325 VALLEY DRIVE FREIGHT FORWARDER FACILITY

BRISBANE, CALIFORNIA

ENVIRONMENTAL NOISE STUDY

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INTRODUCTION

This report provides an environmental noise study for the subject project. The purpose of the study is to quantify the existing noise levels in the residential neighborhoods near the project; calculate the expected noise impact, if any, from the project; and determine whether the project complies with the applicable standards. This report summarizes the City's acoustical standards, the long-term noise measurements results, project noise calculations, and noise reduction measures. Those readers not familiar with the fundamental concepts of environmental acoustics are referred to Appendix A enclosed with this report.

The project site is located in the City of Brisbane at 325 Valley Drive, near Cypress Lane. Currently, there is an office/warehouse building at the site, which will be demolished. We understand the proposed freight forwarder facility will consist of a new 90,000 square foot office/warehouse building built to serve freight forwarder warehousing uses. The facility will have dedicated driveways and 26 loading bays at the rear of the building. Depending upon future tenants, the facility will likely operate during normal business hours; however, there is the potential that operation will be from 5:00 a.m. until 10:00 p.m. For the purposes of this study, we have assumed operation from 5:00 a.m. until 10:00 p.m.

EXECUTIVE SUMMARY

No mitigation is required to meet the City of Brisbane's noise standards. In addition, two percent or less of people are expected to be potentially awakened by individual nighttime truck movements at the facility. We estimate that this is fewer than the number of people who are being awakened by existing single-event noise. Therefore, we do not consider this to be an impact.

ACOUSTICAL CRITERIA

City of Brisbane – Noise Element of the 1994 General Plan

Policy 184a of the Brisbane Noise Element references the State of California's Guidelines for land-use compatibility.[1] Noise exposure is quantified in terms of Day-Night Average Sound Level (DNL).[2] Table 1 provides a summary of the State's Guidelines.

[1] 2003 General Plan Guidelines. State of California Office of Planning and Research, Page 250.

[2] Day-Night Average Sound Level (DNL) – A descriptor established by the U.S. Environmental Protection Agency to describe the average noise level with a penalty applied to noise occurring during the nighttime hours (10 pm to 7 am) to account for the increased sensitivity of people during sleeping hours.

TABLE 1: NOISE AND LAND-USE COMPATIBILITY STANDARDS

Residential – Single-Family and Duplexes	Residential – Multi-Family	Schools, Libraries, Churches	Playgrounds, Neighborhood Parks	Category
Less than 60 dB	Less than 65 dB	Less than 70 dB	Less than 70 dB	A
Between 55 dB and 70 dB	Between 60 dB and 70 dB	Between 60 dB and 70 dB	Between 67 dB and 75 dB	B
Between 70 dB and 75 dB	Between 70 dB and 75 dB	Between 70 dB and 80 dB	Greater than 73 dB	C
Greater than 75 dB	Greater than 75 dB	Greater than 80 dB		D

A	**Normally Acceptable:** Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.
B	**Conditionally Acceptable:** New construction or development should be undertaken only after detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, with closed windows and fresh air supply systems or air conditioning, will normally suffice.
C	**Normally Unacceptable:** New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.
D	**Clearly Incompatible:** New construction or development should generally not be undertaken.

City of Brisbane – Municipal Code

The Municipal Code contains the following applicable noise criteria:

- Noise in a residential or commercial zoning district should not exceed ten dB above the local ambient for a cumulative period of more than 15 minutes in any hour[3]
- Noise in a residential or commercial zoning district should not exceed 20 dB above the local ambient for a cumulative period of more than three minutes in any hour[4]
- Night operations conducted by an applicant at the Crocker Park Trade Commercial District will not create noise, glare, or other effects that are likely to create a sleep disturbance for the occupants of neighboring residential properties[5]

EXISTING NOISE ENVIRONMENT

To quantify the existing noise environment at the project site, we conducted five long-term continuous five-day noise measurements from 10 January to 15 January 2008 (weekday and weekend days). The purpose of the measurements is to quantify the noise levels in the nearby residential neighborhoods and at the Lipman Middle School. A summary of the measurement locations and the measured data are listed below in Table 2 (and on Figures 1 to 3).

[3] City of Brisbane Municipal Code, Section 8.28.030

[4] City of Brisbane Municipal Code, Section 8.28.030

[5] City of Brisbane Municipal Code, Section 17.19.060, Item E.1

TABLE 2: MEASUREMENT DATA

Monitor Number	Measurement Location	Average Daytime Noise Level ($L_{eq}(h)$[6], dB)	Average Nighttime Noise Level ($L_{eq}(h)$, dB)	DNL[7] (dB)
L1	Along Mission Blue Drive, 35-feet south of Mission Blue centerline, 160-feet west of Kestrel Court, 1800-feet north of 325 Valley Drive; 12-feet above grade	52 to 61	43 to 56	59
L2	End of Kestrel Court, 1300-feet north of 325 Valley Drive; 12-feet above grade	56 to 62	48 to 61	62
L3	At Lipman Middle School, 300-feet north of 325 Valley Drive; 12-feet above parking lot grade.	55 to 69	47 to 60	62
L4	Adjacent to 204 Humboldt Road, 855-feet north of 325 Valley Drive; 12-feet above grade	54 to 68	47 to 59	62
L5	Adjacent to 124 Humboldt Road, 1000-feet north of 325 Valley Drive; 12-feet above parking lot grade	56 to 68	48 to 60	62

Traffic noise from local roadways and distant traffic noise from US-101 dominate the noise environment at all of the measurement locations. Noise from industrial activities at buildings along Valley Drive and aircraft flyovers from San Francisco International Airport (SFO) also contribute to the noise environment, but to a lesser extent.

PROJECT-GENERATED NOISE

Calculated DNL and $L_{eq}(h)$

Based on the *325 Valley Drive Freight Forwarder Warehousing Land Use Trip Generation Characteristics Traffic Evaluation* by Kimley-Horn and Associates dated 29 February 2008 and the revised hourly trip distribution received 22 April 2008, we have calculated the predicted noise levels from the freight forwarder facility. Our calculations are based on the following:

[6] $L_{eq}(h)$ — The equivalent steady-state A-weighted sound level that in one hour, would contain the same acoustic energy as the time-varying sound level during an hour.

[7] The DNL values shown are an average over the five days of measurements. Typically, the DNL values did not vary more than one dB from day to day.

- 689 total daily trips to or from the facility[8]
- Revised hourly trip distribution received via email on 22 April 2008 from Kimley-Horn
- Breakdown by vehicle type (small, medium, large) from Table 5 of the traffic report
- Noise levels and spectra as per the Federal Highway Administration (FHWA) Traffic Noise Model (TNM)
- Distance attenuation based upon receivers being located downwind of the noise source (i.e., trucks)
- Local topography as depicted in maps provided by the City of Brisbane

From the assumptions listed above, we calculated the DNL in the residential neighborhoods; Figure 1 illustrates the project-generated DNL contours. We also predicted the peak-hour $L_{eq}(h)$ for both the daytime (i.e., 7:00 a.m. until 10:00 p.m.) and nighttime (i.e., 5:00 a.m. until 7:00 a.m.) hours. Figures 2 and 3 show the daytime and nighttime peak-hour $L_{eq}(h)$ contours.

Based on the existing noise environment and our calculations, the noise generated by the facility is not expected to increase the DNL in the neighboring residential areas or at Lipman Middle School. The project-generated DNL in the residential areas and at Lipman Middle School will be DNL 45 dB or less, which is significantly below the current DNL of 59 to 62 dB and is below the City's strictest Noise Element "normally acceptable" goal of DNL 60 dB. New noise sources that are more than ten dB below existing noise levels do not increase the overall (cumulative) noise level; therefore, the noise from the freight-facility will not increase the noise levels in the residential areas or at Lipman Middle School.

Noise from the facility is not going to be more than ten dB above the hourly average noise levels in the neighboring residential areas or at Lipman Middle School. Based on our calculations, the maximum project-generated $L_{eq}(h)$ during the daytime will be 54 dB and during the nighttime will be 52 dB. We measured existing daytime $L_{eq}(h)$ of 52 to 69 dB and nighttime $L_{eq}(h)$ of 43 to 61 dB.

Sleep Disturbance

We have also analyzed the potential for sleep disturbance, since operation from 5:00 a.m. until 7:00 a.m. may occur at the facility. Our sleep disturbance analysis is based on the following assumptions:

- Maximum noise level and spectrum for a heavy truck, per the FHWA TNM
- Backup beeper noise level from measurements of similar trucks
- Sleep disturbance prediction method per FICAN[9]

[8] Table 6 of the Kimley-Horn and Associates report; we have used the highest (worst-case) trip volume.

[9] Effects of Aviation Noise on Awakenings from Sleep. Federal Interagency Committee on Aviation Noise (FICAN), 1997. Although the sleep disturbance predictions in this reference are based upon aviation noise, we believe these predictions are valid for truck noise.

- Distance attenuation based upon receiver being located downwind of noise source (i.e., trucks)
- Exterior-to-interior residential facade noise reduction of 15 dB; this corresponds to a "windows open" condition

Noise levels from individual truck movements will be L_{max}[10] 53 dB at the exterior of the closest residences and L_{max} 38 dB inside of the residences; the interior noise level will be lower with closed windows. We measured L_{max} significantly above 53 dB during the nighttime hours, likely due to sources such as aircraft flyovers, car passbys, motorcycles and/or sirens. Because there are already many events occurring at night above 53 dB, no mitigation is recommended for the individual nighttime truck movements from the proposed use.

Based on our calculations, two percent of those residents closest to the facility (within 800 to 1,400 feet) might be awakened from a single nighttime truck movement. We understand that this area, which includes the end of Kestrel Court and the north side of Humboldt Road, contains approximately 14 residential units. Assuming an average of 2.2 residents per unit, two percent of the residents closest to the facility would amount to one person. We estimate that this is fewer than the number of people who are being awakened by existing single-event noise. Therefore, we do not consider this to be a significant impact.

We have reviewed some preliminary sleep disturbance studies which attempt to predict the percent of awakenings from multiple noise events. In sum, the studies indicate that the probability of sleep disturbance increases as the number of truck movements increases; however, there is no accepted prediction method to date.

CONCLUSIONS

Based on the existing noise environment in the residential areas and at Lipman Middle School and the predicted noise levels from the freight forwarder facility, the facility will not increase the existing DNL noise levels and the facility complies with the City standards. Therefore, no mitigation is necessary for the facility.

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[10] L_{max} – The maximum A-weighted sound level measured during a period of time.

A P P E N D I X A

FUNDAMENTAL CONCEPTS OF ENVIRONMENTAL NOISE

This section provides background information to aid in understanding the technical aspects of this report.

Three dimensions of environmental noise are important in determining subjective response. These are:

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

Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound levels are usually measured and expressed in decibels (dB), with 0 dB corresponding roughly to the threshold of hearing.

The "frequency" of a sound refers to the number of complete pressure fluctuations per second in the sound. The unit of measurement is the cycle per second (cps) or hertz (Hz). Most of the sounds, which we hear in the environment, do not consist of a single frequency, but of a broad band of frequencies, differing in level. The name of the frequency and level content of a sound is its sound spectrum. A sound spectrum for engineering purposes is typically described in terms of octave bands, which separate the audible frequency range (for human beings, from about 20 to 20,000 Hz) into ten segments.

Many rating methods have been devised to permit comparisons of sounds having quite different spectra. Surprisingly, the simplest method correlates with human response practically as well as the more complex methods. This method consists of evaluating all of the frequencies of a sound in accordance with a weighting that progressively de-emphasizes the importance of frequency components below 1000 Hz and above 5000 Hz. This frequency weighting reflects the fact that human hearing is less sensitive at low frequencies and at extreme high frequencies relative to the mid-range.

The weighting system described above is called "A"-weighting, and the level so measured is called the "A-weighted sound level" or "A-weighted noise level." The unit of A-weighted sound level is sometimes abbreviated "dBA." In practice, the sound level is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighting characteristic. All U.S. and international standard sound level meters include such a filter. Typical sound levels found in the environment and in industry are shown in Figure A-1.

Although a single sound level value may adequately describe environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise is a conglomeration of distant noise sources, which results in a relatively steady background noise having no identifiable source. These distant sources may include traffic, wind in trees, industrial activities, etc. and are relatively constant from moment to moment. As natural forces change or as human activity follows its daily cycle, the sound level may vary slowly from hour to hour. Superimposed on this slowly varying background is a succession of identifiable noisy events of brief duration. These may include nearby activities such as individual vehicle passbys, aircraft flyovers, etc. that cause the environmental noise level to vary from instant to instant.

To describe the time-varying character of environmental noise, statistical noise descriptors were developed. "L_{10}" is the A-weighted sound level equaled or exceeded during 10 percent of a stated time period. The L_{10} is considered a good measure of the maximum sound levels caused by discrete noise events. "L_{50}" is the A-weighted sound level that is equaled or exceeded 50 percent of a stated time period; it represents the median sound level. The "L_{90}" is the A-weighted sound level equaled or exceeded during 90 percent of a stated time period and is used to describe the background noise. The L_{max} is the maximum sound level measured during a period of time.

As it is often cumbersome to quantify the noise environment with a set of statistical descriptors, a single number called the average sound level or "L_{eq}" is now widely used. The term "L_{eq}" originated from the concept of a so-called equivalent sound level that contains the same acoustical energy as a varying sound level during the same time period. In simple but accurate technical language, the L_{eq} is the average A-weighted sound level in a stated time period. The L_{eq} is particularly useful in describing the subjective change in an environment where the source of noise remains the same but there is change in the level of activity. Widening roads and/or increasing traffic are examples of this kind of situation.

In determining the daily measure of environmental noise, it is important to account for the different response of people to daytime and nighttime noise. During the nighttime, exterior background noise levels are generally lower than in the daytime; however, most household noise also decreases at night, thus exterior noise intrusions again become noticeable. Further, most people trying to sleep at night are more sensitive to noise. To account for human sensitivity to nighttime noise levels, a special descriptor was developed. The descriptor is called the DNL (Day-Night Average Sound Level), which represents the 24-hour average sound level with a penalty for noise occurring at night. The DNL computation divides the 24-hour day into two periods: daytime (7:00 am to 10:00 pm); and nighttime (10:00 pm to 7:00 am). The nighttime sound levels are assigned a 10 dB penalty prior to averaging with daytime hourly sound levels.

For highway noise environments, the average noise level during the peak hour traffic volume is approximately equal to the DNL.

The effects of noise on people can be listed in three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as startle, hearing loss

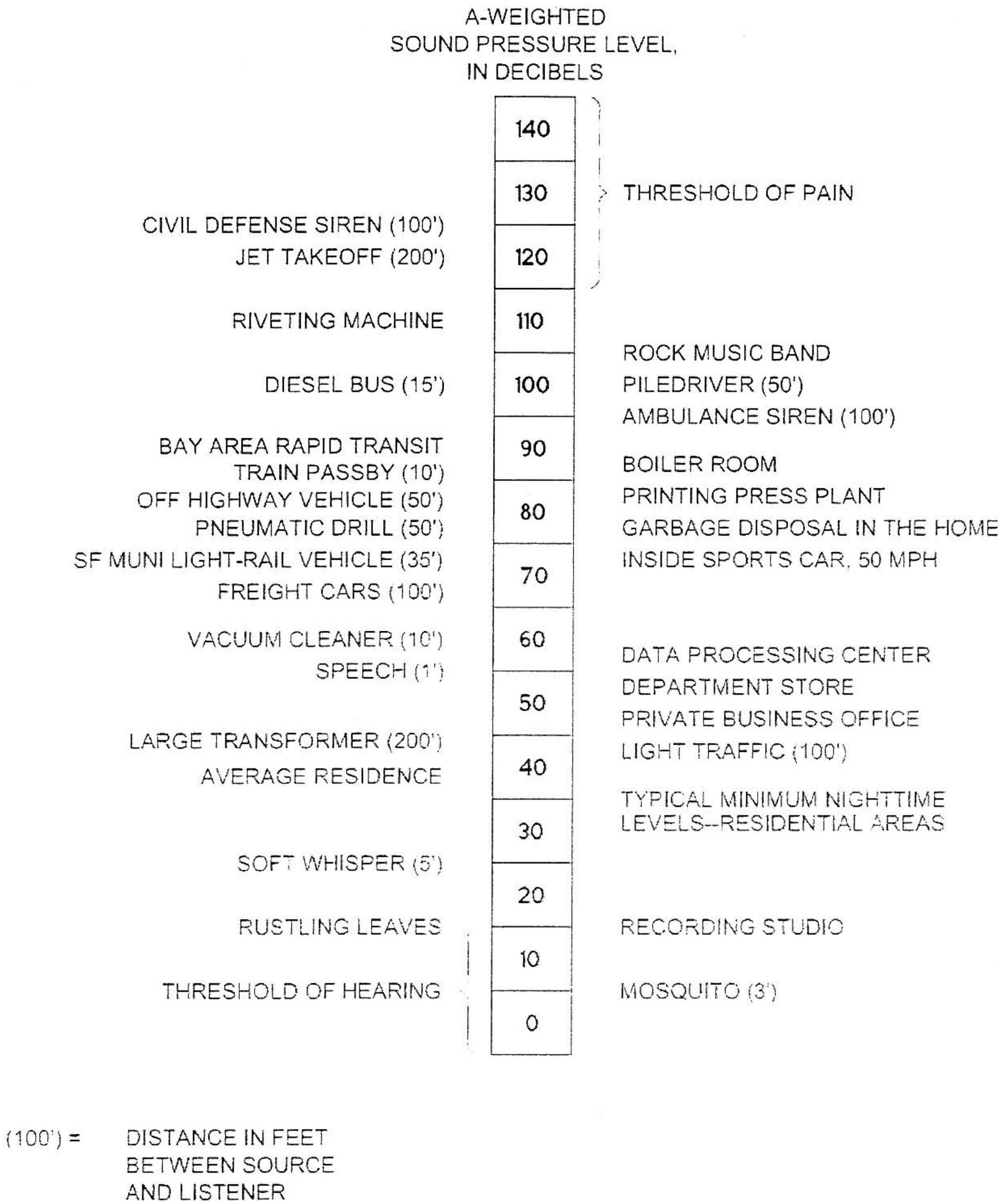
The sound levels associated with environmental noise usually produce effects only in the first two categories. Unfortunately, there has never been a completely predictable measure for the subjective effects of noise nor of the corresponding reactions of annoyance and dissatisfaction.

This is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise over time.

Thus, an important factor in assessing a person's subjective reaction is to compare the new noise environment to the existing noise environment. In general, the more a new noise exceeds the existing, the less acceptable the new noise will be judged.

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

Except in carefully controlled laboratory experiments, a change of only 1 dB in sound level cannot be perceived. Outside of the laboratory, a 3 dB change is considered a just-noticeable difference. A change in level of at least 5 dB is required before any noticeable change in community response would be expected. A 10 dB change is subjectively heard as approximately a doubling in loudness, and would almost certainly cause an adverse community response.



TYPICAL SOUND LEVELS MEASURED IN THE ENVIRONMENT AND INDUSTRY

FIGURE A1