers – consider banning gas powered leaf blowers
- Motorcycle noise
- Allendale and Quito Bus – bus stopping in front of house with loud speaker being heard
- Hakone – noise from events. Stop amplification of noise after certain hours
- Construction noise – limit hours. Better information should be provided to contractors. Contact information should be made available to public/neighbors
- Children's Hospital – amplified music/excessive parties/children's playground location, truck deliveries
- Residential garbage pickup – limit hours
- Backyard parties – live music
- City should get out information to the community so everyone knows the rules
- Tailor the type of measurement weight (A/B/C) to the type of noise
- Low flying aircraft are too noisy
- Declare Saratoga a Noise Adverse City
- Updates should have "Common Sense"
- Car key fobs and alarms are too loud

Noise Measurement Map

A map of noise measurement locations (see Table 1) is provided at the end of this appendix.

References and Bibliography

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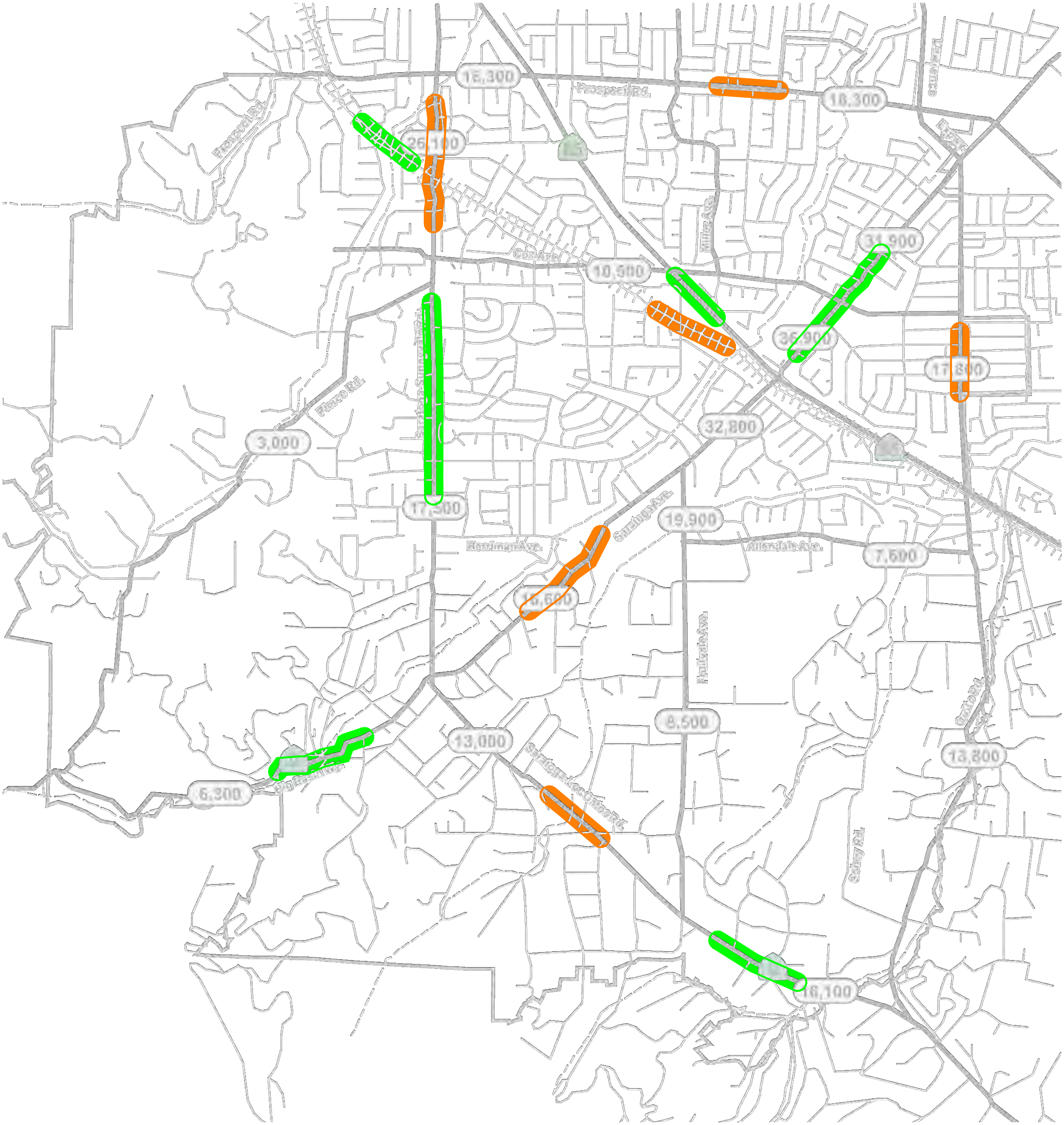
- Guidelines for the Preparation and Content of Noise Elements of the General Plan (Noise Control Program, California Department of Health, in coordination with the California Governor's Office of Planning and Research, Sacramento, CA) February 1976, Revised 2003.
- The Audible Landscape: A Manual for Highway Noise and Land Use, Prepared for U.S. Department of Transportation, Federal Highway Administration, Offices of Research and Development, November 1974.



= Short-Term Measurement

= Long-Term Measurement

CITY OF SARATOGA
NOISE ELEMENT UPDATE
PROPOSED NOISE MEASUREMENT LOCATIONS

FIGURE 1

CSA #
13–0257

JLD
06.13.13

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APPENDIX C: EXISTING NOISE CONTOURS

TABLE NE-A1: EXISTING ROADWAY NOISE AND NOISE CONTOUR DISTANCES

Street	Segment			DNL at 50-foot setback in dB	Distance from Centerline to DNL Contour			
					70	65	60	55
Prospect Road	Saratoga-Sunnyvale Road	to	Miller Avenue	69	<50	94	202	435
Prospect Road	Miller Avenue	to	Lawrence Expressway	70	<50	101	218	470
Saratoga-Sunnyvale Road	Prospect Road	to	Cox Avenue	71	60	128	276	595
Saratoga-Sunnyvale Road	Cox Avenue	to	Saratoga Avenue	70	51	110	237	511
Pierce Road	Surrey Lane	to	Comer Dr.	59	<50	<50	<50	96
Cox Avenue	Saratoga-Sunnyvale Road	to	Saratoga Avenue	66	<50	56	121	261
Saratoga Avenue	Lawrence Expressway	to	Cox Avenue	72	68	147	316	680
Saratoga Avenue	Cox Avenue	to	SR 85	72	72	156	335	723
Saratoga Avenue	SR 85	to	Fruitvale Avenue	72	69	149	322	693
Saratoga Avenue	Fruitvale Avenue	to	Saratoga-Sunnyvale Road	68	<50	76	164	354
Big Basin Way	Saratoga-Sunnyvale Road	to	Pierce Road	68	<50	76	164	353
Fruitvale Avenue	Saratoga Avenue	to	Allendale Avenue	69	<50	86	185	399
Fruitvale Avenue	Allendale Avenue	to	Saratoga-Los Gatos Road	65	<50	<50	105	226
Allendale Avenue	Fruitvale Avenue	to	Quito Road	64	<50	<50	98	210
Quito Road	Saratoga Avenue	to	Allendale Avenue	68	<50	80	172	371
Quito Road	Allendale Avenue	to	Saratoga-Los Gatos Road	66	<50	57	123	265
Saratoga-Los Gatos Road	Saratoga Avenue	to	Fruitvale Avenue	67	<50	65	139	301
Saratoga-Los Gatos Road	Fruitvale Avenue	to	Quito Road	71	62	134	288	620
SR 85	(Cupertino)	to	Saratoga Avenue	75	101	217	468	1009
SR 85	Saratoga Avenue	to	(Los Gatos)	75	114	245	528	1137

Notes: *DNL values are normalized to a measurement distance of 50 feet from the roadway centerline. DNL values for SR 85 are also normalized for comparison purposes and account for shielding from terrain and barriers (even though a 50-foot setback is within the right-of-way).*

Source: *Charles Salter Associates, 2013*

City of Saratoga

Existing Traffic Noise Contours

- DNL 55 to 60 dB
- DNL 60 to 65 dB
- DNL 65 to 70 dB
- DNL 70 to 75 dB
- > DNL 75 dB

N

CSA Project
No. 13-0257
1 Oct. 2013

APPENDIX D: PROJECTED FUTURE NOISE CONTOURS

TABLE NE-A2: PROJECTED FUTURE (2030) ROADWAY NOISE AND NOISE CONTOUR DISTANCES

Street	Segment			DNL at 50-foot setback in dB	Distance from Centerline to DNL Contour			
					70	65	60	55
Prospect Road	Saratoga-Sunnyvale Road	to	Miller Avenue	70	51	110	237	510
Prospect Road	Miller Avenue	to	Lawrence Expressway	71	55	119	256	552
Saratoga-Sunnyvale Road	Prospect Road	to	Cox Avenue	72	70	151	324	699
Saratoga-Sunnyvale Road	Cox Avenue	to	Saratoga Avenue	71	60	129	279	601
Pierce Road	Surrey Lane	to	Comer Dr.	60	<50	<50	52	112
Cox Avenue	Saratoga-Sunnyvale Road	to	Saratoga Avenue	67	<50	66	142	305
Saratoga Avenue	Lawrence Expressway	to	Cox Avenue	73	80	172	370	798
Saratoga Avenue	Cox Avenue	to	SR 85	74	88	190	408	880
Saratoga Avenue	SR 85	to	Fruitvale Avenue	73	81	175	378	813
Saratoga Avenue	Fruitvale Avenue	to	Saratoga-Sunnyvale Road	69	<50	89	192	414
Big Basin Way	Saratoga-Sunnyvale Road	to	Pierce Road	69	<50	89	192	413
Fruitvale Avenue	Saratoga Avenue	to	Allendale Avenue	70	<50	101	217	468
Fruitvale Avenue	Allendale Avenue	to	Saratoga-Los Gatos Road	66	<50	57	123	266
Allendale Avenue	Fruitvale Avenue	to	Quito Road	65	<50	53	115	247
Quito Road	Saratoga Avenue	to	Allendale Avenue	69	<50	94	202	434
Quito Road	Allendale Avenue	to	Saratoga-Los Gatos Road	67	<50	67	144	311
Saratoga-Los Gatos Road	Saratoga Avenue	to	Fruitvale Avenue	68	<50	76	164	352
Saratoga-Los Gatos Road	Fruitvale Avenue	to	Quito Road	73	74	159	343	739
SR 85	(Cupertino)	to	Saratoga Avenue	77	150	324	698	1503
SR 85	Saratoga Avenue	to	(Los Gatos)	78	170	365	787	1695

Notes: *DNL values are normalized to a measurement distance of 50 feet from the roadway centerline. DNL values for SR 85 are also normalized for comparison purposes and account for shielding from terrain and barriers (even though a 50-foot setback is within the right-of-way).*

Source: *Charles Salter Associates, 2013*

City of Saratoga
Future (2030) Traffic Noise Contours
DNL 55 to 60 dB
DNL 60 to 65 dB
DNL 65 to 70 dB
DNL 70 to 75 dB
> DNL 75 dB
N
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No. 13-0257
1 Oct. 2013