NOISE IMPACT ANALYSIS

GUASTI PLAZA SPECIFIC PLAN AMENDMENT

CITY OF ONTARIO, CALIFORNIA

Prepared for:

David Evans and Associates, Inc.
Attn: Josephine Alido
4200 Concours Street, Suite 200
Ontario, CA 91764

Date:

December 7, 2009

Project No.: P09-053 N

NOISE SETTING

NOISE DESCRIPTORS

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise is generally defined as unwanted sound. Sound is characterized by various parameters that describe the rate of oscillation of sound waves, the distance between successive troughs or crests, the speed of propagation, and the pressure level or energy content of a given sound wave. In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level.

The unit of sound pressure expressed as a ratio to the lowest sound level detectable by a young person with good auditory acuity is called a decibel (dB). Because sound or noise can vary in intensity by over one million times within the range of human hearing, decibels are a logarithmic progression used to keep sound intensity numbers at a convenient and manageable level. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, noise levels at maximum human sensitivity are factored more heavily into sound descriptions in a process called "A-weighting" written as dBA. Any further reference to decibels written as "dB" should be understood to be A-weighted.

Time variations in noise exposure are normally expressed in terms of a steady-state energy level equal to the energy content of the time varying period (called Leq), or, alternately, as a statistical description of the sound level that is exceeded over some fraction of a given observation period. Finally, because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dB increment be added to quiet time noise levels in a 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL).

CNEL also differs from Leq in that it applies a time-weighted factor designed to emphasize noise events that occur during the evening and nighttime hours (when quiet time and sleep disturbance is of particular concern). Noise occurring during the daytime period (7:00 AM to 7:00 PM) receives no penalty. Noise produced during the evening time period (7:00 PM to 10:00 PM) is penalized by 5 dBA, while nighttime noise (10:00 PM to 7:00 AM) is penalized by 10 dBA.

Most community development noise standards utilize the CNEL metric. Because the CNEL metric averages noise over a 24-hour period the noise impact from a single event noise source such as an aircraft over-flight or a moving train are balanced by times of no such noise activity. For example, noise produced during an aircraft over-flight will vary from relatively quiet background levels before the over-flight to a maximum value when the aircraft passes overhead, then returning down to background levels as the aircraft leaves the observer’s vicinity. Although noise during a single event noise episode may be high, duration is typically short and the averaged CNEL can still be low depending on the frequency, duration and time of day of such episodes.

NOISE STANDARDS

The City of Ontario has adopted noise/land use compatibility guidelines for acceptable community noise levels that are based upon the CNEL rating scale. The guidelines rank noise/land use compatibility in terms of varying degrees of acceptability of noise levels for various land use types.

The Ontario noise compatibility matrix is shown in Figure 1. Multi-family residential uses are considered "clearly acceptable" with ambient noise environments of 60 dBA CNEL or less. The "normally acceptable" exterior noise level is 65 dBA CNEL and noise levels up to up to 75 dB CNEL are considered "normally unacceptable" for multi-family residential uses. Commercial, retail or office uses are considered normally acceptable at ambient levels that are +10 dB higher than those for a multi-family alternative. Land uses that are proposed with "normally unacceptable" zones must demonstrate that adequate noise insulation features are incorporated into project design to not interfere with meeting interior noise exposure goals through a detailed analysis of the noise reduction and insulation requirements.

As shown below, the City of Ontario's General Plan states that for single and multifamily residential projects, the CNEL should not exceed 65 dB at exterior living areas, or 45 dB at interior living areas. At commercial retail spaces or office uses, the interior CNEL should not exceed 55 dB. There is no exterior standard for commercial retail development. Noise levels exceeding 65 dB CNEL are considered "normally unacceptable" for multi-family residential uses but exceptions may be made for unusual situations. Land uses that are proposed with "normally unacceptable" zones must demonstrate that adequate noise insulation features are incorporated into project design to not interfere with meeting interior noise exposure goals through a detailed analysis of the noise reduction and insulation requirements for the proposed type of use.

Land Use	**Interior Standard**	**Exterior Standard**
Residential	45 dB CNEL	65 dB CNEL
Retail & Office	55 dB CNEL	--

CNEL-based standards are used to make land use decisions as to the suitability of a given site for its intended use. They apply to those noise sources not amenable to local control such as on-road traffic, aircraft, trains, etc. Because cities cannot regulate the noise created by such sources, they control the types of land use or levels of mitigation required by the receiving property. The City's General Plan therefore does not specifically regulate the noise transmission from one land use to another, but rather identifies the acceptable levels of noise experienced by a land use from noise sources that are exempted from local control (on-road traffic, Ontario Airport, railroads, etc.)

Figure 1

Ontario Land Use Compatibility Guidelines for Exterior Community Noise

Land Use Category	Community Noise Exposure CNEL, dB			
	Clearly Acceptable	Normally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential Single Family, Duplex	50-60	60-65	65-70	Above 70
Multi-Family	50-60	60-65	65-75	Above 75
Mobile Homes	50-60	60-65	--	Above 65
Schools, Libraries, Churches, Hospitals, Nursing Homes	50-60	60-65	65-70	Above 70
Transient Lodging: Motels, Hotels	50-65	65-70	70-80	Above 80
Auditoriums, Concert Halls, Amphitheaters	50-55	55-60	60-70	Above 70
Sports Arena, Outdoor Spectator Sports	50-60	60-65	65-75	Above 75
Playgrounds, Neighborhood Parks	50-65	65-70	70-75	Above 75
Commercial Offices	50-65	65-75	75-80	Above 80
Commercial Retail	50-70	70-75	75-80	Above 80
Industrial, Manufacturing, Utilities	50-70	70-75	75-85	-

Clearly Acceptable: No special noise insulation required, assuming buildings of normal conventional construction.

Normally Acceptable: Acoustical reports will be required for major new construction. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

Normally Unacceptable: 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 included in the design.

Clearly Unacceptable: New construction or development should generally not be undertaken.

Source: Ontario General Plan Noise Element

Those sources that are amenable to direct regulation are detailed in the City of Ontario Municipal Code, Section 5-29.04, Ordinance 2888, Chapter 29. Noise standards are shown for noise emanating from one property and crossing the property line of another property. Table 1 summarizes the City noise standards for various zoning classifications.

Because one of the alternatives of the Guasti project may have a residential component, unacceptable noise levels at the residential portion of the site emanating from the adjacent commercial portion of the site could arise. According to the City of Ontario Noise Control Ordinance, "Where two (2) or more dissimilar land uses occur on a single property, the more restrictive noise standard shall apply", (Section 9-1.3305). In recognition of the likely lesser noise sensitivity for residential uses located within a mixed use development, the noise ordinance standard for such uses is substantially relaxed. Noise levels of up to 70 dB average and 90 dB maximum are allowed within a mixed use development. If the site were developed without a residential component, a substantially less stringent standard would apply from one land use impacting an adjacent use.

Construction activities are exempt from noise regulations if they occur between the hours of 7:00 a.m. and 6:00 p.m. on weekdays and 9:00 a.m. and 6:00 p.m. on Saturdays or Sundays.

TABLE 1
CITY OF ONTARIO NOISE STANDARDS

	Maximum Exterior Noise Levels		
Noise Zone	Receiving Land Use Category	Noise Level (dBA)	
		7 a.m. to 10 p.m.	10 p.m. to 7 a.m.
I	Single Family Residential	65	45
II	Multi-family residential and mobile home parks	65	50
III	Commercial	65	60
IV	Residential Portion of Mixed Use	70	70
V	Manufacturing and Industrial and Other Uses	70	70

It is unlawful for any person at any location within the incorporated area of the City to create noise, or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which noise causes the noise level, when measured at any location on any other property, to exceed either of the following:

1. The noise standard for a cumulative period of more than 15 minute period; or
2. A maximum instantaneous (single instance) noise level equal to the value of the noise standard plus (20) dBA for any period of time

(c) In the event the ambient noise level exceeds the noise standard, the maximum allowable noise level under such category shall be increased to reflect the maximum ambient noise level

(d) The noise zone IV standard shall apply to that portion of residential property falling within one hundred feet of a commercial property or use, if the noise originates from that commercial property or use.

(e) If the measurement location is on a boundary between two different noise zones, the lower noise level standard applicable to the noise zone shall apply

BASELINE NOISE LEVELS

The City of Ontario is located in the southwestern portion of San Bernardino County. An amendment to the Guasti Plaza Specific Plan is proposed, which would allow residential uses on at the eastern and southeastern sections of the Specific Plan area along Turner Avenue, as an alternative to planned office and commercial uses. The adopted plan does not allow any residential uses. Existing on-site noise derives from the I-10 Freeway to the north of the site, the Southern Pacific Railroad to the south and beyond that, the Ontario International Airport (ONT).

Noise measurements were made in order to document existing baseline levels in the area. Noise measurements were conducted in October, 2008, for 24- hours at eight on-site locations. The location and resultant CNEL for each of the monitors is shown in Figure 2. The detailed results of the measurements including the hourly Leqs for each monitoring location are provided in the appendix.

Meters 1, 2 and 8 recorded noise levels representative of the northern site perimeter closest to the I-10 Freeway. Measurements showed CNEL's ranging from 66-68 dB. Typically, observed noise levels decline at night and in the early morning. The hourly Leq's along the northern site perimeter do not demonstrate such a decline. Freeway traffic as well as noise from other noise sources remained fairly constant throughout the 24-hour monitoring period.

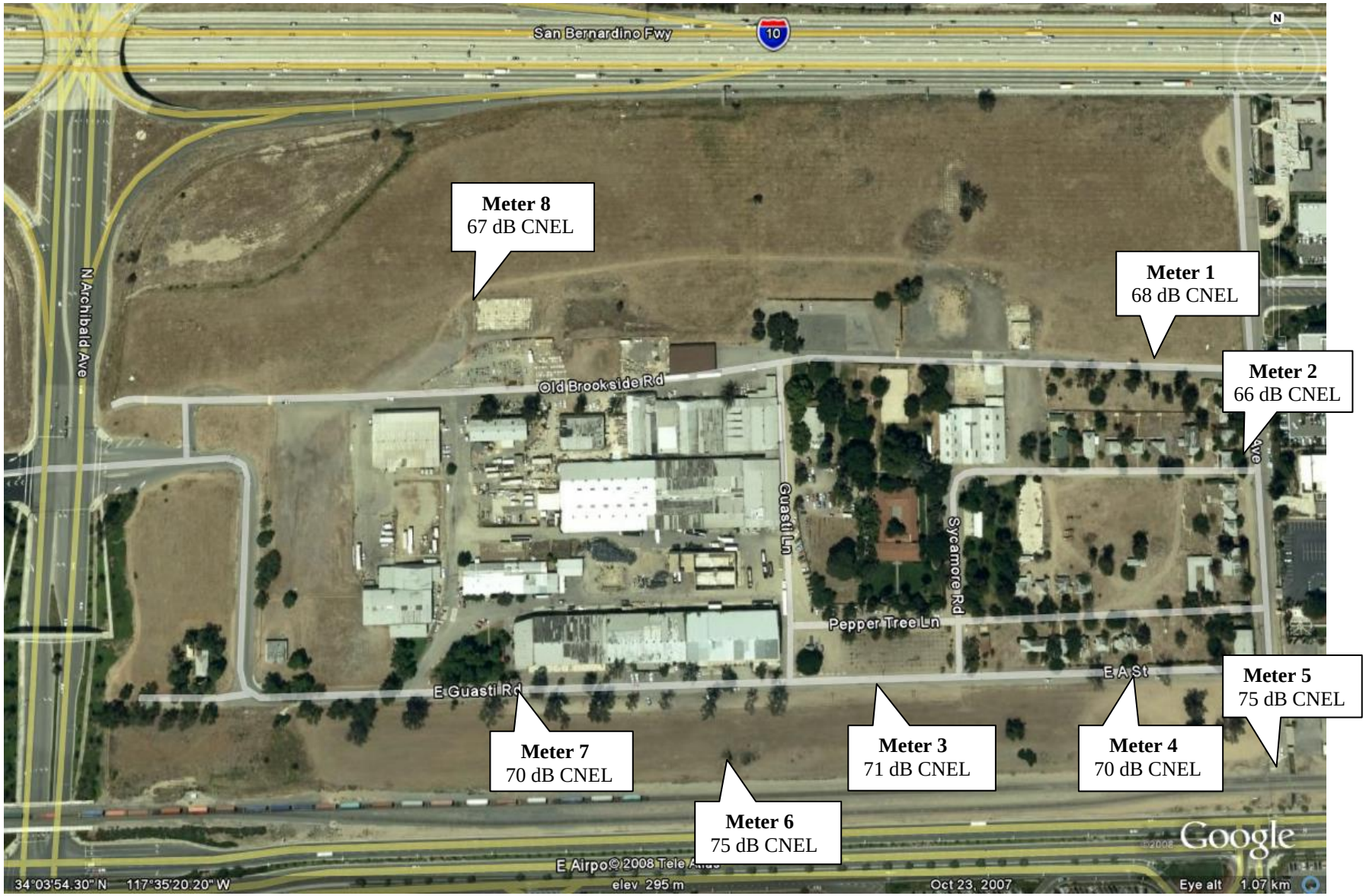
Meters 3, 4 and 7 recorded noise levels along the southern perimeter of the site; adjacent to and south of East Guasti Road/ East "A" Street. These meters indicate CNELs in the 70-71 dB range. Meters 5 and 6 were located farther south, close to the Southern Pacific Railroad track, and recorded noise levels of approximately 75 dB CNEL. This noise level represents the worst case noise exposure for possible residences within the project site.

Line source noise sources, such as moving trains, attenuate at a spreading loss of 3 dB per distance doubling between the source and the closest receiver. Meters 5 and 6 were located approximately 75 feet from the railroad track centerline, while meters 3, 4 and 7 were approximately 250 feet from the railroad track centerline. There is an expected 5 dB CNEL of noise attenuation from distance separation for railway noise. However, other variables such as airplane overflight and residual noise from freeway traffic influence the noise readings.

Computer modeling and calibrating measurements indicate that the 65 dB CNEL noise contour from ONT currently parallels the project site along its southern boundary. Although this is an annual average and may vary from day to day, some portion of the observed noise levels is clearly due to ONT flight activity.

On-site CNELs are marginally within the "normally unacceptable" land use noise compatibility guidelines for residential uses, although within the compatibility standards for commercial use. "Normally unacceptable" use is allowed provided that the new construction development includes a detailed analysis of the noise reduction requirements must be made and needed noise insulation features. However, the noise compatibility guidelines are strictly advisory goals, and compliance is discretionary in special circumstances.

FIGURE 2
NOISE METER LOCATIONS



NOISE CONSTRAINTS

There are three major noise sources that are of concern for this project.

RAILROAD OPERATIONS

Currently, the Union Pacific Railroad Company (UPRR) operates 42 freight trains and on average, one passenger train a day at a maximum speed of 70 mph along the track that passes directly south of the Guasti Plaza site. The UPRR trains do not stop or idle at the site or near the site. The trains operate at all hours and all days, traveling at a maximum speed of 70 miles per hour on this track. The passenger train travels the Amtrak Sunset Limited route.

Measured noise levels at a distance of 75 feet from the railroad track centerline demonstrate a CNEL of 75 dB CNEL. Farther from the tracks, along Guasti Road/ East "A" Street, noise levels are around 70-71 dB CNEL. Metrolink trains operate on a track south of the Ontario International Airport along Mission Blvd. Metrolink train noise does not present a noise constraint for this project.

Possible future rail growth is unknown. The Los Angeles County Metropolitan Transportation Authority has proposed that the Metro Gold Line extension will access Ontario Airport; however no funding or schedule for project implementation has been identified. It is assumed therefore, for the purposes of this analysis that future noise levels due to railroad operations are unchanged from current operations. Therefore, worst case noise impacts due to rail operations are assumed to be 75 dB CNEL at the southern site perimeter.

AIRPORT NOISE

Noise from aircraft operation at Ontario International Airport (ONT) is another noise source for Guasti Plaza development. As shown in the appendix, the project is not currently within the 65 dB CNEL Airport Noise Contour. However, the 65 dB CNEL noise contour may expand into the southern portion of the possible residential area by the year 2030. Therefore, possible residential units for the Guasti project will be designed to meet the future projected aircraft noise level of 65 dB CNEL.

I-10 TRAFFIC

The project site is approximately 500 feet from the I-10 centerline. Measured noise levels at the northern site perimeter are currently in the 67-68 dB CNEL range with some portion due to aircraft and train noise. Even in the unlikely event that traffic along the I-10 were to double, because of the logarithmic nature of noise, future noise levels would be +3 dB CNEL higher. This assumed that traffic speeds remain the same, but in reality, if traffic volumes were to double then freeway congestion would cause lower speeds which would lower traffic noise levels. Nevertheless, if residential uses are designed for 75 dB CNEL (train) and 65 dB CNEL (aircraft) then noise from the I-10 freeway will already be accounted for.

LAND USE NOISE IMPACTS

An amendment to the Guasti Plaza Specific Plan is proposed which would allow residential uses in sections of the Specific Plan area as an alternative to planned office and commercial uses. This study differentiates noise impacts for each development scenario, i.e. possible residential or previously approved office/commercial use.

THRESHOLDS OF SIGNIFICANCE

According to the current CEQA Appendix G guidelines, noise impacts are considered potentially significant if they cause:

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. Noise levels exceeding the City of Ontario Noise Standards would be considered significant.

b. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.

c. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Two characteristic noise sources are typically identified with land use redevelopment such as that proposed for the development of the Guasti Plaza Specific Plan Amendment project. Construction activities, especially heavy equipment, will create short-term noise increases near the project site. There are currently no nearby noise-sensitive receptors that are anticipated to be of concern. Upon completion, project-related traffic may cause an incremental increase in area-wide noise levels throughout the project area. This project will cause a small increase in area wide traffic but the increase is small relative to the overall cumulative traffic projections. For the Guasti Specific Plan Amendment project, it is the noise from the surrounding community acting on the project which is of concern.

CEQA Guidelines also identify potential impact significance due to aircraft noise. CEQA states that for a project located within an airport land use plan or where such a plan has not been adopted, within two miles or an airport, a residential project could be significantly impacted by the ambient acoustic environment. As discussed, this project may be within the 65 dB CNEL noise contour for the ONT by the year 2030. Aircraft noise is significant for possible residential uses but design features will be included to ensure that interior noise levels are within the recommended 45 dB CNEL threshold. Noise from freeways or trains travels horizontally and can be reduced by barriers such as

structures or sound walls. Aircraft noise propagates downward and cannot be reduced as effectively. The emphasis in any elevated airport noise environment is therefore to adequately insulate structural interiors even if the exterior levels exceed planning standards.

Construction noise is typically governed by ordinance limits on allowable times of equipment operations. The City of Ontario Noise Ordinance limits the hours of construction operation to be between the hours of 7:00 a.m. and 6:00 p.m. on weekdays and 9:00 a.m. and 6:00 p.m. on Saturdays or Sundays.

The term "substantial increase" is not defined by any responsible agency. The limits of perceptibility by ambient grade instrumentation (sound meters) or by humans in a laboratory environment is around 1.5 dB. Under ambient conditions, people generally do not perceive that noise has clearly changed until there is a +3 dB difference. A threshold of 3 dB is commonly used to define "substantial increase."

CONSTRUCTION NOISE IMPACTS

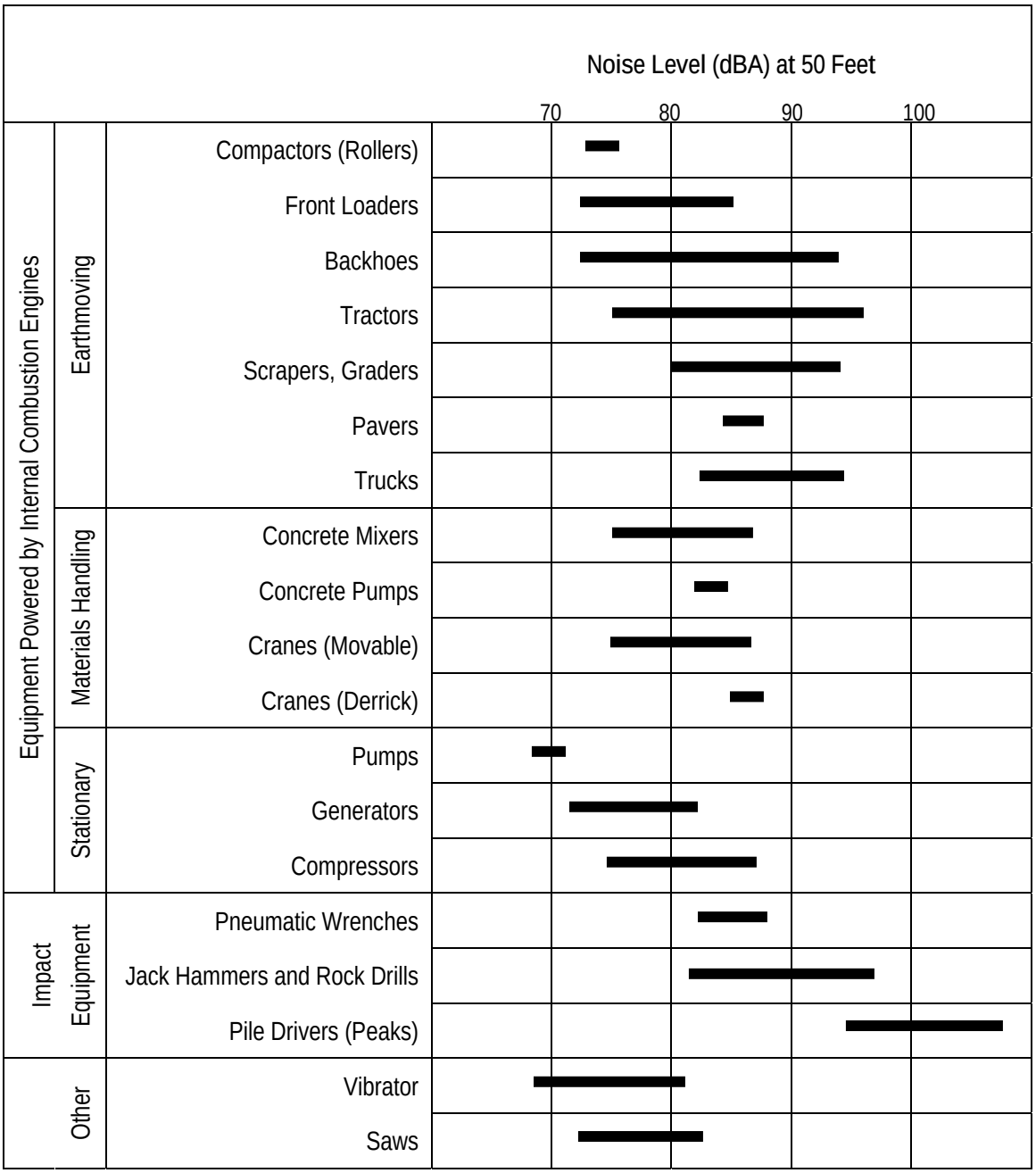
Temporary construction noise impacts vary markedly because the noise strength of construction equipment ranges widely as a function of the equipment used and its activity level. Short-term construction noise impacts tend to occur in discrete phases dominated initially by earth-moving sources, then by foundation and parking area construction, and finally for finish construction.

As shown in Figure 3, heavy equipment noise can exceed 90 dB(A) and averages about 85 dB(A) at 50 feet from the source when the equipment is operating at typical loads. Most heavy equipment operates with varying load cycles over any extended period of time. The upper end of the noise generation range shown in Figure 3 thus represents short-term effects, while the longer term averages are most representative of the lower end of the indicated noise curves.

Point sources of noise emissions are atmospherically attenuated by a factor of 6 dB per doubling of distance. The loudest construction may require 500 feet of distance between the source and a nearby receiver to reduce the average 85 dB(A) source strength to a generally acceptable 65 dB exterior exposure level. There are currently no sensitive receivers within 500 feet of the site which might be adversely affected by construction noise. If the proposed residential uses are developed and occupied first, they would represent noise-sensitive receivers for subsequent commercial construction. However, they are planned to be equipped with strongly upgraded structural noise protection. The same measures designed to reduce aircraft, train and freeway noise will also mitigate potential construction equipment noise audibility. Construction noise impacts are considered to be less-than-significant.

Figure 3

Typical Construction Equipment Noise Generation Levels



Source: EPA PB 206717, Environmental Protection Agency, December 31, 1971, "Noise from Construction Equipment and Operations."

GROUNDBORNE VIBRATION IMPACTS

Construction

The proposed project would involve the construction and operation of either residential dwelling units, or office and commercial uses. Caltrans notes that excessive groundborne vibration is typically associated with such activities as pile driving or blasting, neither of which would likely be required during site construction. Only minimal groundborne vibrations would be created during site preparation and subsequent construction associated with project development.

Operation

Railroads generate ground-borne vibration that may be perceptible at adjacent uses. Construction of residential or commercial units in proximity to railroad tracks can cause rattling windows and throbbing floors. At stronger vibration levels, cosmetic damage can occur in fragile buildings. Vibration is most commonly expressed in terms of the root mean square (RMS) velocity of a vibrating object. RMS velocities are expressed in units of vibration decibels (VdB).

Ground-borne vibration is not a phenomenon that most people experience every day. The background vibration velocity level in residential areas is usually 50 VdB or lower, well below the threshold of perception for humans which is around 65 VdB. Although the perceptibility threshold is about 65 VdB, human response to vibration is not usually significant unless the vibration exceeds 70 VdB. Rapid transit or light rail systems typically generate vibration levels of 70 VdB or more near their tracks. If there is unusually rough road or track, wheel flats, geologic conditions that promote efficient propagation of vibration, or vehicles with very stiff suspension systems, the vibration levels from any source can be 10 decibels higher than typical. Hence, at 50 feet, the upper range for rapid transit vibration is around 80 VdB and the high range for heavy rail vibration is 85 VdB. If the vibration level in a residence reaches 85 VdB, most people will be strongly annoyed by the vibration as shown below:

Vibration Level	Human Response
65 VdB	Approximate threshold of perception for many humans
75 VdB	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find transit vibration at this level annoying.
85 VdB	Vibration acceptable only if there are an infrequent number of events per day.

.

The upper level of vibration exposure, i.e. 85 VdB, is typically associated with vibration nuisance perception in a commercial (retail/office) environment. Freight trains are diesel-powered. They differ in their overall length, number and size of locomotives, and number of heavily loaded cars. Locomotives and rail cars with wheel flats are the sources of the highest vibration levels. It is not uncommon for freight trains to be the source of intrusive ground-borne vibration. Commuter passenger trains can be powered by either diesel or electric locomotives. Often, as for the Guasti project, commuter trains share track with freight trains.

Soil and subsurface conditions are known to have a strong influence on the levels of ground-borne vibration. Among the most important factors are the stiffness and internal damping of the soil and the depth to bedrock. Experience with ground-borne vibration is that vibration propagation is more efficient in stiff clay soils, and shallow rock seems to concentrate the vibration energy close to the surface and can result in ground-borne vibration problems at large distances from the track. Factors such as layering of the soil and depth to water table can have significant effects on the propagation of ground-borne vibration.

Soils in Ontario derive primarily from erosion from the San Gabriel and San Bernardino Mountains. They are comprised primarily of sand, silty sand, gravelly sand and sandy silt. These "soft" soils contribute to internal attenuation of vibration propagation. Internal attenuation is the process by which energy of vibration is converted to the thermal energy of ground particles and then absorbed. Internal attenuation is expressed in terms of an "attenuation constant" which is a measure of the rate of frictional absorption. The attenuation constant for stiff clay soils is typically 0.02 whereas silty sands may have an attenuation constant of 0.30.

The receiving building is also a key component in the evaluation of ground-borne vibration since ground-borne vibration problems occur almost exclusively inside buildings. The train vibration may be perceptible to people who are outdoors, but it is very rare for outdoor vibration to cause complaints. The vibration levels inside a building are dependent on the vibration energy that reaches the building foundation, the coupling of the building foundation to the soil, and the propagation of the vibration through the building. The general guideline is that the heavier a building is, the lower the response will be to the incident vibration energy.

Coupling losses from floor to floor within a building decrease vibration levels from the foundation upward. As a rule of thumb, vibration levels decrease by 1-2 dB per floor. Resilient floor coverings accelerate this rate.

The criteria for acceptable ground-borne vibration expressed in terms of the root-mean-squared (RMS) velocity levels in decibels (VdB). For the two land-use categories being considered for development for this project, the Department of Transportation (DOT) in their 2006 Transit Noise and Vibration Impact Assessment establishes the following thresholds of significance:

Land Use Category	**Frequent Events[1]**	**Occasional Events[2]**	**Infrequent Events[3]**
Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

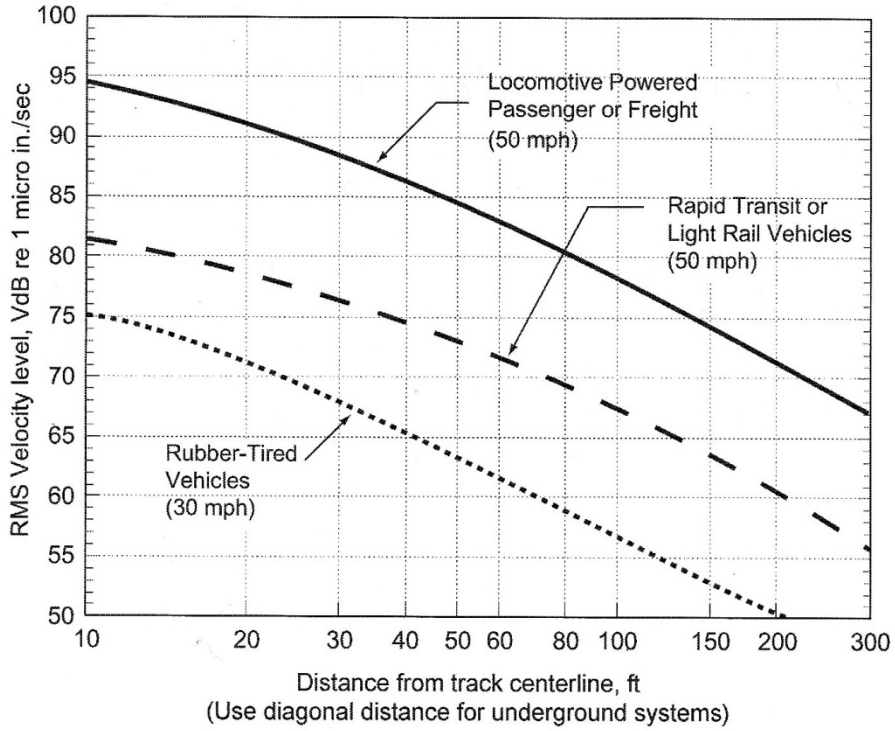
1. "Frequent Events" is defined as more than 70 vibration events of the same source per day.
2. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. 3. "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day.

For the Guasti project, 43 daily train events per day would fall into the "Occasional Events" category. Thus, for residential use 75 VdB is the recommended limit and 78 VdB for commercial uses.

The screening distances shown below are provided by the DOT report. These distances include a 5-decibel factor of safety. Because of the 5-decibel safety factor, the distances shown below are conservative.

Type of Project	**Critical Distance for Land Use Categories* Distance from Right-of-Way or Property Line**	
	Residences	Commercial Uses
Conventional Commuter Railroad	200	120
Rail Rapid Transit	200	120
Light Rail Transit	150	100
Intermediate Capacity Transit	100	50

As shown below, according to the DOT Vibration Assessment, a locomotive powered passenger or freight train traveling at 50 mph would create a vibration level of 85 VdB at 50 feet from the track. Geometrical spreading losses would reduce this vibration level to 80 VdB at 85 feet from the track. Proposed commercial or residential uses are anticipated to have a minimum setback of approximately 85 feet from the track along the southern project perimeter.



Internal attenuation would reduce the vibration level by an additional 3 VdB. The interior vibration level at the closest possible future home or office would be as follows (VdB):

	Homes	***Offices***
First Floor	77	77
Second Floor	76	76
Third Floor	74	74
Fourth Floor	73	73
Fifth Floor	71	
Significance Threshold	75	78

Residential uses at the lowest floors may slightly exceed the adopted significance threshold for occasional events. Office uses at the anticipated minimum set-back would likely not exceed the 78 VdB threshold at any floor.

According to the DOT Vibration Assessment, ground-borne vibration that is 0 to 5 decibels greater than the impact threshold is considered potentially significant although there is a chance that actual ground-borne vibration levels will be below the impact threshold. In this case, the impact would be reported in the environmental document as exceeding the applicable threshold and a commitment would be made to conduct more detailed studies to refine the vibration impact analysis during final design and determine appropriate mitigation, if necessary. A site-specific Detailed Analysis may show that vibration control measures are not needed for the residential alternative.

A Site Specific Detailed Analysis may use adjustments to develop vibration projections for specific receiver positions inside buildings. All of the adjustments are given as single numbers to be added to, or subtracted from, the base level. The adjustment parameters are speed, wheel and rail type and condition, type of track support system, type of building foundation, and number of floors above the basement level. It should be recognized that many of these adjustments are strongly dependent on the frequency spectrum of the vibration source and the frequency dependence of the vibration propagation. The single number values are suitable for generalized evaluation of the vibration impact and vibration mitigation measures since they are based on typical vibration spectra. However, the single number adjustments are not adequate for detailed evaluations of impact of sensitive buildings or for detailed specification of mitigation measures. Detailed Analysis requires consideration of the relative importance of different frequency components.

PROJECT-RELATED VEHICULAR NOISE IMPACTS

Long-term noise concerns from the increased urbanization of the project area center primarily on mobile source emissions surrounding the project site. These concerns were addressed using the California specific vehicle noise curves (CALVENO) in the federal highway noise prediction model (FHWA-RD-77-108) in a computerized version of the model developed by Caltrans. The model calculates the LEQ noise level for a particular reference set of input conditions, and then makes a series of adjustments for site-specific traffic volumes, distances, speeds, or noise barriers.

Table 2 summarizes the 24-hour CNEL level at 50 feet from the roadway centerline along area roadway segments. Three traffic scenarios were evaluated; "existing conditions", "opening year-no project", and "opening year-with project". The noise analysis utilized data from the project traffic analysis, prepared by the traffic consultant, Katz, Okitsu & Associates, for this project. Traffic attributed to the proposed project would increase the total daily traffic traveling along the major thoroughfares within the project vicinity. Close to or within the development area, traffic noise may be perceptibly increased. As project-related traffic becomes progressively diluted on any particular roadway, the incremental contribution to the noise environment becomes continually smaller.

The site is now mostly vacant and any development will result in an increase in the traffic noise. As seen in Table 2, many roadway segments adjacent to the project site will exceed the +3 dB CNEL significance threshold. However, this project will house the only noise-sensitive uses in the project area. As long as residences within the project area are designed to meet the maximum roadway and ambient noise level, impacts will not be significant. Including on-site project traffic along Guasti Road, noise levels in the project area are calculated to approach 72 dB CNEL at 50 feet from the roadway centerline in the future. At 100 feet from the roadway centerline, future traffic noise impacts are reduced by -3 dB, or 69 dB CNEL. Therefore, depending on building placement traffic noise levels of up to 72 dB CNEL are possible along Guasti Road. Noise levels along other project roadways will be much less, in the low to mid-60 dB CNEL range. Regardless, because of other noise sources such as rail and aircraft, residential dwellings will be designed to accommodate noise levels up to 75 dB CNEL. Any on-site roadway noise will be mitigated by design features to reduce noise from trains and aircraft.

Table 2
Traffic Noise Impact Analysis
(dB CNEL at 50 feet from centerline)

Roadway		Existing	Opening Year-No Project	Opening Year-With Project
Guasti Rd/	W of Winery	68.5	68.5	73.6
	E of Winery	67.6	67.9	71.7
	W of Villa	67.1	67.1	71.3
	Villa-Biane	67.8	67.7	70.8
	Biane-Street 5	67.9	67.5	71.0
	Street 5-Turner	67.4	67.3	70.8
	E of Turner	68.4	68.4	71.9
Old Guasti Rd/	Garrett-Gertrude	NA	NA	60.5
	Gertrude-Luisa	NA	NA	60.8
	Luisa-Villa	NA	NA	63.1
	Villa-Biane	NA	NA	64.7
	Biane-Turner	NA	NA	62.5
Turner Ave/	Guasti-Brookside	62.1	59.1	66.3
	Brookside-Old Guasti	NA	NA	62.1

NA=not available

ON-SITE NOISE GENERATION

In addition to residential uses, the project proposes the development of commercial and light industrial land uses within the Guasti Plaza site. The City will require the developer of this the specific plan to evaluate any potential noise impacts that may be associated with any commercial or industrial land uses that may be proposed. Although particular users have not yet been identified for the commercial and commercial land uses, they will be restricted to "Community Commercial Uses" which are typically lower in intensity than larger retail and commercial areas. Typical noises that may be generated by commercial and light industrial land uses include alarm systems, truck deliveries, landscaping maintenance and maintenance services.

Because of the unique nature of mixed land uses, the City's noise ordinance contains a lower noise protection standard for the residential component than for purely residential development. The noise ordinance standard previously shown in Table 1 (Category IV-Residential Portion of Mixed Use) is 70 dB (15-minute average) both day and night. Commercial land uses are actually afforded a greater level of noise intrusion protection. In areas where project residences share a property line with a commercial component, the more stringent commercial noise standard would paradoxically apply.

TRANSPORTATION NOISE IMPACTS

Exterior on-site noise exposure has been shown to be as high as 75 dB CNEL nearest the train tracks. Additionally, future noise from ONT may expose Guasti Plaza Specific Plan Amendment occupants to noise levels of 65 dB CNEL from flight activity. Finally future roadway traffic along interior streets within the project site (Guasti Road) may approach 72 dB CNEL at 50 feet from the roadway.

COMMERCIAL USE ALTERNATIVE

Commercial and office uses are compatible with noise levels up to 75 dB CNEL. Unless there is an outdoor component, it is typically the interior noise level that is of interest. Commercial and office uses are compatible with interior noise levels of up to 55 dB CNEL. Normal exterior to interior noise attenuation with standard commercial construction is -20 to -25 dB CNEL. Therefore, commercial/office uses would be compatible with exterior noise levels of up to 80 dB CNEL.

RESIDENTIAL USE ALTERNATIVE

EXTERIOR RECREATIONAL NOISE

Exterior on-site noise exposure has been shown to be as high as 75 dB CNEL nearest the train tracks. Additionally, future noise from ONT may expose Guasti Plaza occupants to noise levels of 65 dB CNEL from flight activity. Finally future roadway traffic along interior streets within the project site (Guasti Road) may approach 72 dB CNEL at 50 feet from the roadway.

The goal is to create exterior recreational space with a noise exposure of 65 dB CNEL or less. Measures such as a barrier may assist in reducing non aircraft source noise, but because of flights from ONT, it is unlikely that any of the methods will consistently reduce exterior recreational space noise levels to below 65 dB CNEL within the project site. Regardless, the following measures can be utilized to minimize noise from roadways or railway but it is probable that noise levels in exterior recreational space will exceed the 65 dB CNEL standard.

BARRIERS

Shielding by barriers can be obtained by placing walls, berms or other structures, such as buildings, between the noise source and the receiver. The effectiveness of a barrier depends upon blocking line of sight between the source and receiver, and is improved with increases in distance the sound must travel to pass over the barrier as compared to a straight line from source to receiver. Barrier effectiveness depends upon the relative heights of the source, receiver and barrier. In general, barriers are most effective when placed close to either the receiver or the source. For maximum effectiveness, barriers must be continuous and relatively airtight along their length and height. Earth, in the form of berms or the face of a depressed area, is an effective barrier material, as well as

walls that have minimum densities of 4 lbs/sq. ft. There are practical limits to the noise reduction provided by barriers. For roadway traffic or train noise, a 5 to 10 dBA noise reduction may often be attained.

For this site, carports or garages can also be used to form or complement a barrier shielding adjacent dwellings or an outdoor activity area, and could provide some noise mitigation for exterior recreational uses adjacent to the rail line. However, the wall must break the line-of-sight from the source to the receiver. Preliminary conceptual plans for the site show 3 and 4 story residential buildings along the railroad track frontage in the eastern portion of the site. The buildings are approximately 87 feet from the track centerline. The plans call for an 8-foot landscape buffer between the edge of railroad right-of-way and the Guasti property line.

Without any shielding, exterior noise exposure at balconies or patios facing the train tracks could be as high as 75 dB CNEL. Insertion of a noise wall or carport wall was examined as a potential noise mitigation measure. Such a wall would be placed within the Guasti development just past the 8-foot landscape buffer. Because the adjacent residential buildings may be as high as 4 stories, the wall would need to be capable of blocking noise up to 35 feet from ground level. A noise model was used to calculate effective wall height necessary to reduce exterior noise at 4th story balconies to below 65 dB CNEL. As seen in the appendix, a wall height of 26 feet would block the line-of-sight from the train tracks to 4th story balconies and reduce 75 dB CNEL of railway noise to 67 dB CNEL, and a wall height of 28 feet would reduce noise at 4th story balconies facing the train tracks to 65 dB CNEL. Therefore, because a 28 foot wall is likely not feasible, it is probable that exterior recreational noise levels would not be mitigable to the General Plan standard on any balconies closest to and facing the train tracks.

SITE DESIGN

Buildings can be placed on a project site to shield other structures or areas, to remove them from noise impacted areas. The use of one building to shield another can significantly reduce overall project noise control costs, particularly if the shielding structure is insensitive to noise, such as commercial or industrial uses. This would provide for placement of relatively insensitive land uses, such as commercial areas, between the noise source and a more sensitive portion of the project.

Typically, placement of outdoor recreational activity areas within the shielded portion of a building complex, such as a central courtyard, can be an effective method of providing a quiet retreat in an otherwise noisy environment. However for this project, because overhead aircraft noise could be 65 dB CNEL, this is not completely effective. Patios or balconies should be placed on the side of a building opposite the noise source, and "wing walls" can be added to buildings or patios to help shield sensitive uses. Again, this measure could assist in mitigating noise from roadways and trains but not aircraft. It is unlikely that exterior recreational noise levels will be below 65 dB CNEL even if recreational uses are sited in the interior of the complex.

VEGETATION / LANDSCAPE BUFFERS

It is often supposed that trees and other vegetation can provide significant noise attenuation. However, approximately 100 feet of dense foliage (so that as no visual path extends through the foliage) is required to achieve a 5 dBA attenuation of noise. The use of vegetation as a noise barrier would not be considered a practical method of noise control for the Guasti project, since large tracts of dense foliage are not part of the planned landscape.

INTERIOR NOISE

The goal is for interior space is a noise level less than 45 dB CNEL. The following practices are typically used to accomplish this goal in highly impacted areas. Once a site plan is available, a supplemental acoustical report verifying compliance based upon the selected structural features must be prepared at the building permit stage.

SOUND INSULATION OF OUTER WALLS AND WINDOWS

Acoustical treatment involves incorporating materials or design of a structure to reduce the sound transmission of external noise sources (aircraft, train or roadway) through the structure. The sound insulation of new buildings, is usually taken care of as part of the overall design process. Often it is not possible to avoid living rooms and bedrooms having windows or walls exposed to high exterior noise. Then the rooms have to be protected sufficiently by sound insulating outer walls and windows. When the outer walls are massive and heavy (concrete or brick walls), the difference between outside and inside level is determined largely by the sound insulation of the windows or roof.

Doors and windows provide the most obvious components of low sound insulation in a building. Generally, the quality of these components dictates the degree of insulation achieved by the building as a whole. For instance, if an external wall has an opening or gap of about 10% of its area (a value typical for windows), the overall noise reduction will only be about 10 dB even if the rest of the wall provides high insulation. Normal modern windows with double panes, with at least a 100 mm separation between panes and good seals have weighted sound reduction indices around 30 dB. Solid well-fitting doors, with good quality gaskets and rebated sills, can achieve a sound insulation of 25–30 dB in typical residential installations. But near busy roadways or railway lines sound reduction indices above 30 dB may be needed. Additionally, when window closure is necessary for noise control, air conditioning is required.

Tightly closed or sealed windows cannot be used for natural ventilation. A mechanical ventilation system or air conditioning system must be provided. The associated air vents and inlets should be located away from the noisy facade or should have silencers so that they do not provide paths for noise transmission. Roof insulation and the attenuation of roof ventilation and blocking of chimney flues may also be required for aircraft noise. As before, mechanical ventilation is required.

Upgraded windows and doors in combination with the highly upgraded drywall and roofs and stipulation against openings or vents facing the freeway should offer the needed noise attenuation. This should allow residential building the ability to meet the required 45 dB CNEL interior noise standard with the projected exterior noise loadings.

The City of Ontario Municipal Code, Chapter 15, Sound Transmission Control in High Noise Impact Areas specifies building requirements by noise exposure to provide an interior CNEL (due to exterior noise) of 45 dB or less in all habitable rooms in residential dwellings or other noise sensitive nonresidential buildings. The Code specifies mitigation measured to be used for construction of new residential dwellings in areas where CNEL is between 70-75 dB CNEL. With the use of these upgraded structural components interior noise levels should be below the required 45 dB CNEL threshold and reduced to less-than-significant.

Article 2. Building Requirements for New Residential Construction in the 70 CNEL to 75 CNEL Noise Zone

Sec. 8-15.201. Exterior walls.

(a) New walls that form the exterior portion of habitable rooms shall be constructed as follows:

1) Studs shall be at least four (4) inches in nominal depth;

2) Exterior finish shall be stucco, minimum seven-eighths () inch thickness, brick veneer, masonry, or any siding material allowed by this Code. Wood or metal siding shall be installed over one-half (½) inch solid sheathing;

3) Masonry walls with a surface weight of less than forty (40) pounds per square foot will require an interior supporting studwall that is finished as required by subsection (a)(6) of this section;

4) Wall insulation shall be at least R-11 glass fiber or mineral wool and shall be installed continuously throughout the stud space;

5) Exterior solid sheathing shall be covered with overlapping asphalt felt;

6) Interior wall finish shall be at least five- eighths (⅝) inch thick gypsum wallboard or plaster.

(§ 2, Ord. 2616, eff. June 20, 1996)

Sec. 8-15.202. Exterior windows.

(a) Openable windows. An openable window in the exterior walls of habitable rooms shall have a laboratory sound transmission class rating of at least STC forty (40) dB and shall have an air infiltration rate of no more than 5 cubic feet per minute when tested according to ASTM E-283.

(b) Fixed windows. All fixed windows in the exterior walls of habitable rooms shall:

a) Have a sound transmission class rating of at least STC forty (40) dB; or

b) Shall be five-eighths (5/8) inch laminated glass with an STC rating of forty (40) dB and shall be set in non-hardening glazing materials.

c) Shall be glass block at least three and one-half (3½) inches thick.

d) The total areas of glazing in rooms used for sleeping shall not exceed twenty (20) percent of the floor area.

(§ 2, Ord. 2616, eff. June 20, 1996)

Sec. 8-15.203. Exterior doors.

(a) Exterior hinged doors to habitable rooms that are directly exposed to aircraft noise and are facing the source of the noise shall be a door and edge seal assembly that has a laboratory sound transmission class of at least STC forty (40) dB.

(b) Exterior hinged doors to habitable rooms that are not directly exposed to aircraft noise and do not face the source of the noise shall have a minimum STC rating of thirty-five (35) dB.

(c) Sliding glass doors at habitable rooms shall not be allowed in walls that are directly exposed to aircraft noise. Sliding glass doors in walls that are not directly exposed shall have an STC rating of at least forty (40) dB.

(d) Access doors from a garage to a habitable room shall have an STC rating of at least thirty (30) dB.

(§ 2, Ord. 2616, eff. June 20, 1996)

Sec. 8-15.204. Roof/ceiling construction.

(a) Roof rafters shall have a minimum slope of 4:12 and shall be covered on their top surface with one-half (½) inch solid sheathing and any roof covering allowed by this Code.

(b) Attic insulation shall be batt or blown-in glass fiber or mineral wool with a minimum R-30 rating applied between the ceiling joists.

(c) Attic ventilation shall be:

(1) Gable vents or vents that penetrate the roof surface that are fitted with transfer ducts at least six (6) feet in length that are insulating flexible ducting or metal ducts containing internal one (1) inch thick coated fiberglass sound-absorbing duct liner. Each duct shall have a lined ninety (90) degree bend in the duct so that there is no direct line-of-sight from the exterior through the duct into the attic; or

(2) Noise control louver vents; or

(3) Eave vents that are located under the cave overhang.

(d) Ceilings shall be finished with gypsum board or plaster that is at least five-eighths (5/8) inch thick. Ceiling materials shall be mounted on resilient channels.

(e) Skylights shall penetrate the ceiling by means of a completely enclosed light well that extends from the roof opening to the ceiling opening. A secondary openable glazing panel shall be mounted at the ceiling line or at a point that provides at least a four (4) inch space between the skylight glazing and the secondary glazing and shall be glazed with at least three-sixteenths (3/16) inch plastic or laminated glass. The weather-side skylight shall be any type that is permitted by the Building Code. The size of skylights shall be no more than twenty (20) percent of the roof area of the room.

(§ 2, Ord. 2616, eff. June 20, 1996)

Sec. 8-15.205. Floors.

The floor of the lowest habitable rooms shall be concrete slab on grade. Wood framed floors for habitable rooms will be allowed when they are directly above another habitable room, a basement, garage, workshop, utility room or other non-habitable rooms that are completely enclosed with wall materials allowed by this Code.

(§ 2, Ord. 2616, eff. June 20, 1996)

Sec. 8-15.206. Ventilation.

(a) A ventilation system shall be provided that will provide at least the minimum air circulation and fresh air supply requirements of this Code in each habitable room without opening any window, door or other opening to the exterior. All concealed ductwork shall be insulated flexible glass fiber ducting that is at least ten (10) feet long between any two points of connection.

(b) Kitchen cooktop vent hoods shall be the non-ducted recirculating type with no ducted connection to the exterior.

(§ 2, Ord. 2616, eff. June 20, 1996)

Sec. 8-15.207. Fireplaces.

Each fireplace shall be fitted with a damper at the top of the chimney that is operated from the firebox and shall have glass doors across the front of the firebox.

(§ 2, Ord. 2616, eff. June 20, 1996)

Sec 8-15.208. Wall and ceiling openings.

Openings in the shell of the residence which degrade its ability to achieve an interior CNEL rating of forty-five (45) dB or less when all doors and windows are closed are prohibited unless access panels, pet doors, mail delivery drops, air-conditioning, or other openings are designed to maintain the forty-five (45) CNEL (or less) standard in the room to which they provide access.

(§ 2, Ord. 2616, eff. June 20, 1996)

In addition to exterior to interior noise attenuation, the Uniform Building Code (UBC) imposes certain structural standards that govern noise transmission from one unit to another within the same building of a multi-tenant structure. Horizontal noise transmission resistance through shared ("party") walls must be rated at STC=50 or higher. Vertical sound transmission through the floor/ceiling assembly of stacked units must similarly have an STC=50 or higher rating. Vertical transmission through floor/ceiling assemblies must also be able to reduce impact noise such as footfalls, dropped objects, etc. by 50 dB. The impact noise reduction is expressed in a parameter called the "impact isolation class," or IIC. If structural assemblies are sound rated, the UBC also has standards regarding penetration of such assemblies by piping, ducts, electrical outlets, etc. The noise control requirements for multiple occupancy residences are summarized in Table 3.

TABLE 3
STRUCTURAL NOISE ATTENUATION COMPLIANCE

Construction of multiple family dwelling units requires compliance with all noise insulation requirements of the California Building Code. The code requires the following noise insulation features for such units as stated in CBC Appendix 1208A:

1. Wall and floor-ceiling assemblies separating dwelling units from each other and from public spaces such as interior corridors and service areas shall provide airborne sound insulation for walls, and both airborne and impact sound insulation for floor-ceiling assemblies. Wall assemblies shall have a minimum STC rating of 50. Floor-ceiling assemblies shall have a minimum STC and IIC ratings of 50.

2. Construction details for all sound- and impact-rated assemblies shall be provided on architectural plans. Laboratory test reports governing the STC and IIC ratings of these assemblies shall be specified.

3. Entrance doors from interior corridors to dwelling units together with their perimeter seals shall have a minimum STC rating of 26. The 1 3/8-inch (35 mm) solid core wood or 18-gauge insulated steel slab doors with resilient stop and compression seals all around, including threshold, are acceptable without other substantiating data.

4. All penetrations or openings in construction assemblies for piping, electrical devices, recessed cabinets, bathtubs, soffits, or heating, ventilating or exhaust ducts shall be sealed, lined, insulated or otherwise treated to maintain the required ratings.

5. All rigid conduit, ducts, plumbing pipes, and appliance vents located in sound assemblies shall be sealed, lined, insulated or otherwise treated to maintain the required ratings.

6. Mineral fiber insulation shall be installed in joint spaces whenever a plumbing pipe or duct penetrates a floor-ceiling assembly or where such pipe or duct passes through the plane of the floor-ceiling assembly from within a wall. The insulation shall be installed to a point 12 inches (305 mm) beyond the pipe or duct.

7. Combustion air and kitchen and bathroom exhaust ducts within sound separation assemblies shall be wrapped with Type "C" insulation as shown in Table No. 6-D, Uniform Mechanical Code.

8. Electrical penetrations in sound-rated wall and floor-ceiling assemblies shall conform to the following (outlet box used herein is defined as a box used for receptacles, switches, surface-mounted lighting fixtures, junction points, telephones, thermostats, television uses, etc.):

    a. Outlet box dimensions shall not exceed 6 inches (152 mm) in length or width.

    b. Only outlet boxes and ceiling exhaust fans in the bathrooms shall be permitted in walls and ceilings. All other equipment and devices including recessed fixtures, panel boards, heaters, kitchen exhaust fans, sound-producing equipment (bells, intercoms, etc.) shall not be installed in these sound-rated assemblies.

    c. Light switches, outlet boxes and surface-mounted fixtures shall not be installed back-to-back. Plugs and switches shall be separated by 36 inches (914 mm) minimum.

    d. Surface-mounted fixtures shall be separated by 24 inches (610 mm) minimum. All openings shall be caulked to ensure integrity.

    e. Outlet boxes shall not exceed 1 1/2" (38 mm) in depth so as to allow the required 2-inch (51 mm) uncompressed insulation to be installed in a standard 2-inch X 4-inch (51 mm by 104 mm) wall. On walls of deeper dimensions, boxes of greater depths may be permitted.

    f. Conduits or raceways (stubouts) may penetrate the sound-rated assemblies provided the conduit is covered at the penetration point with permanently resilient sealant.

    g. Floor-ceiling assemblies between residential areas and equipment penthouses (a/c units, etc.) shall be installed in accordance with the sound separation requirements.

9. Floor coverings such as carpet and pad which are required as part of a sound- and impact-rated assembly shall be installed prior to final inspection and that such coverings must be retained as a permanent part of the assembly and may be replaced only by other floor coverings which provide the required ratings.

10. Wall-mounted lavatories and toilets are not permitted on sound-rated walls.

SUMMARY

Because of the lack of adjacent sensitive receptors, noise or vibration from construction activities will not create a significant impact.

Because of the lack of adjacent sensitive receptors, traffic generated by the Guasti Plaza site will not create a significant impact.

Project related traffic may create traffic noise levels as high as 72 dB CNEL at 50 feet from the roadway centerline within the Guasti Plaza site along Guasti Road. Traffic noise levels along other on-site roadways are much less.

On-site noise monitoring demonstrates noise levels along the railroad track at the southern site perimeter could be as high as 75 dB CNEL closest to the track centerline. On-site monitoring also demonstrates that the proximity to the I-10 Freeway traffic could create a noise exposure in the 66-68 dB CNEL range along the northern site perimeter. In the future, the ONT 65 dB CNEL noise contour could extend onto the Guasti Plaza site.

COMMERCIAL USE ALTERNATIVE

Development of commercial or office uses along the southern project boundary within the Specific Plan Amendment area do not provide a noise constraint. Meeting an interior noise level of 55 dB CNEL can be readily accomplished with standard commercial construction practices.

Train vibration impacts are considered less-than-significant for possible office/commercial uses.

RESIDENTIAL USE ALTERNATIVE

For the residential alternative, it is probable that noise levels within exterior recreational areas (individual patios or common space) cannot be mitigated to below 65 dB CNEL. This is a potentially significant impact.

Interior noise levels within residential units can be mitigated to below 45 dB CNEL with highly upgraded acoustical features and specialized construction methods. All homes within the project site will require upgraded air conditioning and ventilation to allow for the closure of windows as a mitigation measure. Once a site plan is available, a supplemental acoustical report verifying compliance based upon the selected structural features must be prepared at the building permit stage.

Vibration impacts are considered potentially significant at possible multi-family uses closest to the train tracks. A site-specific Detailed Analysis is needed to document that necessary vibration control measures have been incorporated into each affected residence prior to the issuance of a certificate of occupancy.

Appendix

Noise Monitoring Data

ONT Noise Contours

Meters 1-6
Hourly Noise Levels

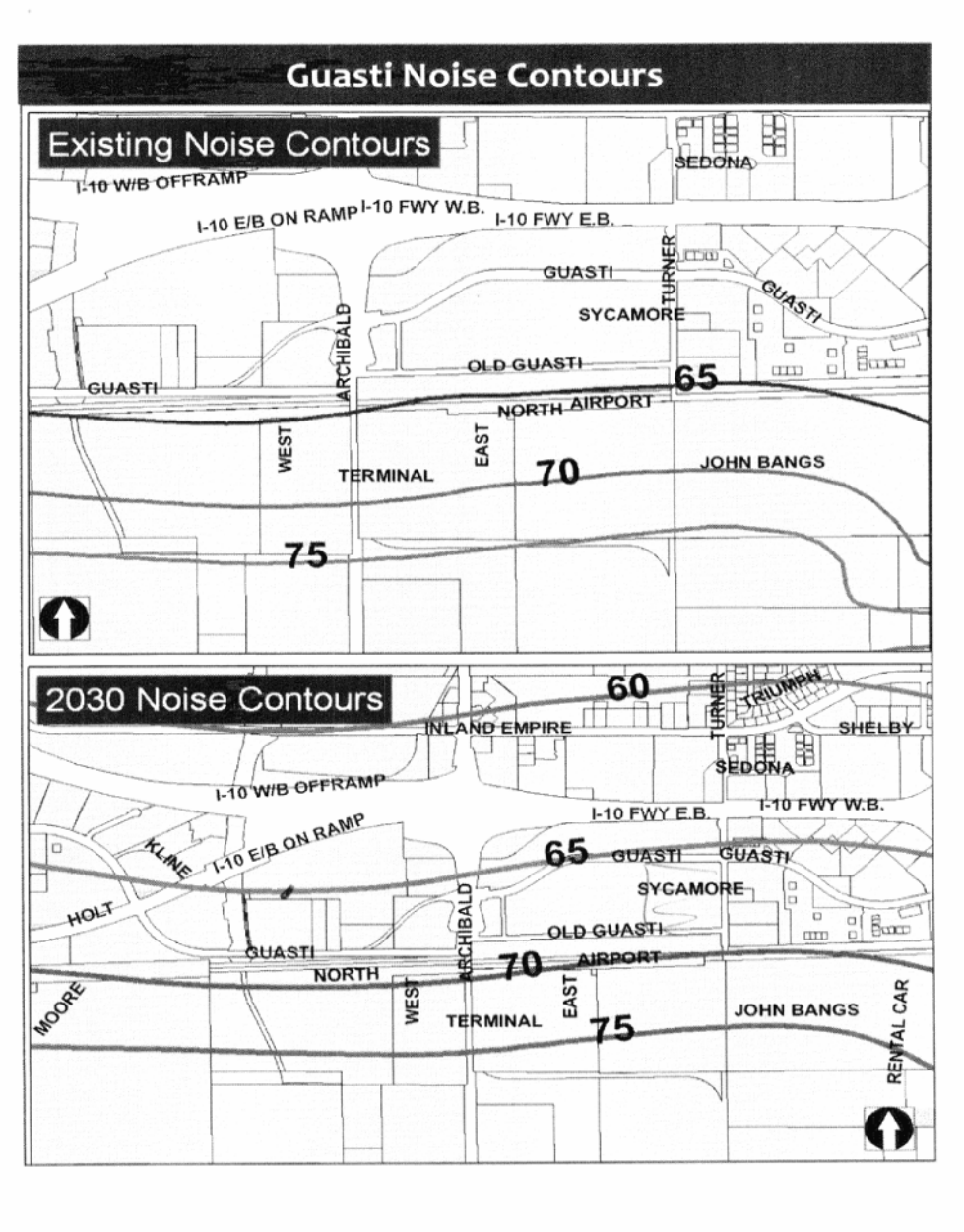
Start of Hour	End of Hour	Hourly Noise Levels (Leq)					
		1	**2**	**3**	**4**	**5**	**6**
14:00	15:00	54.1	53.2	62.9	59.2	66.6	65.1
15:00	16:00	52.9	55.5	57.3	56.3	64.8	63.4
16:00	17:00	55.8	54.9	59.4	58.8	69.3	66.6
17:00	18:00	58.5	56.3	61.8	60.8	61.6	61.5
18:00	19:00	60.5	57.9	61.8	60.4	72.1	64.7
19:00	20:00	61.0	57.9	59.3	59.0	65.9	65.8
20:00	21:00	60.4	57.7	63.0	61.8	71.6	70.5
21:00	22:00	60.6	58.2	65.0	63.6	55.0	54.4
22:00	23:00	61.2	59.8	66.7	65.2	72.0	71.7
23:00	0:00	60.4	57.5	63.3	61.2	66.2	66.1
0:00	1:00	60.8	57.8	64.9	63.2	73.1	72.9
1:00	2:00	59.4	57.2	64.8	63.5	56.4	53.5
2:00	3:00	60.9	59.1	64.0	62.5	67.1	67.0
3:00	4:00	59.8	57.7	63.8	61.9	66.4	69.2
4:00	5:00	59.7	56.2	60.4	58.9	66.0	66.8
5:00	6:00	64.0	62.2	66.1	65.7	67.2	68.4
6:00	7:00	65.2	64.4	66.6	65.9	66.3	67.2
7:00	8:00	63.3	61.1	64.4	63.1	68.4	69.4
8:00	9:00	61.0	59.1	58.9	57.9	67.0	66.7
9:00	10:00	55.9	60.2	53.0	52.5	53.0	51.9
10:00	11:00	53.9	57.0	61.2	58.6	53.6	50.8
11:00	12:00	53.0	54.4	58.3	56.8	60.3	58.5
12:00	13:00	52.3	52.9	51.4	53.6	56.6	54.5
13:00	14:00	52.9	54.0	61.8	59.2	59.4	67.9
CNEL		**68.0**	**66.2**	**71.1**	**69.8**	**74.9**	**75.1**

`

Meters 7-8
Hourly Noise Levels

Start of Hour	End of Hour	Hourly Noise Levels (Leq)	
		7	8
14:00	15:00	60.9	57.9
15:00	16:00	59.5	60.2
16:00	17:00	62.5	61.0
17:00	18:00	59.2	59.5
18:00	19:00	60.6	59.8
19:00	20:00	61.7	59.9
20:00	21:00	65.6	59.2
21:00	22:00	56.1	57.6
22:00	23:00	66.7	59.9
23:00	0:00	61.6	57.5
0:00	1:00	67.3	60.3
1:00	2:00	52.8	57.7
2:00	3:00	61.8	59.4
3:00	4:00	64.4	58.2
4:00	5:00	62.7	60.5
5:00	6:00	64.1	63.1
6:00	7:00	64.2	64.2
7:00	8:00	64.9	62.1
8:00	9:00	61.9	61.0
9:00	10:00	52.6	58.4
10:00	11:00	50.3	60.6
11:00	12:00	58.2	59.6
12:00	13:00	52.7	57.7
13:00	14:00	57.0	57.5
CNEL		70.3	67.2

Noise Contours
(dB CNEL)



Guasti Train Noise Model 26 foot wall

Distance to Receiver	87
Distance to Wall	55
Wall Base Height	0
Receiver Pad Height	30
Height of Receiver	5
Hard or Soft Site	Hard
Height of Wall	26

	Auto	Med Truck	Hvy Truck
Vehicle Height	0	2.3	8
Net Receiver Height	35	32.7	27
Net Wall Height	26.00	23.70	18.00
Direct LOS Height	22.13	20.67	17.07
Effective Wall Height	26.00	23.70	18.00
Direct Distance (CD)	93.78	92.94	91.09
Indirect Distance (CI)	94.08	93.13	91.11
Difference (Δ)	0.301	0.188	0.019
Fresnel Adjusted	0.295	0.184	0.018
Reduction (NLR)	7.86	7.00	5.00

50 ft Reference SPL

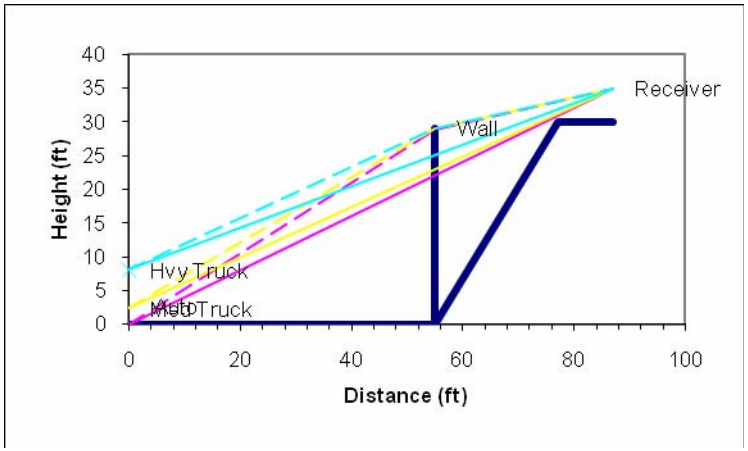
Type	Day	Evening	Night	CNEL
Auto	0	0	0	0.00
Medium Trucks	0	0	0	0.00
Heavy Trucks	67.07	59.28	68.8	74.96
	67.07	59.28	68.80	74.96

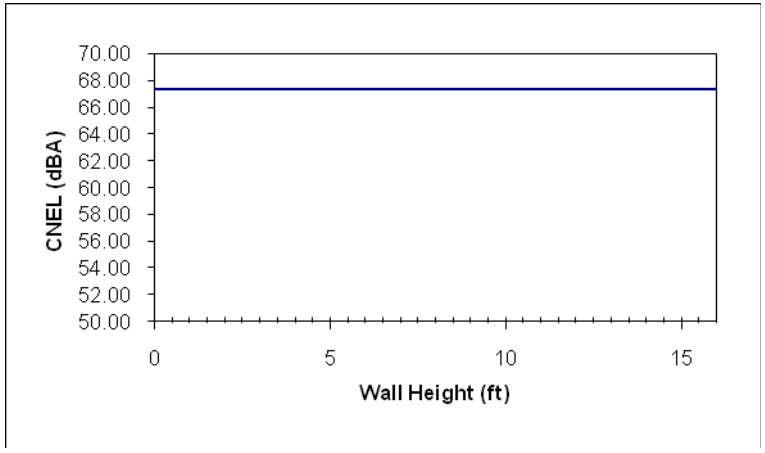
Attenuated SPL

Type	Day	Evening	Night	CNEL
Auto	-2.73	-2.73	-2.73	-2.73
Medium Trucks	-2.69	-2.69	-2.69	-2.69
Heavy Trucks	64.46	56.67	66.19	72.35
	64.46	56.67	66.19	72.35

Resulting Noise Levels

	Auto	Medium Truck	Heavy Truck	24-hour CNEL
Total Attenuated Noise	-10.59	-9.69	67.35	67.35





Guasti Train 28-foot wall

Distance to Receiver	87
Distance to Wall	55
Wall Base Height	0
Receiver Pad Height	30
Height of Receiver	5
Hard or Soft Site	Hard
Height of Wall	28

50 ft Reference SPL

Type	Day	Evening	Night	CNEL
Auto	0	0	0	0.00
Medium Trucks	0	0	0	0.00
Heavy Trucks	67.07	59.28	68.8	74.96
	67.07	59.28	68.80	74.96

	Auto	Med Truck	Hvy Truck
Vehicle Height	0	2.3	8
Net Receiver Height	35	32.7	27
Net Wall Height	28.00	25.70	20.00
Direct LOS Height	22.13	20.67	17.07
Effective Wall Height	28.00	25.70	20.00

Attenuated SPL

Type	Day	Evening	Night	CNEL
Auto	-2.73	-2.73	-2.73	-2.73
Medium Trucks	-2.69	-2.69	-2.69	-2.69
Heavy Trucks	64.46	56.67	66.19	72.35
	64.46	56.67	66.19	72.35

	Auto	Med Truck	Hvy Truck
Direct Distance (CD)	93.78	92.94	91.09
Indirect Distance (CI)	94.47	93.46	91.28
Difference (Δ)	0.697	0.523	0.187
Fresnel Adjusted	0.683	0.511	0.183
Reduction (NLR)	9.62	8.98	6.99

Resulting Noise Levels

	Auto	Medium Truck	Heavy Truck	24-hour CNEL
Total Attenuated Noise	-12.35	-11.68	65.37	65.37