

## 17 NOISE

This chapter provides background information on noise in Novato. The chapter begins with an overview of noise and vibration concepts, including an explanation of noise-related terminology. The next section describes the policies, standards and plans that regulate noise-generating activity. The chapter concludes with a summary of noise-sensitive land uses in Novato and a description of Novato's existing noise environment, including noise generated by vehicle traffic, aircraft and rail service.

### *A. Noise and Vibration Concepts*

This section explains terminology used to describe the measurement of noise, summarizes adverse effects of noise on humans and presents key concepts associated with the measurement of and impacts from groundborne vibration.

#### 1. Noise Terminology

The discussion of noise requires the use of a number of technical terms. Some of the key noise-related terms used in this chapter include:

- ◆ **Decibel (dB).** A decibel is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities.
- ◆ **A-weighted sound level (dBA).** The A-weighted sound level is the most common method to characterize sound in California. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. All sound levels in this chapter are A-weighted, unless reported otherwise.
- ◆ **Energy-equivalent sound/noise level ( $L_{eq}$ ).**  $L_{eq}$  describes the average level that has the same acoustical energy as the summation of all the time-varying events. This descriptor is useful because sound levels can vary markedly over a short period of time. The most common averaging period for  $L_{eq}$  is hourly, but it can be of any duration.
- ◆ **Day/night average sound level ( $L_{dn}$ ).** Since the sensitivity to noise increases during the evening and at night, 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events.  $L_{dn}$  is a measure of the cumulative noise exposure in a community, with a 10 dB addition to nocturnal (10:00 p.m. to 7:00 a.m.) noise levels. This is the measurement that the City of Novato normally uses in noise evaluations and analysis.
- ◆ **Community Noise Equivalent Level (CNEL).** CNEL is the energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring between 10:00 p.m. and 7:00 a.m. and 5 dB added to the A-weighted sound levels occurring between 7:00 p.m. and 10:00 p.m.

#### 2. Effects of Noise

Representative outdoor and indoor noise levels in units of dBA are shown in Table 17-1. This table also identifies subjective impressions of these noise levels. A discussion of how varying levels of noise impact sleep, speech and general annoyance is provided below.

a. Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and about 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noise above 35 dBA and fluctuating noise levels above about 45 dBA have been shown to affect sleep.

b. Annoyance

Causes for annoyance include interference with speech, radio and television; house vibrations and interference with sleep and rest. The  $L_{dn}$  as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. The threshold for annoyance from vehicle noise is about 55 dBA  $L_{dn}$ . At an  $L_{dn}$  of about 60 dBA, approximately eight percent of the population is highly annoyed. When the  $L_{dn}$  increases to 70 dBA, the percentage of the population highly annoyed increases to about 20 to 25 percent of the population.

**TABLE 17-1 TYPICAL SOUND LEVELS**

| Noise Generators<br>(at a given distance<br>from Noise Sources) | dBA | Noise<br>Environments                       | Subjective<br>Impression |
|---|-----|---|--------------------------|
| Civil Defense Siren<br>(100 feet)                               | 130 |   |                          |
| Jet Takeoff (200 feet)  | 120 |   | Pain Threshold           |
|   | 110 |   |                          |
| Diesel Pile Driver (100 feet)                                   | 100 | Rock music concert                          | Very Loud                |
|   | 90  | Boiler Room<br>Printing Press Plant         |                          |
| Freight Cars (50 feet)  | 80  |   |                          |
|   | 70  | In Kitchen with Garbage<br>Disposal Running | Moderately Loud          |
| Freeway (100 feet)<br>Vacuum Cleaner (10 feet)                  | 60  | Data Processing Center                      |                          |
| Light Traffic (100 feet)<br>Large Transformer<br>(200 feet)     | 50  | Department Store                            |                          |
|   | 40  | Private Business Office                     |                          |
| Soft Whisper (5 feet)   | 30  | Quiet Bedroom                               | Quiet                    |
|   | 20  | Recording Studio                            |                          |
|   | 10  |   | Threshold of<br>Hearing  |

### 3. Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Table 17-2 displays continuous vibration impacts on human annoyance and on buildings. Annoyance is a subjective measure and vibrations may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying.

Potential sources of vibration in Novato include construction activities and railroad operations. Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction-related ground-borne vibration levels. Railroad operations are potential sources of substantial ground vibration depending on distance, the type and the speed of trains and the type of railroad track. Vibration impacts are generally different for passenger and freight operations. The main difference between passenger and freight operations is the time duration of individual events; a passenger train lasts a few seconds whereas a long freight train may last several minutes, depending on speed and length. A discussion of potential ground vibration impacts from the proposed SMART commuter rail service is in Section D.2.

**TABLE 17-2 REACTION OF PEOPLE AND DAMAGE TO BUILDINGS FOR CONTINUOUS VIBRATION LEVELS**

| Peak Particle Velocity (in/sec) | Human Reaction  | Effect on Buildings   |
|---------------------------------|---|---|
| 0.006 – 0.019                   | Threshold of perception   | Vibration unlikely to cause damage of any type  |
| 0.08                            | Vibrations readily perceptible  | Recommended upper level of the vibration to which ruins and ancient monuments should be subjected                   |
| 0.10                            | Level at which continuous vibrations begin to annoy people                    | Virtually no risk of architectural damage to normal buildings   |
| 0.20                            | Vibrations annoying to people in buildings                                    | Threshold at which there is a risk of architectural damage to normal dwellings such as plastered walls or ceilings. |
| 0.4 – 0.6                       | Vibrations considered unpleasant by people subjected to continuous vibrations | Vibration at this level would cause architectural damage and possibly minor structural damage.                      |

Source: Transportation Related Earthborne Vibrations. Caltrans, Technical Advisory, TAV-02-01-R9601, February 2002.

### *B. Regulatory Framework*

This section describes the relevant policies, standards and guidelines relating to noise as established by federal and State agencies and the City of Novato.

## 1. Federal

### a. Department of Housing and Urban Development

Department of Housing and Urban Development (HUD) has established guidelines for evaluating noise impacts on residential projects seeking financial support under various grant programs. Title 23 of the Code of Federal Regulations, Part 772 (23 CFR 772) and 24 CFR 51(B) describe HUD policies and programs to protect against excessive noise in communities and places of residence. These policies and programs apply to development projects with HUD involvement. Section 51.101 of CFR states that the HUD goal for the interior noise level in residences should not exceed 45 dB  $L_{dn}$ . The normally acceptable noise level for exterior uses is 65 dB  $L_{dn}$ .

### b. Federal Highway Administration (FHWA)

An assessment of noise and a consideration of noise abatement for major proposed federal or federal-aid highway construction projects is required by 23 CFR 772. The FHWA must consider noise abatement for sensitive receivers when “worst-hour” noise levels approach or exceed 67 dBA  $L_{eq}$ .

### c. Federal Transit Administration and Federal Railroad Administration

Federal Transit Administration (FTA) and Federal Railroad Administration (FRA) procedures for the evaluation of noise from transit projects are specified in the document titled *Transit Noise and Vibration Impact Assessment*. This analysis uses the FTA’s vibration impact criteria for sensitive buildings, residences, and institutional land uses near railroads. The thresholds for residences are 72 vibration decibels (VdB) for frequent events (more than 70 events of the same source per day), 75 VdB for occasional events (30 to 70 vibration events of the same source per day), and 80 VdB for infrequent events (less than 30 vibration events of the same source per day).

## 2. State of California

### a. California Administrative Code (CAC) Section 65302(f)

CAC Section 65302(f) requires that all General Plans include a Noise Element to address noise problems in the community. State law also requires that current and future noise level contours be developed for the following sources:

- ◆ Highways and freeways.
- ◆ Primary arterials and major local streets.
- ◆ Passenger and freight on-line railroad operations and ground rapid transit systems.
- ◆ Commercial, general aviation, heliport, and military airport operations, aircraft flyovers, jet engine tests stands and all other ground facilities and maintenance functions related to airport operation.
- ◆ Local industrial plants, including, but not limited to, railroad classification yards.
- ◆ Other stationary ground noise sources identified by local agencies as contributing to the community noise environment.

State Land Use Compatibility Standards, illustrated in Table 17-3, include a sound level/land use compatibility chart that divides various outdoor  $L_{dn}$  ranges into four compatibility categories based on land use: normally acceptable, conditionally acceptable, normally unacceptable and clearly unacceptable. For many land uses, the chart shows overlapping  $L_{dn}$  ranges for two or more categories. These overlapping  $L_{dn}$  ranges are intended to indicate that local conditions (existing

sound levels and community attitudes toward dominant sound sources) should be considered in evaluating land use compatibility at specific locations.

b. California Noise Insulation Standards

The State of California establishes minimum noise insulation performance standards for hotels, motels, dormitories, apartment houses and dwellings other than detached single-family dwellings as set forth in the 2013 California Building Code. The noise limit is a maximum interior noise level of 45 dBA  $L_{dn}$ . Where exterior noise levels exceed 60 dBA  $L_{dn}$ , a report must be submitted with the building plans describing the noise control measures that have been incorporated into the design of the project to meet the noise limit.

c. Division of Aeronautic Noise Standards

Title 21 Chapter 5000 of the CCR identifies noise compatibility standards for airport operations. Section 5014 of the Code states that the standard for the acceptable level of aircraft noise for persons living in the vicinity of airports is established to be a community noise equivalent level (CNEL), of 65 dB. Land uses such as residences, schools, hospitals or places of worship exposed to aircraft noise exceeding 65 dB CNEL are deemed to be in a noise-impact area.

**3. City of Novato**

a. General Plan

The existing General Plan includes objectives, policies and programs relating to noise in the Safety and Noise chapter. Noise-related objectives call for the City to ensure compatible development throughout the city, prevent noise increases and reduce noise levels where feasible and practical. Policies and programs to support these objectives focus on enforcing noise and land use compatibility standards, mitigating potential noise impacts from new development and roadway projects, restricting truck traffic to designated routes and enforcing the California Vehicle Code that limits noise emissions of vehicles operated on public streets.

The existing General Plan also includes land use compatibility standards for noise, measured in decibels. The General Plan's noise standards are further based on  $L_{dn}$ . Normally acceptable noise and land use compatibility standards are presented in Table 17-4.





b. City of Novato Municipal Code

Nuisance noise is addressed in Chapter 14 (Police Regulations) of the Novato Municipal Code. Section 14-13.1 states that, "it shall be unlawful and a nuisance for any person between the hours of 10:00 p.m. and 6:00 a.m., within the city persistently to maintain, emit, cause (mechanically or otherwise), or permit any animal owned by or in the possession or control of that person, to emit any noise or sound which, by reason of its raucous or nerve-racking nature, disturbs the peace or comfort or injures the health of any person of normal sensitivity residing within the area provided, however, that poultry and/or livestock in an agriculturally zoned area shall be exempt."

***C. Noise-Sensitive Land Uses***

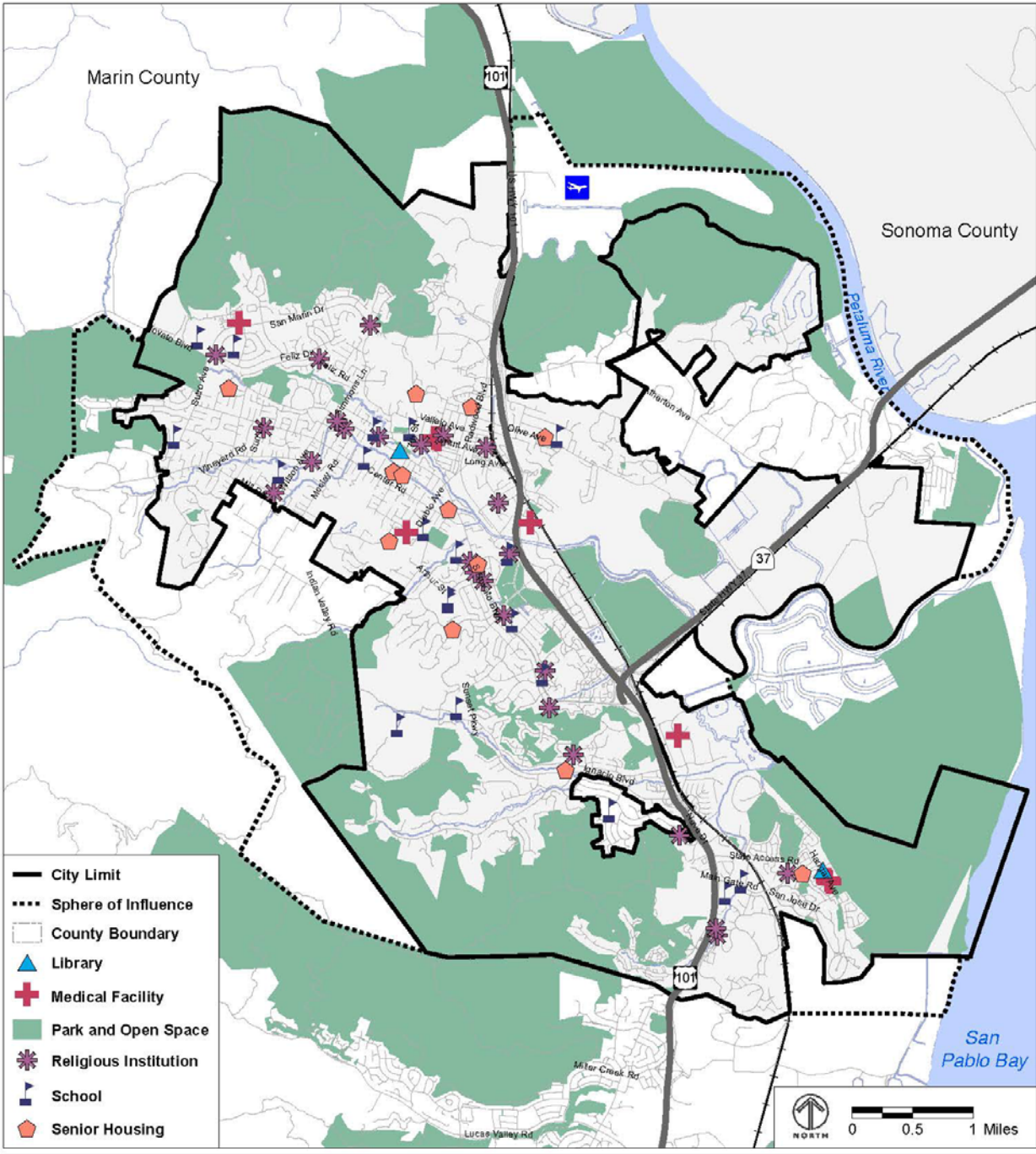
Noise-sensitive land uses are defined as locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Specific uses considered sensitive to noise include senior housing, hospitals or healthcare facilities, parks and wildlife areas, places of worship, libraries and schools. The location of these uses are shown in Figure 17-1.

TABLE 17-3 STATE LAND USE COMPATIBILITY STANDARDS FOR COMMUNITY NOISE ENVIRONMENT

| Land Use Category   | Community Noise Exposure—L <sub>dn</sub> or CNEL (dB) |       |       |       |       |       |    |
|---|---|-------|-------|-------|-------|-------|----|
|   | 50  | 55    | 60    | 65    | 70    | 75    | 80 |
| Residential—low-density single-family, duplex, mobile homes   | 50-60   | 55-70 | 60-70 | 65-70 | 70-75 | 75-80 | 80 |
| Residential—multi-family  | 50-65   | 60-70 | 65-70 | 70-75 | 75-80 | 80    |    |
| Office buildings, business commercial and professional  | 50-70   | 65-70 | 70-75 | 75-80 | 80    |       |    |
| Industrial, manufacturing, utilities, agriculture   | 50-75   | 70-75 | 75-80 | 80    |       |       |    |
| Transient lodging—motels, hotels  | 50-65   | 60-70 | 70-75 | 75-80 | 80    |       |    |
| Schools, libraries, churches, hospitals, nursing homes  | 50-70   | 65-70 | 70-75 | 75-80 | 80    |       |    |
| Playgrounds, neighborhood parks   | 50-70   | 65-70 | 70-75 | 75-80 | 80    |       |    |
| Golf courses, riding stables, water recreation, cemeteries  | 50-75   | 70-75 | 75-80 | 80    |       |       |    |
| Auditoriums, concert halls, amphitheaters   | 50-70   | 70-75 | 75-80 | 80    |       |       |    |
| Sports arenas, outdoor spectator sports   | 50-75   | 70-75 | 75-80 | 80    |       |       |    |
|  <b>Normally Acceptable:</b> Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.   |   |       |       |       |       |       |    |
|  <b>Conditionally Acceptable:</b> New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction but with closed windows and fresh air supply systems or air conditioning will normally suffice. |   |       |       |       |       |       |    |
|  <b>Normally Unacceptable:</b> New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made, and needed noise insulation features must be included in the design.  |   |       |       |       |       |       |    |
|  <b>Clearly Unacceptable:</b> New construction or development generally should not be undertaken.  |   |       |       |       |       |       |    |

Source: Governor's Office of Planning and Research 2003.

CITY OF NOVATO  
 EXISTING CONDITIONS REPORT  
 NOISE



Source: Marin County GIS and DC&E

FIGURE 17-1  
 NOISE SENSITIVE LAND USES

**TABLE 17-4 CITY OF NOVATO LAND USE COMPATIBILITY GUIDELINES FOR COMMUNITY NOISE ENVIRONMENT**

| Land Use Category   | Threshold of Normally Acceptable |
|---|----------------------------------|
| Residential, Hotels and Motels—Indoor   | 45 L <sub>dn</sub>               |
| Residential, Hotels and Motels—Outdoor  | 60 L <sub>dn</sub>               |
| Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds—Outdoor                 | 65 L <sub>dn</sub>               |
| Schools, Libraries, Museums, Hospitals, Personal Care, Meeting Halls and Churches—Outdoor | 60 L <sub>dn</sub>               |
| Office Buildings, Business Commercial and Professional—Outdoor                            | 70 L <sub>dn</sub>               |
| Industrial, Manufacturing, Utilities and Agriculture—Outdoor                              | 70 L <sub>dn</sub>               |

***D. Existing Noise Conditions***

This section identifies sources of noise and existing noise levels in Novato. The primary source of noise in Novato is vehicle traffic from highways and major roadways. Additional noise sources, both present and future, include the Northwest Pacific Railroad corridor and the Marin County Airport at Gness Field. There are no known stationary noise sources, such as plants or factories, that make a significant contribution to Novato’s noise environment.

**1. Highways and Major Roadways**

The most significant source of traffic noise in Novato is from Highway 101. State Route 37 also carries high volumes of traffic and creates noise impacts on existing developed areas within the City. Major arterials, including San Marin Drive, Novato Boulevard, South Novato Boulevard, Redwood Boulevard and others are significant noise sources for land uses immediately joining these roadways.

A noise monitoring survey was conducted in December 2008 to quantify noise levels along Highway 101 and major roadways in Novato. Data from this survey was used to create a model of existing traffic noise levels throughout the city. These noise levels, as represented by noise contour lines, are shown in Figure 17-2. Detailed noise measurement data from the December 2008 survey is shown in Appendix D.

**2. SMART/ Northwest Pacific Railroad**

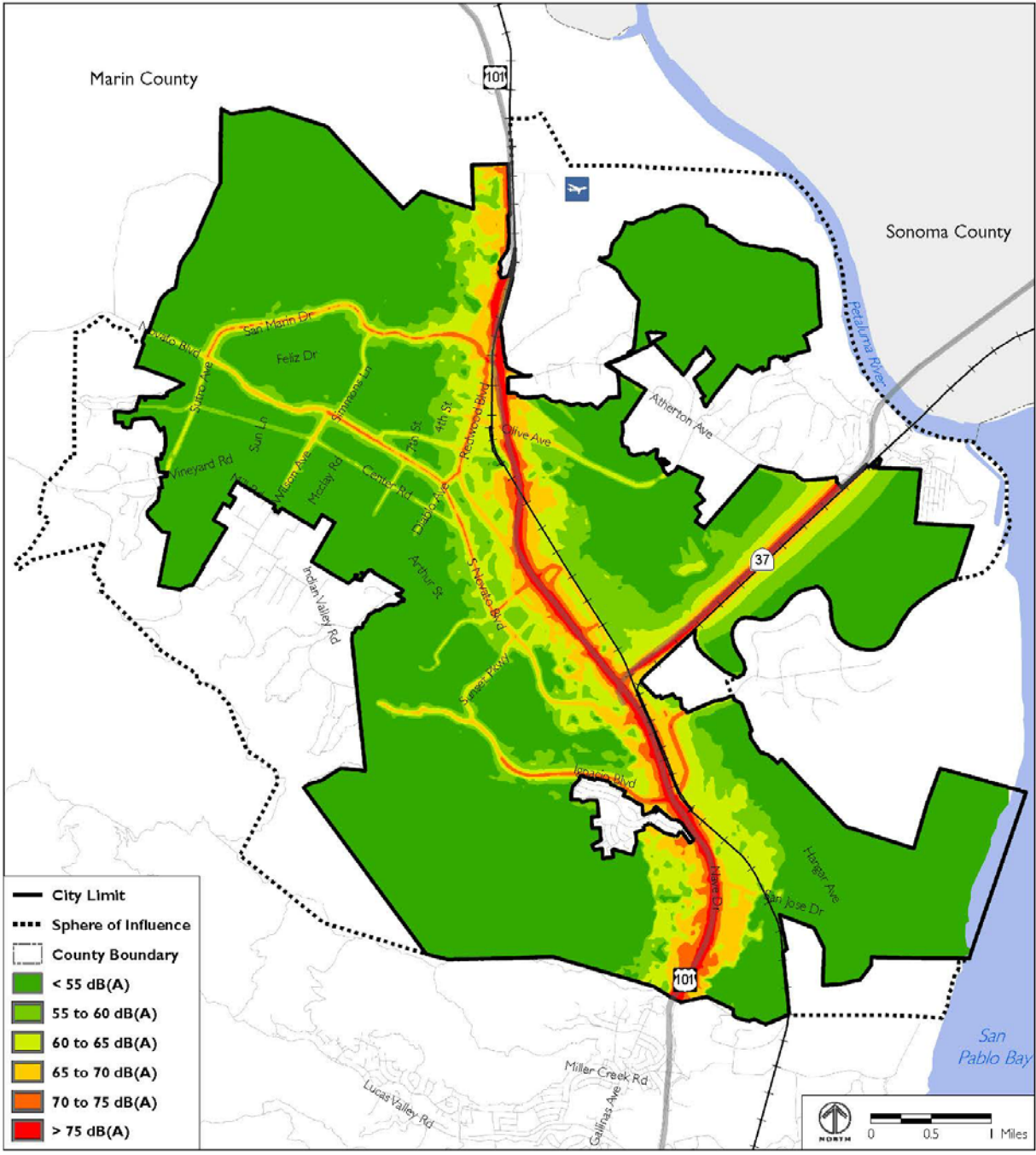
The Northwest Pacific Railroad roughly parallels Highway 101 in the north and central portion of the city then diverges to the east through Hamilton Field. The Northwestern Pacific Railroad Company (NWPCo) is currently operating freight service between Napa and Petaluma along tracks owned by the Sonoma Marin Area Rail Transit District (SMART). As defined by a 2008 Consent Decree between the City of Novato, NWPCo and North Coast Railroad Authority (NCRA), NWPCo may operate up to three round trips per week with a maximum of 18 cars per trip. In addition, all freight operation shall occur during daylight hours until the City of Novato has established and executed a Quiet Zone pursuant to the Federal Railroad Administration’s (FRA) Train Horn Rule. While there are three spurs in Novato, one public and two private, NWPCo currently does not provide service to any Novato customers.



SMART is currently upgrading seven of the ten Novato crossings with a combination of Supplemental Safety Measures (SSMs) and Alternative Safety Measures (ASMs) through a Memorandum of Understanding with the NCRA/NWPCo as required by the Consent Decree. The completion of these improvements will provide the City of Novato with the infrastructure required to file a Notice of Intent to Initiate a Quiet Zone with the FRA.

In addition, SMART has begun reconstruction of the rail line to support their future passenger service. Once operational, SMART will provide service to Novato residents and businesses through two stops; one on Redwood Boulevard just north of San Marin Drive and the other just north of Main Gate Road in the Hamilton Community. SMART intends to initially operate 14 round trips per day between Santa Rosa and San Rafael.

In 2008, SMART approved a Supplemental EIR that analyzed noise and vibration impacts resulting from weekday (12 round trips per day) and weekend (four round trips per day) passenger rail service, as well as three cumulative scenarios including potential freight activity (between three and eight round trips per day). Although the line currently creates a minimal noise source in the community, due to limited freight activity (no SMART activity), planned full activation of the NWPRR will result in elevated noise levels along the railroad and in the vicinity of at-grade rail crossings. Day-night average noise levels (not near at-grade crossings) are estimated to range from 56 to 59 dBA  $L_{dn}$  at a distance of 100 feet from the tracks, assuming combined passenger and freight train service. Train warning whistles can generate maximum noise levels of approximately 105 dBA at 100 feet and would be audible throughout the community. Near at-grade railroad crossings,  $L_{dn}$  noise levels will be substantially higher unless the City of Novato obtains Quiet Zone designations from the Public Utilities Commission (PUC), SMART and NCRA, which would eliminate the need for passenger and freight trains to sound their whistles within 1/4-mile of at-grade crossings. Trains would also be a source of perceptible groundborne vibration within approximately 50 to 100 feet of the tracks.



Source: Illingworth & Rodkin, 2008

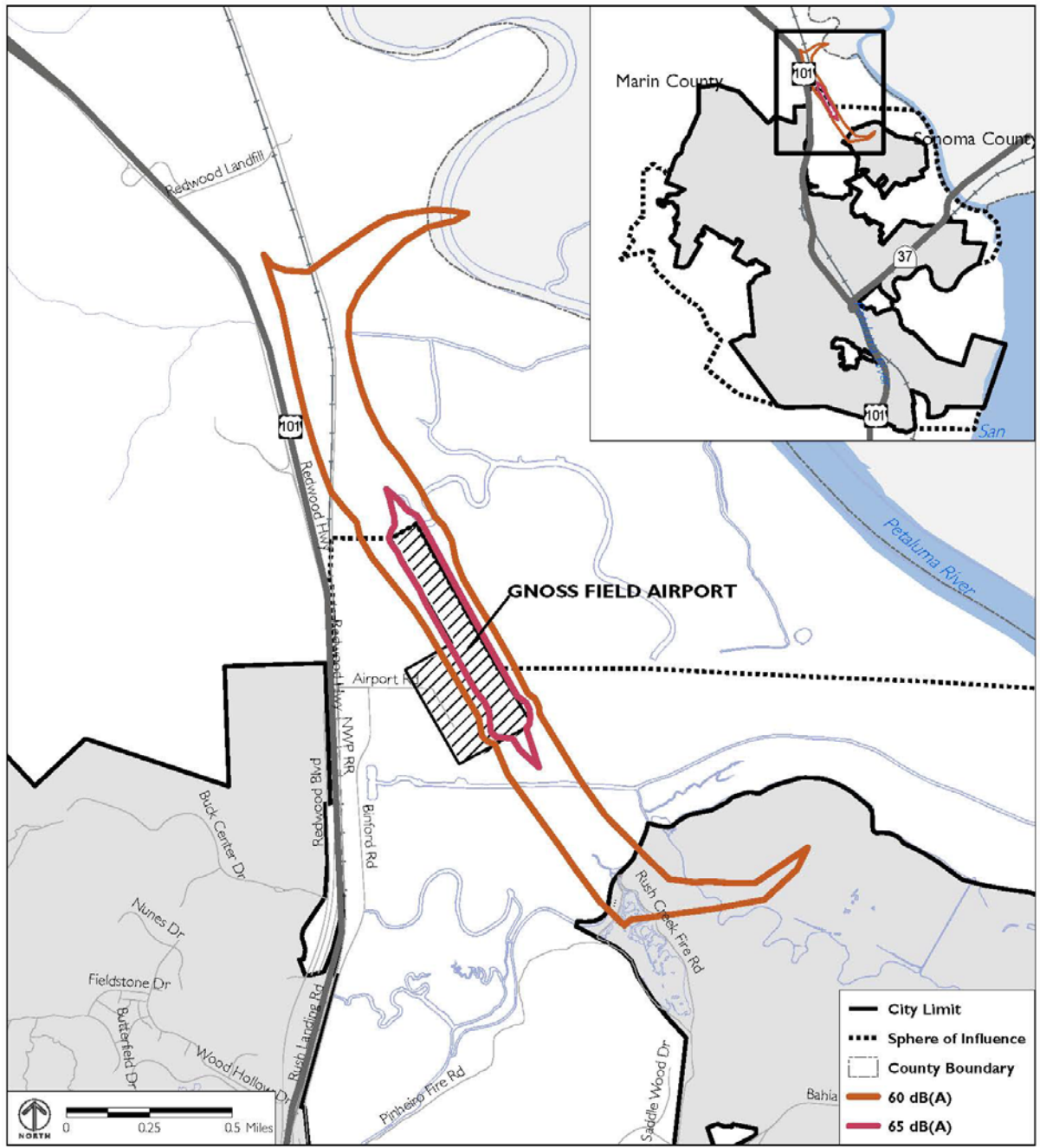
FIGURE 17-2  
 EXISTING VEHICULAR NOISE CONTOURS

### 3. Aircraft

Aircraft using Gness Field Airport intermittently contribute to ambient noise levels in the city. This general aviation airport is located north of the City of Novato east of Highway 101. Aircraft based at the field include 222 aircraft ranging from single-engine light aircraft to corporate jet aircraft. The airport averages about 95,000 aircraft arrivals and departures per year. Approximately 77 percent of aircraft operations are local general aviation, 22 percent are transient general aviation, and less than 1 percent are jet air taxi operations. The County encourages airport users to reduce noise and avoid flying over sensitive areas to the south and southeast of the Gness Field Airport. The County is currently in the environmental review process to evaluate a proposal to extend the only runway by 1,100 feet. The purpose of the extension is to serve existing and anticipated aircraft and activity levels, as well as current and future changes in small aircraft design.

Aircraft noise in California is described in terms of the CNEL, which is approximately equivalent to the day/night average noise level ( $L_{dn}$ ) but includes a 5 dB weighting factor for the evening hours (7:00 p.m. to 10:00 p.m.). Existing noise contours for Gness Field are shown on Figure 17-3. The 60 dBA CNEL noise contour generated by Gness Field Airport extends to the northernmost city limits.

Jet aircraft to and from the Oakland and San Francisco International airports generate intermittent noise when passing over the City of Novato. Noise generated by these overflights, although audible and noticeable in quiet areas above other ambient noise sources, does not contribute to daily average noise levels in the city.



Note: Noise contour lines are approximate.

FIGURE 17-3  
 EXISTING NOISE CONTOURS FOR THE AIRPORT AT GROSS FIELD