

***MAIN STREET PRECISE PLAN  
ENVIRONMENTAL NOISE STUDY  
REDWOOD CITY, CALIFORNIA***

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## INTRODUCTION

This study presents a noise assessment of the potential impacts of a Precise Plan for several contiguous parcels on Main Street between Veterans Boulevard and Brewster Avenue. The proposed project is a Precise Plan and General Plan and Zoning Map Amendments for properties located at 305, 333, 369, and 373 Main Street, and 1001 Veterans Boulevard in Redwood City, California. The proposed General Plan Amendment would change the project area's current land use designation from commercial/office park to heavy commercial/mixed-use. A component of the mixed-use would be high-density residential development. The primary noise-related issue is the compatibility of the proposed residential development with the noise environment in the area. This report was divided into two major sections: Setting, and Impacts and Mitigation Measures. The Setting Section includes background information on environmental noise, a discussion of the applicable noise standards and policies, and a description of the existing noise environment. The Impacts and Mitigation Measures Section sets forth significance criteria, evaluates potential noise impacts, and recommends measures to mitigate noise impacts upon existing and future uses in the plan area.

## SETTING

### *Noise Fundamentals*

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its loudness. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (frequency) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is amplitude of sound waves combined with the reception characteristics of the ear. Amplitude may be compared with the height of an ocean wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* 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. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its level. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level or dBA*. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This energy-equivalent sound/noise descriptor is called  $L_{eq}$ . The most common averaging period is hourly, but  $L_{eq}$  can describe any series of noise events of arbitrary duration.

**TABLE 1 Definitions of Acoustical Terms Used in this Report**

| <b>Term</b>                               | <b>Definitions</b>  |
|---|---|
| Decibel, dB                               | A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.  |
| Sound Pressure Level                      | Sound pressure is the sound force per unit area, usually expressed in micro Pascals (micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter. |
| Frequency, Hz                             | The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.  |
| A-Weighted Sound Level, dBA               | The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.  |
| Equivalent Noise Level, $L_{eq}$          | The average A-weighted noise level during the measurement period. The hourly $L_{eq}$ used for this report is denoted as dBA $L_{eq[h]}$ .  |
| Community Noise Equivalent Level, CNEL    | The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels in the night between 10:00 pm and 7:00 am.   |
| Day/Night Noise Level, $L_{dn}$           | The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.   |
| $L_{01}$ , $L_{10}$ , $L_{50}$ , $L_{90}$ | The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.  |
| Ambient Noise Level                       | The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.  |
| Intrusive                                 | That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.  |

**TABLE 2 Typical Noise Levels in the Environment**

| Common Outdoor Noise Source      | Noise Level (dBA) | Common Indoor Noise Source  |
|----------------------------------|-------------------|-----------------------------|
|                                  | <b>120 dBA</b>    |                             |
| Jet fly-over at 300 meters       |                   | Rock concert                |
|                                  | <b>110 dBA</b>    |                             |
|                                  | <b>100 dBA</b>    |                             |
| Pile driver at 20 meters         |                   | Night club with live music  |
|                                  | <b>90 dBA</b>     |                             |
| Large truck pass by at 15 meters |                   |                             |
|                                  | <b>80 dBA</b>     | Noisy restaurant            |
|                                  |                   | Garbage disposal at 1 meter |
| Gas lawn mower at 30 meters      |                   | Vacuum cleaner at 3 meters  |
| Commercial/Urban area daytime    | <b>70 dBA</b>     | Normal speech at 1 meter    |
| Suburban expressway at 90 meters |                   |                             |
| Suburban daytime                 | <b>60 dBA</b>     | Active office environment   |
|                                  | <b>50 dBA</b>     |                             |
| Urban area nighttime             |                   | Quiet office environment    |
|                                  | <b>40 dBA</b>     |                             |
| Suburban nighttime               |                   |                             |
| Quiet rural areas                | <b>30 dBA</b>     | Library                     |
|                                  |                   | Quiet bedroom at night      |
| Wilderness area                  | <b>20 dBA</b>     |                             |
|                                  | <b>10 dBA</b>     | Quiet recording studio      |
| Threshold of human hearing       | <b>0 dBA</b>      | Threshold of human hearing  |

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level, CNEL*, is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level, L<sub>dn</sub>*, is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

### ***Pertinent Plans and Policies***

#### City of Redwood City General Plan

Redwood City addresses issues of land use compatibility, transportation noise, and community noise in the *Noise Element* of the City of Redwood City Strategic General Plan (adopted in 1990). The City establishes goals and policies in the *Noise Element* to promote compatible development throughout the city. A Noise and Land Use Compatibility Table is also presented with the element to identify acceptable and unacceptable noise level ranges for specific land use types.

The following “general land use recommendations” are listed in the *Noise Element’s* Land Use Compatibility Table.

- *Residential land uses are considered satisfactory in noise environments of less than 55 dBA CNEL.*
- *Noise environments between 55 dBA and 60 dBA CNEL are considered conditionally acceptable for residential development. Under these conditions, new construction or development should be undertaken only after a detailed analysis of noise reduction requirements is made and needed noise insulation features are included in the project’s design.*
- *Commercial land uses are considered satisfactory in noise environments of less than 70 dBA CNEL.*
- *Noise environments between 70 dBA and 80 dBA CNEL are considered “conditionally acceptable” for commercial development. Under these conditions, new construction or development should be undertaken only after a detailed analysis of noise reduction requirements is made and needed noise insulation features are included in the project’s design.*

The *Noise Element* also contains the following objectives and policies pertinent to the proposed project.

- *Minimize the impacts of noise on people through noise reduction and project suppression techniques, and through appropriate land use policies.* (Objective 1, page 11-12)
- *Require all exterior noise sources (construction, operations, air compressors, pumps, fans, and leaf blowers) to use available noise suppression devices and techniques to bring exterior noise down to acceptable levels compatible with adjacent land uses.* (Policy N-3, page 11-12)
- *Commercial drive-through uses should only be allowed when compatibility with adjacent land uses can be demonstrated.* (Policy N-4, page 11-12)
- *Land Uses within the Planning Boundary of San Carlos Airport shall be compatible with the Aircraft Noise/Land Use Compatibility Standards found at page 8 of the 1981 San Mateo County Airport Land Use Plan. The “Planning Boundary” for the San Carlos Airport is considered the ground area encompassed by the combination of the line depicting the 55 CNEL Noise Contour, as shown on the Noise Contour Map at page 7 of the 1981 San Mateo County Airport Land Use Plan and the outer boundary (Elevation 359) of the Hazard Zoning Plan at page 11 of the 1981 San Mateo Land Use Plan.* (Policy N-5, page 11-12,13)

#### San Carlos Airport Land Use Plan

The San Carlos Airport Land Use Plan (ALUP), which is a chapter of the San Mateo County ALUP, establishes airport noise and land use compatibility standards for development in the airport vicinity of San Carlos Airport and its takeoff and approach zones. Projected airport takeoff and approach zone CNEL noise contours presented in this plan are used to evaluate land use compatibility for proposed underlying developments; the 55 dBA CNEL noise contour is recognized as the threshold for review by the Airport Land Use Commission (ALUC). Underlying commercial land uses are considered compatible in noise environments less than 70 dBA CNEL, conditionally compatible in noise environments between 70 and 80 dBA CNEL, and incompatible in noise environments greater than 80 dBA CNEL.

**Table 3 State of California and Redwood City Noise Guidelines for Land Use Planning**

| Generalized Land Use        | CNEL Range      | General Land Use Recommendation  |
|-----------------------------|-----------------|--|
| Residential and Educational | Less than 55    | Satisfactory, with little noise impact and requiring no special noise insulation for new construction.   |
|                             | 55 to 60        | New construction or development should be undertaken only after an analysis of noise reduction requirement is made and needed noise insulation features included in the design.  |
|                             | Greater than 60 | New construction or development should not be undertaken   |
| Commercial                  | Less than 70    | Satisfactory, with little noise impact and requiring no special noise insulation for new construction.   |
|                             | 70 to 80        | New construction or development should be undertaken only after an analysis of noise reduction requirement is made and needed noise insulation features included in the design.  |
|                             | Greater than 80 | New construction or development should not be undertaken unless related to airport activities or services. Conventional construction will generally be inadequate, and special noise insulation features should be included in construction. |
| Industrial                  | Less than 75    | Satisfactory, with little noise impact and requiring no special noise insulation for new construction.   |
|                             | 75 to 85        | New construction or development should be undertaken only after an analysis of noise reduction requirement is made and needed noise insulation features included in the design.  |
|                             | Greater than 85 | New construction or development should not be undertaken unless related to airport activities or services. Conventional construction will generally be inadequate, and special noise insulation features should be included in construction. |
| Open                        | Less than 75    | Satisfactory, with little noise impact and requiring no special noise insulation for new construction.   |
|                             | Greater than 75 | Land uses involving concentrations of people (spectator sports and some recreational facilities) or of animals (livestock farming and animal breeding) should generally be avoided.  |

SOURCE: Redwood City Strategic General Plan, Noise Element, page 11-14, adopted 1990.

## Redwood City Municipal Code

Chapter 24 (Noise Regulation) of the Redwood City Municipal Code sets allowable noise limits for different types of receiving land uses. The noise levels allowed by the Noise Ordinance depend primarily on the background noise level in the area. For the residential developments, applicable noise ordinances are discussed in Chapter 24, Article II, Division 2 and 3. Section 24.21 prohibits noise increases of 6 db above local ambient measured noise at any point within a residential district due to an assemblage of 3 or more people during the hours of 8:00 pm and 8:00 am. Section 24.30 of the Noise Ordinance establishes that noise levels generated by construction are prohibited between the hours of 8:00 pm to 7:00 am weekdays, or at any time on Saturdays, Sundays or holidays. In addition, Section 24.31 of the Ordinance prohibits noise levels from exceeding 110 dBA for any item of machinery, equipment, or device used during construction in a residential district.

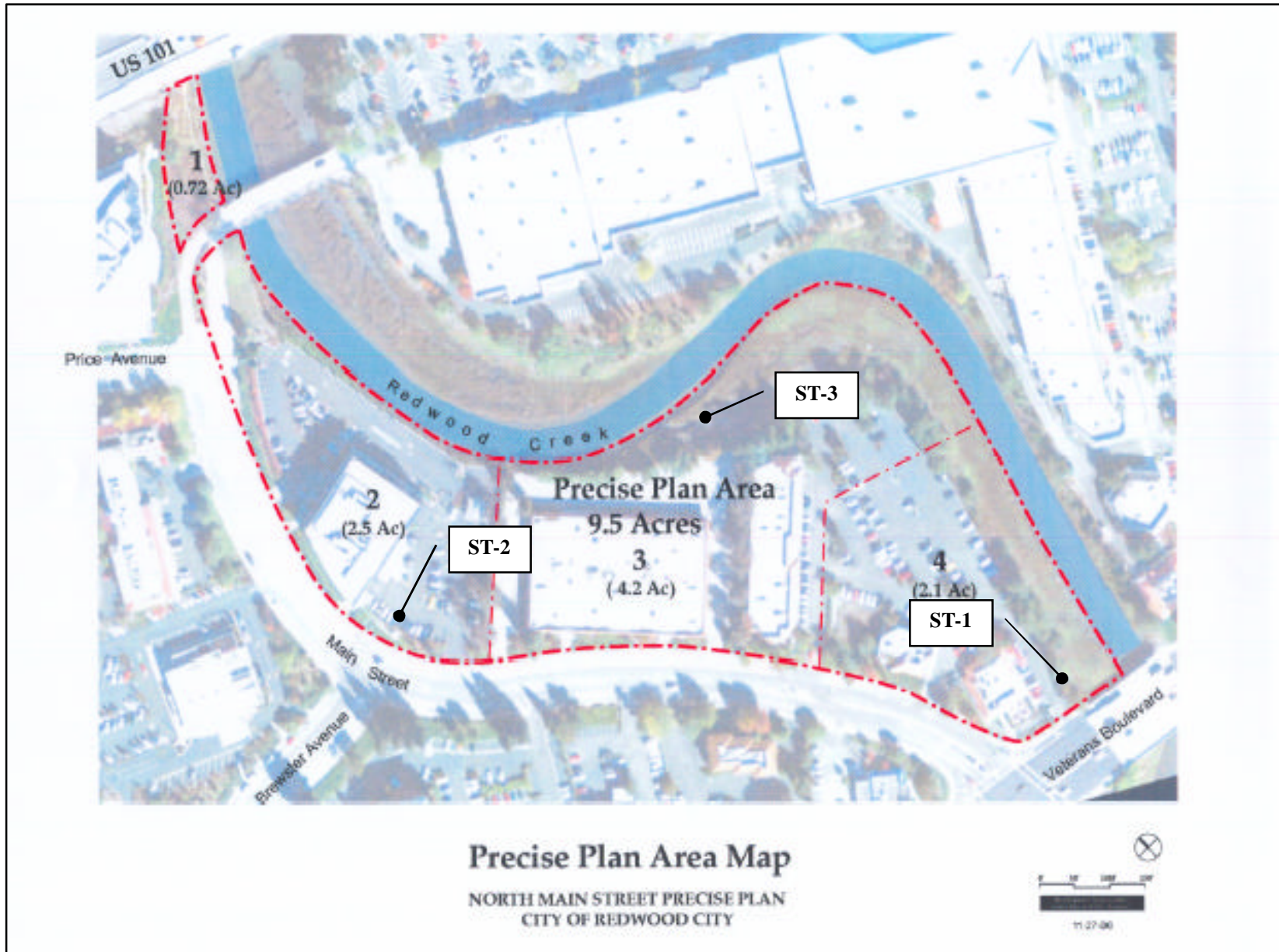
## State of California Building Code and Guidelines

Environmental noise intrusion into new multi-family housing is regulated by Chapter 12, Section 1208, Sound Transmission Control, in the 2001 California Building Code. Interior noise levels attributable to exterior sources shall not exceed 45 CNEL in any habitable room. Residential structures proposed where the noise level exceeds 60 CNEL shall require an acoustical analysis showing that the proposed design will limit exterior noise to the prescribed allowable interior level.

### ***Existing Noise Environment***

The noise environment in the Main Street Precise Plan Area results from traffic on the local streets and U.S. Highway 101. Noise measurements were made during midday at three different locations in the area on January 5, 2007. The first location was on Veterans Boulevard, about 145 feet from the centerline of the road, just east of Main Street (ST-1). The average noise level was 66 dBA  $L_{eq}$  and noise levels fluctuated between 62 dBA and 77 dBA during the ten-minute measurement. The only notable source other than vehicular traffic was a helicopter that caused maximum noise level of 76 dBA. The second measurement was along Main Street, at a distance of about 65 feet from the roadway centerline near the intersection with Brewster (ST-2). The average noise level was 64 dBA  $L_{eq}$ . Traffic noise levels ranged from about 60 dBA to 76 dBA. The third measurement was behind 333 Main Street near the creek (ST-3). The only significant noise source at this location was traffic on U.S. Highway 101. The noise level was fairly steady at 63 to 65 dBA. The average noise level during the measurement was 64 dBA  $L_{eq}$ . Activities at the shopping center located across the creek did not make any measurable contribution to the midday noise levels and no potential noise sources were observed (such as loading docks).

**Figure 1** Noise Measurement Locations



## IMPACTS AND MITIGATION MEASURES

### *Significance Criteria*

The California Environmental Quality Act (CEQA) contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Based on the CEQA Guidelines, the proposed project would be considered in this EIR to have a significant impact on the noise environment if it would result in:<sup>1</sup>

- (a) exposure of persons to or generation of noise levels in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies;
- (b) a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or
- (c) a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

A significant impact would be identified if land uses proposed by the project would be exposed to noise levels exceeding the City's established guidelines for noise and land use compatibility.

There are no existing noise sensitive receptors in or around the area, and the implementation of the plan is not expected to cause an increase in traffic noise, so there would not be a permanent increase in ambient noise. No further analysis is warranted.

Construction noise levels would be treated differently because they are temporary and intermittent. Significant noise impacts would result from construction if noise levels were sufficiently high to interfere with speech, sleep, or normal residential activities. Construction-related hourly average noise levels received at commercial/office land uses above 70 dBA  $L_{eq}$  during the daytime would be considered significant. To cause a significant environmental impact, construction activities affecting a receptor must persist for more than one construction season.

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<sup>1</sup>CEQA Guidelines, Appendix G, item XI(a, c, d).

## *Assessment*

### **Impact 1: Project-Facilitated Construction Noise.**

Construction activities facilitated by the project could include site preparation, building demolition, building modification and rehabilitation, and construction of new buildings. Construction activities generate considerable amounts of noise, especially during the demolition and foundation phases and the construction of project infrastructure when heavy equipment is used. The effects of noise resulting from construction depend on the noise generated by various pieces of construction equipment, the timing and duration of noise generating activities, and the distance between construction noise sources and noise-sensitive receptors. Although construction noise would be localized to the individual site location, businesses adjacent to a construction site would be intermittently exposed to noise levels exceeding 75 dBA  $L_{eq}$  throughout the construction period. Construction could elevate noise levels at adjacent businesses by 15 to 20 dBA or more. This is a *potentially significant impact*.

**Mitigation Measure 1:** To reduce noise impacts from project-related construction activities, the following measures, when applicable, are recommended:

- *Construction Scheduling.* Ensure that noise-generating construction activity is limited to between the hours of 7:00 AM to 8:00 PM, Monday through Friday, and noise levels generated by construction are prohibited on Saturdays, Sundays and holidays. (*Redwood City Municipal Code Section 24.30*)
- *Construction Equipment Mufflers and Maintenance.* Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.
- *Equipment Locations.* Locate stationary noise-generating equipment as far as possible from sensitive receptors when sensitive receptors adjoin or are near a construction project site.
- *Construction Traffic.* Route all construction traffic to and from the construction sites via designated truck routes where possible. Prohibit construction-related heavy truck traffic in residential areas where feasible.
- *Quiet Equipment Selection.* Use quiet construction equipment, particularly air compressors, wherever possible.
- *Temporary Barriers.* Construct solid plywood fences around construction sites adjacent to operational business, residences or noise-sensitive land uses.
- *Temporary Noise Blankets.* Temporary noise control blanket barrier could be erected, if necessary, along building facades of construction sites. This mitigation would only be necessary if conflicts occurred which were irresolvable by proper scheduling. Noise control blanket barriers can be rented and quickly erected.

- *Noise Disturbance Coordinator.* For larger construction projects, the City may choose to require project designation of a "Noise Disturbance Coordinator" who would be responsible for responding to any local complaints about construction noise. The Disturbance Coordinator would determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and institute reasonable measures to correct the problem. Conspicuously post a telephone number for the Disturbance Coordinator at the construction site and include it in the notice sent to neighbors regarding the construction schedule. (The City should be responsible for designating a Noise Disturbance Coordinator and the individual project sponsor should be responsible for posting the phone number and providing construction schedule notices.)

Implementation of these measures would reduce this impact to a *less-than-significant level*.

**Impact 2: Potential Exposure of New, Plan-Facilitated Noise-Sensitive (Residential) Development to Noise Levels Exceeding Standards.**

The compatibility of the proposed land uses with the existing and future noise environment has been evaluated based on the guidelines identified in Table 3. Residential development is considered normally acceptable in noise environments of 55 dBA CNEL or less, and commercial or retail development is considered normally acceptable in noise environments of 70 dBA CNEL or less.

The plan area is located within San Carlos Airport Influence Area B. The noise contour map established in the City's General Plan (Airport Noise Contours) indicates that the entire plan area is located outside of the future 55 dBA CNEL noise contour for the airport. Therefore, aircraft noise would not affect the compatibility for new residential uses in the plan area.

Traffic noise levels throughout the area would exceed 55 dBA CNEL. Along Main Street, the noise level would be about 65 dBA CNEL. At Veterans Boulevard, the noise level would be about 69-70 dBA CNEL 100 feet from the roadway's centerline. The noise-sensitive residential development would be exposed to noise levels exceeding the "normally acceptable" level. In addition, proposed multi-family housing in noise environments that exceed 60 dBA CNEL would require acoustical evaluation under the California Building Code. This is considered a *potentially significant impact*.

**Mitigation Measure 2:**

Site-specific noise studies shall be conducted for all new residential uses to identify appropriate noise reduction measures to be included in the final design, which may include the following:

- Utilize site planning to minimize noise in shared residential outdoor activity areas by locating the areas behind the buildings, in courtyards, or orienting the terraces to alleyways rather than streets, whenever possible.

- Air conditioning should be provided in all units so that windows can remain closed to maintain interior noise levels below 45 dBA CNEL.
- Residential units proposed within 100 feet of Veterans Boulevard centerline where noise levels would exceed 70 dB CNEL should incorporate sound-rated windows and construction methods.
- A detailed analysis of residential interior noise levels shall be completed during design following the requirements of the 2001 California Building Code. The report will confirm that the design includes the noise control treatments necessary to achieve compliance with the noise standards.

Implementation of these measures would reduce the impact for new residential uses to a *less-than-significant level*.