

# CHAPTER 10 - NOISE ELEMENT

---

The Noise Element is a required General Plan Element to be used as a guide for establishing a pattern of land uses that minimizes the exposure of residents to unwanted or excessive sound and to mitigate noise before it encroaches on the economic base of the community. The Noise Element is designed to help people understand the subjective nature of noise and provide reasonable policies that will protect most people from bothersome or annoying sounds. Analysis is required for the following sources of noise: highways and freeways, arterial streets, on line railroad lines, airports and industrial plants and other stationary sources identified by the community as contributing to the noise environment. This chapter describes the fundamental concepts of environmental noise. It also provides a summary of future noise levels, noise mitigation measures, guidelines for land use and noise compatibility and related policies. The quantification methods and compatibility policies contained in this Element are designed to complement the noise control guidelines that the federal Environmental Protection Agency (EPA), federal Interagency Committee on Noise and former state Office of Noise Control (ONC) prepared for use at the local level.<sup>1</sup>

## 10.1 EXISTING AND FUTURE NOISE LEVELS

The most significant source of noise in Vacaville is Interstate Route 80 (I-80), running northeast/southwest through the center of the city. Noise from the freeway is pervasive and is generally the dominant noise source within 1/2 mile of its location. Secondary sources of noise in the community include Interstate Route 505 (I-505) and local arterial streets. Aircraft using the Nut Tree Airport are a source of noise to the undeveloped and industrial properties near the ends of the runway. Likewise, trains on the Southern Pacific railway east of Vacaville generate noise that will impact future residences in the south and southeast planning sectors (Figure 1-1). The trains will not produce a constant, daily noise impact as they will pass this area infrequently throughout the day; however, they will produce peak noise events with each passing. It should also be noted that rail traffic may increase in the coming years with an anticipated emphasis on passenger rail for vehicle trip reduction purposes.

Future noise exposure contours, as illustrated in Figure 10-1, were based on traffic projections for buildout of the General Plan. The future noise environment throughout Vacaville will continue to be dominated by I-80. Doubling the traffic volume on I-80 would increase noise levels by approximately three decibels. This change would be ‘clearly noticeable,’ and although it may not represent a significant impact on human health or welfare, would be the subject of further acoustical analysis.<sup>2</sup> The increase in noise levels is offset somewhat by the fact that vehicles during congested peak-hour conditions will travel at reduced speeds, which reduces the amount of noise generated. Moderate increases in traffic on arterials throughout Vacaville are expected, but the increase in noise exposure is anticipated to be small (less than double) and will go generally unnoticed. No significant changes in Nut Tree Airport operations,<sup>3</sup> or railway operations, were assumed for the future condition.

The noise exposure contours shown in Figure 10-1 were developed using transportation data for the freeways, arterials and railroad. This information included traffic volumes, percentage of truck activity and traffic speeds. The noise contours are day-night averages (DNL or  $L_{dn}$ ) in decibels (dB), which take into account increased sensitivities to noise at night. The mapped contours do not show the effect of existing sound walls, intervening buildings or topography in contributing to the reduction of sound levels, nor the possible contribution of fixed-point, non-transportation noise sources that increase noise levels in areas throughout the community. Therefore, future noise conditions may be less than, or greater than, illustrated on Figure 10-1. For example, a residential use between the 60 and 65 contours may be exposed to a DNL closer to 60 dB if there are buildings between it and the noise source.

The noise exposure contours for the Nut Tree Airport and the Travis Air Force Base airport are shown in Figure 10-2. The data is taken directly from the Nut Tree Airport Master Plan (1993) and Travis Air Force Base Air Installation Compatible Use Zone (AICUZ) study (1994). The Nut Tree Airport Land Use Compatibility Plan (1988) and Comprehensive Airport Land Use Plan - Travis Air Force Base (1990) have not been amended, as of April 1995, to reflect the new noise contours; thus, Figure 10-2 is not consistent with the respective Airport Land Use Plans. The noise contours in the Nut Tree Airport Master Plan and Travis AICUZ study will be incorporated into the respective Airport Land Use Plans by the Solano County Airport Land Use Commission in the near future. It is recognized that Figure 10-2 needs to be consistent with the Airport Land Use Plans; however, it is not practical to adopt a Noise Element using old data when newer, accepted data is available. When the Airport Land Use Plans are amended, Figure 10-2 will be consistent with the plans; however, should the Solano County Airport Land Use Commission adopt contours other than that illustrated in either the Nut Tree Airport Master Plan or the Travis AICUZ, this Element will require further amendments.

As Figure 10-2 shows, aircraft using the Nut Tree Airport have a fairly significant impact on future land uses near the airport because of the noise contours. Aircraft using Travis Air Force Base do not affect the proposed urban area of Vacaville in terms of noise impacts.

## **10.2 FUNDAMENTAL CONCEPTS OF ENVIRONMENTAL NOISE**

Understanding environmental noise requires a familiarity with the physical description of noise and the way humans react to different noises. The important physical characteristics of environmental noise include frequency, level, and temporal (time-varying) behavior. The effects of noise on people can be grouped into three general categories: subjective effects, interference with activities, and physiological effects.

Airborne sound is the rapid fluctuation of air pressure above and below atmospheric pressure. It is received by the ear and perceived by the brain as sound. Noise is defined as unwanted or undesired sound. The sound of a train may be music to the engineer, but may be noise to a person living next to the tracks. Frequency (pitch), noise (loudness), A-

weighted sound levels, and the time-varying character of noise are defined below as a way of summarizing physical characteristics of environmental noise.

**Frequency.** The frequency, or pitch, of sound refers to the number of complete pressure fluctuations, or cycles, per second called Hertz (Hz). Most sounds consist of a broad band of frequencies which are audible to the human ear within a range of 20 Hz to 20,000 Hz.

**Noise Level.**<sup>4</sup> The noise level, or loudness, of sound is the amount of sound pressure which the human ear feels above and below atmospheric pressure. Simply measuring the magnitude of sound on a linear scale is not practical because the range of sound pressures which the human ear can detect is enormous - a ratio of 1 to approximately  $10^{14}$  (1 followed by 14 zeros). By converting this ratio to a logarithmic scale, the range can be reduced to 14 units (0-140). Intensity is measured on a logarithmic scale called the decibel (dB) and ranges from 0 dB, the threshold of human hearing, to 140 dB, the threshold of pain. Sound levels can exceed 140 dB, but are greater than the unprotected human ear can withstand.

The use of a logarithmic scale for measurement of the magnitude of sound is often the cause for confusion because it does not directly correspond to the way in which people perceive the relative “loudness” of different sound levels. People tend to think that if two equal sounds are combined, the result will seem twice as loud. In reality, however, combining two equal sounds - although it doubles the sound energy - produces only a 3 dB increase in magnitude. For one sound to be judged twice as loud as another, it actually must be 10 dB higher (meaning that the acoustic energy must increase 10-fold).

**A-weighted.** A-weighted sound levels correlate with the way the human ear “hears” sound and compensates, using a weighting of frequencies, for the fact that human hearing is less sensitive at low and extremely high frequencies than in the mid-frequency range. Unless otherwise noted, all sound levels referred to in this noise section are A-weighted sound levels, expressed as “dBA.”

**Time-varying Character of Noise.** The time-varying character of noise can be considered using hourly average ( $L_{eq}$ ) sound levels or the day-night average sound level (DNL or  $L_{dn}$ ).  $L_{eq}$  is a good descriptor of noise that can be used to describe any average time period. It is particularly useful in describing the change in noise level of a single activity, for example, traffic volumes. The DNL descriptor adds a 10 dB penalty on sounds occurring between 10:00 p.m. and 7:00 a.m. because of people’s increased sensitivity while sleeping. DNL accounts for the difference in response of people to daytime and nighttime noises by weighting nighttime noise levels when ambient or background noise is generally less and people are more sensitive to noise events. DNL is used to describe the noise exposure levels for Vacaville. However, it is not necessarily a good descriptor for sound at commercial, industrial or office facilities, as no one is typically sleeping and the sensitivity of people in those environments does not change with the time of day.<sup>5</sup>

Noise contours for aircraft operations in California are commonly expressed in CNEL (community noise equivalent level), as shown on Figure 10-2. Inputs to the calculation of CNEL contours include the sound level transmitted by individual operations of each aircraft type

using the airport, the number of operations by aircraft type, the time of day the operations occur, runway use, aircraft flight track geometry and the takeoff and landing profiles of each aircraft type.<sup>6</sup> CNEL is approximately numerically equal to DNL for most environmental settings, but adds an additional 5 dB penalty for sounds occurring between 7:00 p.m. and 10:00 p.m. to further protect sensitive receptors.

**Human Response to Noise.** Noise effects people in many ways. It can result in people experiencing subjective effects, such as annoyance and nuisance; it can cause interference with activities, such as speech and sleep; and, it can induce physiological effects, such as hearing loss and the effects of sustained sleep interference.

To help understand the subjective nature of annoyance, Shultz developed a method of indicating the percentage of people who are ‘highly annoyed’ when exposed to a range of noise levels.<sup>7</sup> The Shultz curve indicates that approximately 8% of a population is highly annoyed when exposed to a noise environment of 60 dB. Beyond 60 dB the percentage of highly annoyed persons increases rapidly. The sharp increase of highly annoyed persons beyond DNL 60 dB supports the selection of that noise level as the dividing point between ‘normally acceptable’ and ‘conditionally acceptable’ land uses (Table 10-1). The extremes of annoyance are worth noting. At the low end, data reflect that about 0.5% of a population will be highly annoyed regardless of how minimal the noise level is (at DNL 40 dB). At the high end, nearly 20% of the population is apparently not highly annoyed even at DNL 90 dB.

Negative reactions to noise generally occur with an increase between background noise, or ambient noise, and the noise generated from a particular activity. In most situations, noise control measures need to reduce noise generation by 5 to 10 dB in order to effectively reduce complaints. Changes smaller than 5 dB are considered insignificant.<sup>8</sup>

People generally have the ability to distinguish between a sound and ambient noise, such as a telephone ringing over music. However, certain ambient noise can render sounds inaudible. For example, face to face conversation with 95 percent intelligibility can usually occur in an ambient noise environment of up to 66 dB when the participants are three feet apart, or in an ambient noise environment of up to 72 dB when they are 18 inches apart.<sup>9</sup> When faced with high ambient noise while engaged in conversation, people will, depending on their level of comfort, move closer to one another or raise their voices to maintain a level of intelligibility. When the ambient noise level is too great and people want to have a conversation, they choose between poor speech intelligibility or removing themselves from the environment. Reasonable people will generally choose to talk, shop, work or dine in an environment where they are most comfortable. It should be recognized that other factors contribute toward a person’s comfort level, but sound levels contribute significantly to a person’s perception of where they choose to conduct their business, relaxation or other activity.

Ambient noise is easily illustrated through the example of restaurants, where owners often prefer a loud environment to give the perception of a “busy” establishment. Diners wanting to converse with others need to overcome the ambient noise, which may be generated by a combination of restaurant staff doing their jobs, other diners talking, or entertainment. People will accept noise in exchange for dining in the “right” place or when enjoying a meal in an active

place. It is impractical for local agencies to regulate and enforce noise standards in such businesses when restaurant owners often design the interior of their businesses for the express purpose of having noise. It is also impractical to regulate and enforce noise exposure in outdoor dining areas, where the ambient noise of roadways or other activities is likely to be less than the ambient noise on the interior of the restaurant.

For such environments, the state Division of Occupational Safety and Health (Cal-OSHA) has established noise exposure standards to protect the interests of persons exposed to harmful levels of noise.<sup>10</sup> Similarly, the federal Department of Labor, Occupational Safety and Health Administration (OSHA), has established noise exposure standards in federal offices.<sup>11</sup> For the consumer in non-residential situations, noise is a question of annoyance, and when the level of noise leads to discomfort, people are able to remove themselves from the environment and choose when or if to return. Given the ability of people to choose where they spend time away from home, that their choices generally involve some willingness to accept the respective noise environment and that harmful noise exposure levels are monitored by state or federal agencies, the City of Vacaville has chosen not to regulate noise levels for non-residential land uses due to the subjective reactions to noise in such environments (see Table 10-1).

Sleep interference is more difficult to quantify, although studies have shown that progressively deeper levels of sleep require louder noise levels to cause disturbance. Learning and job performance begin to be impaired at 45 dB and are clearly impaired with noise levels of 90 dB and greater, although high frequencies or irregular bursts of noise may cause interruption at lower levels. The California Noise Insulation Standards, applicable to new lodging facilities and dwellings other than detached single-family units, state that interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room.<sup>12</sup> A residential interior noise standard of 45 dB DNL, as specified in this Element, will protect against sleep interference except in quiet areas exposed to loud individual noise events.

Environmental noise, in almost every case, produces effects which are subjective in nature or involve interference with human activity. However, brief sounds at levels exceeding 70 dB can produce temporary physiological effects such as constriction of blood vessels, changes in breathing and dilation of the pupils. Steady noises of 90 dB have been shown to increase muscle tension and adversely affect simple decision-making. Long-term exposure to levels exceeding 70 dB can cause hearing loss.<sup>13</sup>

### **10.3 NOISE MONITORING AND STUDY**

The contours on Figure 10-1 provide a general indication of future noise exposure and it is understood that site specific analysis will be required to evaluate noise mitigation for specific development projects. Noise mitigation measures will be based on the specific physical and noise environments at the project site. Acoustic studies should follow a specified format and include the following: a description of the methodology and assumptions used to establish existing noise levels, an evaluation of the effectiveness of various noise attenuation measures to meet the respective noise standard, a program to test the effectiveness of the measure after it has been installed and recommendations to revise study assumptions in the case of ineffective mitigation measures.

It should be noted that the policies in the General Plan, related to noise generated on the ground, are based on DNL noise exposure levels. Policies related to airport/aircraft-related noise, as identified in the Airport Land Use Compatibility Plan for Nut Tree Airport and the Comprehensive Airport Land Use Plan for Travis Air Force Base, are based on CNEL noise exposure levels.

### **10.4 NOISE MITIGATION**

Noise may be controlled three ways: (1) at the source, (2) by barriers between the source and receptor, and (3) by controlling the receptor. A sensitive receptor must be located far from the source or be insulated to reduce noise to an acceptable level within the structure -- not a desirable solution in a climate that invites outdoor living.

Noise mitigation measures recommended by site-specific studies include sound walls, earth berms, noise insulation, building orientation and setback requirements. In addition to these mitigations, most buildings are constructed to mitigate interior sound levels 15 to 20 dB below exterior levels with the windows partially open. The reduction is generally 25 to 30 dB when the windows are closed.<sup>14</sup> Site plan review of new building projects in Vacaville includes consideration of topography, building orientation and setbacks to reduce noise levels. All of these noise reduction measures should be considered when reviewing a project proposed within 'conditionally acceptable' noise contours, as shown on Table 10-1 or against the standards on Table 10-4. Any mitigations should be tailored to individual site characteristics based on an acoustical report. The objective in these areas is to provide interior and exterior noise exposure levels at or below the standards presented on Tables 10-1 and 10-4.

## 10.5 NOISE AND LAND USE COMPATIBILITY GUIDELINES

The objective of the noise and land use compatibility policies is to provide the community with a means of judging the noise environment that it deems to be generally acceptable and to minimize noise-related complaints from residents. The compatibility policies shown in Tables 10-1 and 10-4, based in part on the ONC and EPA guidelines, should be used in conjunction with the future noise exposure levels in Figure 10-1 to identify locations which may require special treatment to minimize noise exposure. Based on the projected noise contours in Figure 10-1, and the use of normal building construction and typical sound attenuation devices, future exterior noise levels in Vacaville are not great enough to produce harmful interior noise exposures. For that reason, and the fact that people experience subjective effects in response to safe levels of noise, the City of Vacaville has not set noise level standards for non-residential land uses and there is no need to adopt the complete ONC guidelines.

In the case of a transportation noise source, a land use or project in the "normally acceptable" category, as shown on Table 10-1, would be acceptable within the ambient noise levels indicated and without special noise abatement measures. For example, a home of standard construction would be an acceptable use in any area equal-to or less-than 60 dB DNL without special insulation, setback or building design. The same home in an area where unmitigated transportation noise levels reach 60-75 dB DNL should only be allowed following an acoustical study which recommends site-specific noise attenuation measures to achieve the interior and exterior standards of Table 10-1. Above 75 dB DNL, residential projects would not be appropriate, as the mitigations would be too extreme.<sup>15</sup>

The following considerations guide the Noise and Land Use Compatibility Policies:

- The standard for maximum exterior transportation noise levels in sensitive land use areas, as defined in Table 10-1, is 60 dB DNL. However, exceptions may occur where 65 dB DNL is acceptable in unique situations (e.g. sound walls greater than eight feet in height adjoining arterial streets or where sound walls would obstruct pedestrian paths between a subdivision and an arterial street). In such exceptions, the 60 dB DNL standard should be applied where outdoor use is a major consideration (e.g., backyards in single-family housing developments and recreation areas in multi-family housing projects).
- The standard for maximum exterior non-transportation noise levels in sensitive land use areas, as defined in Table 10-4, is 50 dBA  $L_{eq}$  and a maximum peak level of 70 dBA.
- The indoor noise level, as required by the State of California Noise Insulation Standards, must not exceed a DNL of 45 dB in lodging places and dwelling places other than detached single-family dwellings. The City recognizes this standard as the maximum acceptable indoor noise level in detached single-family homes.

- New residential developments should be precluded where the exterior noise exceeds 60 dB CNEL due to aircraft, consistent with the Airport Land Use Plans for Nut Tree Airport and Travis Air Force Base. This standard recognizes the peak occurrences associated with aircraft. CNEL contours for the Nut Tree airport and the Travis Air Force Base airport are illustrated in Figure 10-2.
- Appropriate interior and exterior noise standards in commercial, industrial, and office buildings are the standards established and regulated by the California Division of Occupational Safety and Health (Cal-OSHA) and the federal Department of Labor, Occupational Safety and Health Administration. This applies to the ambient noise in work places, as well as retail and dining areas, and also addresses the length of exposure to harmful noise levels. The standards are designed to indicate harmful noise levels and do not address annoyance, which is much more subjective. In the case of non-residential land uses, it is appropriate to assume that consumers will eat and shop in those noise environments where they can shop, eat and converse within their self-defined comfort levels.
- If an area is currently below the desired noise standard, an increase in noise up to the maximum should not automatically be allowed. The impact of a proposed project on an existing land use should be evaluated in terms a significant increase in existing noise levels, regardless of the compatibility policies or criteria.

## 10.6 NOISE POLICIES

### *Guiding Policies*

- 10.6-G 1      Require new residential projects and outdoor activity areas in lodging, hospital and nursing/convalescent home projects to meet acceptable exterior noise level standards as given on Tables 10-1 and 10-4; discourage residential areas from directly abutting Interstate 80 or 505.
- 10.6-G 2      Reduce outdoor noise levels in existing residential areas where economically and aesthetically feasible.
- 10.6-G 3      Ensure that noise does not exceed interior noise levels of 45 DNL for residential, transient lodging, hospital and nursing/convalescent structures from transportation or fixed-point noise sources.
- 10.6-G 4      Minimize vehicular noise sources and noise emanating from transportation activities; control noise at its source to maintain existing noise levels, and in no case exceed acceptable noise levels as established in the Noise and Land Use Compatibility Guidelines, Table 10-1.

- 10.6-G 6 Limit truck traffic in residential areas to designated truck routes.
- 10.6-G 7 Design subdivisions and plan-lines to minimize the transportation-related noise impacts to adjacent residential areas.
- 10.6-G 8 Encourage other agencies to reduce noise levels generated by roadways, railways, airports and other facilities.
- 10.6-G 9 Noise created by transportation noise sources shall be mitigated so as not to exceed the interior and exterior noise level standards of Table 10-1.
- 10.6-G10 Noise created by non-transportation noise sources shall be mitigated so as not to exceed the interior and exterior noise level standards of Table 10-4.
- 10.6-G11 Allow minor exceptions to the noise level design standards (Tables 10-1 and 10-4) in circumstances where impractical mitigation requirements are not consistent with City standards and policies.
- 10.6-G12 New residential land uses shall be precluded where the exterior noise associated with aircraft operations at Nut Tree Airport or Travis Air Force Base exceeds 60 dB CNEL.

See also, Land Use Element Policy 2.1 – I 12, Transportation Element Policies 6.6 – I 2 and 6.6 – I 5.

**Table 10-1 Noise & Land Use Compatibility Policy For Transportation Sources<sup>1</sup> - See next page for airport/land use noise compatibility criteria**

Land Use Category	Noise standard (DNL)		Community Noise Exposure Unmitigated Day/Night Average Noise Level (DNL) in Decibels (dB)									
	Interior	Exterior	Noise contour									
Residential	45	60 <sup>2</sup>	40	45	50	55	60	65	70	75	80	
Transient Lodging Motels, Hotels	45	-- <sup>3</sup>	40	45	50	55	60	65	70	75	80	
Hospitals, Nursing Homes	45	60 <sup>4</sup>	40	45	50	55	60	65	70	75	80	
Other uses <sup>5</sup>	--	--	40	45	50	55	60	65	70	75	80	

 normally acceptable with typical conditions of approval (setbacks, walls, fences and standard building practices).

 conditionally acceptable - subject to noise study to demonstrate noise can be reduced to normally acceptable levels with acceptable mitigation.

 normally unacceptable - regardless of measures implemented to reduce noise.

Footnotes for Table 10-1

1. This table establishes the maximum transportation noise levels that persons should be exposed to and helps determine the type of review necessary when land uses are proposed within existing noise contours. For the purposes of the Noise Element, transportation noise sources are defined as traffic on public roadways, railroad line operations and aircraft in flight.
2. In multi-family/attached unit projects, applies to courtyards, patios, private areas and activity areas.
3. Areas designed for outdoor activity should be located away from noise sources.
4. Applies to courtyards, patios, private areas and activity areas.
5. Other uses are subject to federal and state OSHA noise exposure standards.

**Table 10-1 (continued)**

**Airport/Land Use  
Noise Compatibility Criteria**

As adopted by Solano County Airport Land Use Commission  
This table is to be used for aircraft generated noise

Land Use Category	CNEL, dBA					
	50	55	60	65	70	75
Residential			████████	████████	████████	████████
Schools, Libraries, Hospitals, Nursing Homes		████████	████████	████████	████████	████████
Churches, Auditoriums, Concert Halls		████████	████████	████████	████████	████████
Transportation, Parking, Cemeteries				████████	████████	████████
Offices, Retail Trade		████████	████████	████████	████████	████████
Service Commercial, Wholesale Trade, Warehousing, Warehousing, Light Industrial			████████	████████	████████	████████
Extractive Industrial, General Manufacturing, Utilities				████████	████████	████████
Cropland					████████	████████
Livestock Breeding		████████	████████	████████	████████	████████
Playgrounds, Parks, Zoos		████████	████████	████████	████████	████████
Golf Courses, Riding Stables, Water Recreation			████████	████████	████████	████████
Outdoor Spectator Sports		████████	████████	████████	████████	████████
Amphitheaters	████████	████████	████████	████████	████████	████████

<div style="border: 1px solid black; width: 40px; height: 30px; margin-bottom: 10px;"></div> <p><b>CLEARLY ACCEPTABLE</b> The activities associated with the specified land use can be carried out with essentially no interference from the noise exposure.</p>	<p>The land use is acceptable on the conditions that outdoor activities are minimal and construction features which provide sufficient noise attenuation are used (e.g., installation of air conditioning so that windows can be kept closed). Under other circumstances, the land use should be discouraged.</p>	<p>involve outdoor activities which would be disrupted by noise should generally be avoided.</p>
<div style="border: 1px solid black; width: 40px; height: 30px; background-color: #e0e0e0; margin-bottom: 10px;"></div> <p><b>NORMALLY ACCEPTABLE</b> Noise is a factor to be considered in that slight interference with outdoor activities may occur. Conventional construction methods will eliminate most noise intrusions upon indoor activities</p>	<p><b>NORMALLY UNACCEPTABLE</b> Noise will create substantial interference with both outdoor and indoor activities. Noise intrusion upon indoor activities can be mitigated by requiring special noise insulation construction. Land uses which have conventionally constructed structures and/or</p>	<div style="background-color: black; width: 40px; height: 30px; margin-bottom: 10px;"></div> <p><b>CLEARLY UNACCEPTABLE</b> Unacceptable noise intrusion upon land use activities will occur. Adequate structural noise insulation is not practical under most circumstances. The indicated land use should be avoided unless strong overriding factors prevail and it should be prohibited if outdoor activities are involved</p>
<div style="border: 1px solid black; width: 40px; height: 30px; background-color: #808080; margin-bottom: 10px;"></div> <p><b>MARGINALLY ACCEPTABLE</b> The indicated noise exposure will cause moderate interference with outdoor activities and with indoor activities when windows are open.</p>	<p>Source: Solano County Airport Land Use Commission, Airport Land Use Compatibility Plan, May 1988 Appendix B</p>	

**Table 10-4**

**Noise & Land Use  
Compatibility Policy For Non-Transportation Sources<sup>1</sup>**

Land Use Category	Noise Level Descriptor	Exterior Noise Levels <sup>2,3,4,5</sup>		Interior Noise Levels <sup>2,3,4,5</sup>	
		Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Residential	Hourly L <sub>eq</sub> , dBA	50 <sup>6</sup>	45 <sup>6</sup>	45	35
	Maximum Level, dBA	70 <sup>6</sup>	65 <sup>6</sup>	--	--
Transient Lodging	Hourly L <sub>eq</sub> , dBA	-- <sup>7</sup>	-- <sup>7</sup>	45	35
Hospital, Nursing Homes	Hourly L <sub>eq</sub> , dBA	50 <sup>8</sup>	45 <sup>8</sup>	45	35
Other <sup>9</sup>	Hourly L <sub>eq</sub> , dBA	--	--	--	--
	Maximum Level, dBA	--	--	--	--

Each of the noise levels specified above shall be lowered by five dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).

**Footnotes for Table 10-4**

1. This table establishes the maximum non-transportation noise levels that persons should be exposed to. For the purposes of the Noise Element, non-transportation noise sources may include industrial operations, outdoor recreation facilities, HVAC units, loading docks, construction equipment, etc.
2. Compliance with the noise level standards is to be measured at the affected location of the land use category.
3. If the existing noise levels exceed that of a proposed noise generator, these standards would not be applied to the new noise source unless the additional noise generated would increase the projected, combined noise levels a minimum of three decibels.
4. These standards are applicable to land use determinations and entitlements. They are not applicable for nuisance abatement within residential areas.
5. Exceptions to the standards may be approved for public parks or playgrounds upon a finding that the facility has been designed in a manner that practically limits the noise impact upon other land uses.
6. In multi-family/attached unit projects, applies to courtyards, patios, private areas and activity areas.
7. Areas designed for outdoor activity should be located away from noise sources.
8. Applies to courtyards, patios, private areas and activity areas.
9. Other uses are subject to federal and state OSHA noise exposure standards.

### ***Implementing Policies***

10.6-I 1 Work to preclude the generation of annoying and, or, harmful noise through conditions of approval on stationary noise sources, such as construction and property maintenance activity and mechanical equipment. Support enforcement of the California vehicle noise levels.

*Title 8, Chapter 8.10, of the Vacaville Municipal Code addresses public nuisances and the abatement of such nuisances as excessive noise (§8.10.030.16).*

10.6-I 2 Use the Noise and Land Use Compatibility Policies in Tables 10-1 and 10-4 for establishing new land uses.

10.6-I 3 Require an acoustical analysis for all proposed projects that would locate where the projected transportation noise on Figures 10-1 and 10-2 is greater than the respective 'normally acceptable' noise level as indicated on Table 10-1. Projects would need to mitigate to the appropriate noise standard.

*State law (Title 24) requires mitigation to reduce  $L_{dn}$  to 45 dB in habitable rooms of lodging facilities and attached housing products, but the standard should apply to all housing. Additionally, it specifies that residential structures to be located where the annual  $L_{dn}$  or CNEL exceeds 60 dB shall require an acoustical analysis showing that the building has been designed to achieve the allowable interior level.*

10.6-I 4 Require new developments to pay their fair share for noise attenuation features and mitigation measures to reduce interior noise levels within adjacent or impacted land uses as a condition of approving new projects. This policy applies to both traffic-generated noise sources and fixed-point noise sources.

10.6-I 5 An acoustical analysis prepared pursuant to this Noise Element shall:

- Have the scope of work approved by the Director of Community Development prior to the work being performed.
- Be the financial responsibility of the applicant.
- Be prepared by a qualified person experienced in the fields of noise assessment and architectural acoustics.
- Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions and the predominant noise sources and identify the peak noise sources.
- Estimate existing and projected cumulative (horizon period of the General Plan or subsequent up-dates) noise levels in terms of DNL (for ground transportation or fixed-point sources) or CNEL (for aircraft), and compare those levels to the adopted policies of the Noise Element.
- Recommend appropriate mitigation to achieve compliance with the adopted policies and standards of the Noise Element, giving preference to proper site

planning and design over the construction of noise barriers or structural modifications to buildings which may be considered to contain noise-sensitive land uses. Where the noise source in question consists of intermittent single events, the report must address the effects of maximum noise levels in sleeping rooms in terms of possible sleep disturbance.

- Estimate noise exposure after the prescribed mitigation measures have been implemented.
- Estimate the effects of mitigation measures on noise levels at other areas, especially in the use of sound walls.
- Describe a post-project monitoring program which could be used to evaluate the effectiveness of the proposed mitigation measures.

- 10.6-I 6 Request Caltrans to provide sound walls along I-80 adjacent to residential areas existing prior to 1994.
- 10.6-I 7 Encourage the use of open space, parking, accessory buildings, and landscaping to buffer new and existing development from noise. Use sound walls when other methods are not practical or when recommended by an acoustical expert as part of a mitigation program, consistent with back-up landscape treatments where residential subdivision back-up to roadways.
- 10.6-I 9 Require that the effects of sound walls on noise levels in other areas be considered, and taken into account, in the design, location and construction of sound walls.
- 10.6-I 16 Enforce, as resources permit, the California State Vehicle Noise Standards for Motor Vehicles.
- See Table 10-2.*
- 10.6-I 18 Limit construction, delivery and through truck traffic to designated routes; maintain smooth street surfaces adjacent to land uses which are sensitive to noise intrusion.
- 10.6-I 19 Enforce, as resources permit, the monitoring of approved truck routes by City traffic officers.
- 10.6-I 21 Attempt to maintain local and collector streets at 6,000-9,000 ADT or less to ensure acceptable noise levels within adjacent residences.
- 10.6-I 22 Work with the Solano County ALUC and other agencies to reduce noise generated from sources outside the City's jurisdiction.
- 10.6-I 23 Support implementation of state legislation that requires reduction of noise from motorcycles, automobiles, trucks, and aircraft.

10.6-I 24 Update aircraft noise projections as future operations at the Nut Tree Airport and Travis Air Force Base are projected to change.

---

**TABLE 10-2 CALIFORNIA STATE NOISE STANDARDS FOR MOTOR VEHICLES**  
(dBA at 50 Feet from the Center of the Travel Lane)

---

<b>Vehicle Type</b>	<b>Less Than 35 mph</b>	<b>Greater Than 35 mph</b>
Trucks	88	90
Motorcycles	82	86
Automobiles	76	82

---

Source: California Vehicle Code noise emission standards for operation of licensed motor vehicles in California (Section 23130).

---

- 
- <sup>1</sup> A. United States, Environmental Protection Agency. “Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.” EPA/ONAC 550/9-74-004, March 1974.
- B. Federal Interagency Committee on Noise. “Federal Agency Review of Selected Airport Noise Analysis Issues.” August 1992.
- C. State of California, Office of Planning and Research. “General Plan Guidelines.” November 1990.
- <sup>2</sup> Federal Interagency Committee on Noise. “Federal Agency Review of Selected Airport Noise Analysis Issues.” August 1992.
- <sup>3</sup> Hodges & Shutt. Nut Tree Airport Master Plan Report. Prepared for county of Solano. March 1993.
- <sup>4</sup> California Department. of Transportation, Division of Aeronautics. Airport Land Use Planning Handbook. 1993.
- <sup>5</sup> Acoustics & Vibration Group. Letter to Del Ziegler. April 19, 1993.
- <sup>6</sup> California Department. of Transportation, Division of Aeronautics. Airport Land Use Planning Handbook. 1993.
- <sup>7</sup> Shultz, T.J. 1978. “Synthesis of Social Surveys on Noise Annoyance.” Journal of the Acoustical Society of America. As cited in: Federal Interagency Committee on Noise. Federal Agency Review of Selected Airport Noise Analysis Issues. August 1992.
- <sup>8</sup> United States Environmental Protection Agency, Office of Noise Abatement and Control. Protective Noise Levels; Condensed Version of EPA Levels Document. November 1978. EPA 550/9-79-100.
- <sup>9</sup> United States Environmental Protection Agency, Office of Noise Abatement and Control. Protective Noise Levels; Condensed Version of EPA Levels Document. November 1978. EPA 550/9-79-100..
- <sup>10</sup> California noise exposure standards for the work place are established in the General Industry Safety Orders, Article 105, Title 8, CCR.
- <sup>11</sup> Safe noise exposure levels, as determined by the federal government, were defined in “Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.” (EPA/ONAC 550/9-74-004, March, 1974).
- <sup>12</sup> California Code of Regulations, Title 24, Part 2, Appendix Chapter 35.
- <sup>13</sup> United States Environmental Protection Agency, Office of Noise Abatement and Control. Protective Noise Levels; Condensed Version of EPA Levels Document. November 1978. EPA 550/9-79-100.
- <sup>14</sup> California Department. of Transportation, Division of Aeronautics. Airport Land Use Planning Handbook. 1993.
- <sup>15</sup> Federal Interagency Committee on Noise. “Federal Agency Review of Selected Airport Noise Analysis Issues.” August 1992.

---

Items cited in the footnotes are available for review in the Advanced Planning Division of the Community Development Department.

**Amendments and Corrections to Noise Element**

- |               |  |
|---------------|--|
| June 14, 1994 | Resolution No. 1994-82. References to the former Gliderport were deleted. Figure 10-2, Vacaville Airport Noise Contours Map, was amended to delete the former Gliderport. (GP-2-94, 94-017)  |
| May 9, 1995   | Resolution No. 1995-61. The Noise Element was completely revised. Deleted policies 10.6-G5, 10.6-I8, 10.6-I10, 10.6-I11, 10.6-I12, 10.6-I13, 10.6-I14, 10.6-I15, 10.6-I17 and 10.6-I20; amending policies 10.6-G1, 10.6-G3, 10.6-G4, 10.6-G6, 10.6-G7, 10.6-I1, 10.6-I2, 10.6-I3, 10.6-I4, 10.6-I5, 10.6-I6, 10.6-I7, 10.6-I9, 10.6-I16 and 10.6-I19; introducing policies 10.6-G9, 10.6-G10 and 10.6-G11; amending Table 10-1 and introducing Table 10-4; and amending Figure 10-2. Prepared in consultation with Brown-Buntin Associates, Acoustical Consultants, Fair Oaks, CA. (GP-2-95, 94-052) |

---

November 12, 2002

Resolution 2002-159. Approving General Plan Amendment Related to the Travis Airport Land Use Plan and Other Airport Related Changes.

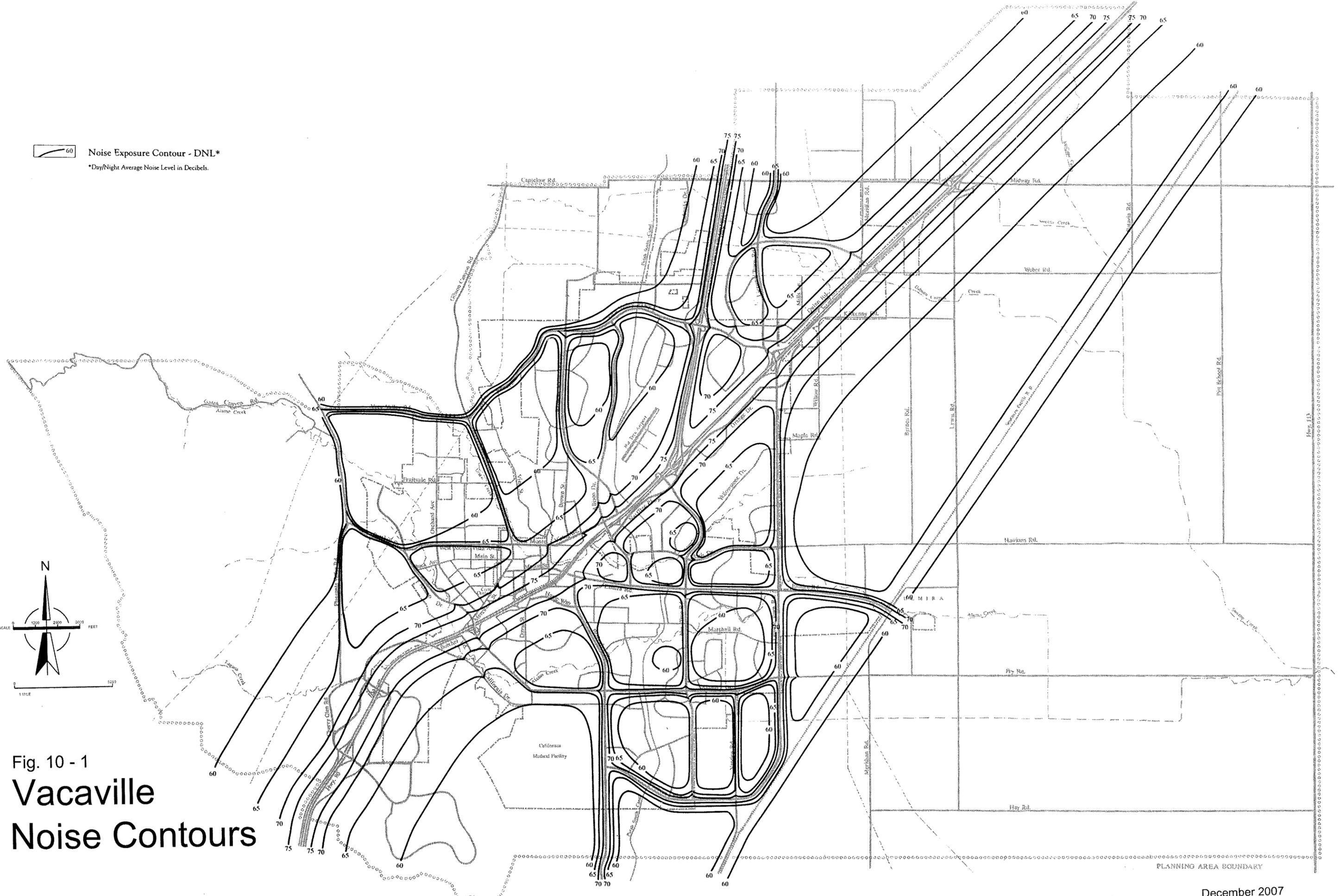


Fig. 10 - 1  
**Vacaville**  
**Noise Contours**

65

# Noise Exposure Contour - CNEL

Source:  
Travis AFB Land Use Compatibility Plan 2002.  
Nut Tree Airport Master Plan, March 1993.

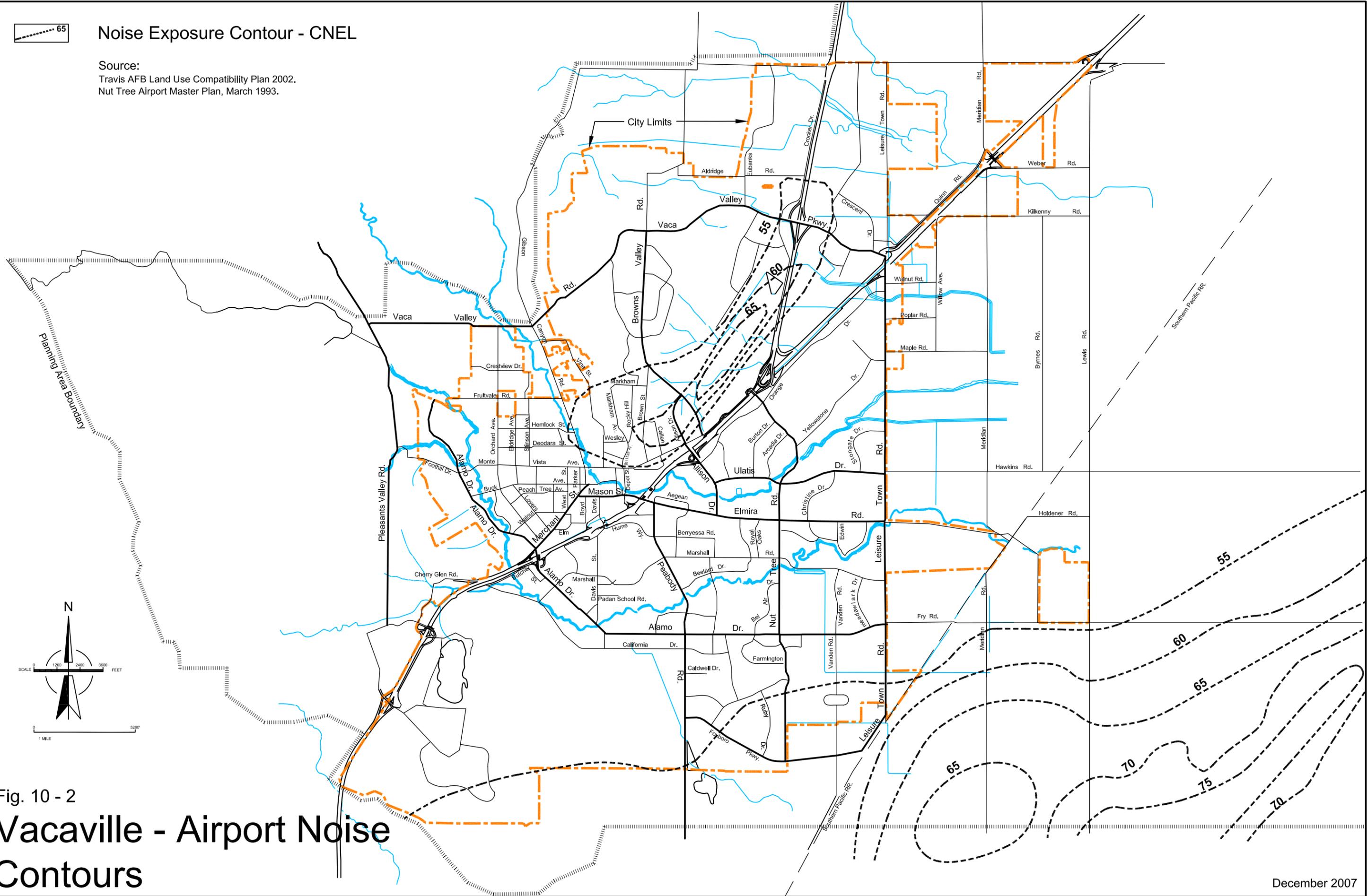


Fig. 10 - 2  
**Vacaville - Airport Noise  
 Contours**