

A P P E N D I X E

N O I S E





Technical Memorandum

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TO R.T. Nahas Company

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SUBJECT Noise and Vibration Technical Memorandum for the Castro Village Expansion

PROJECT NO. RTNC-01

Noise and Vibration Technical Memorandum

The Castro Village Expansion Noise and Vibration (N&V) Technical Memorandum has been prepared to analyze potential noise and vibration impacts from construction and operation of the Castro Village Expansion Project (Project). The noise and vibration analyses include an evaluation of the impacts of the Project compared to the significance criteria adopted by pertinent state and county regulations.

NOISE AND VIBRATION ENVIRONMENTAL SETTING

Regional Setting

The Project site is in an unincorporated portion of Alameda County. As such, Castro Valley is subject to the provisions of the Alameda County General Plan, the Alameda County Code of Ordinances (County Code), and the 2010 California Building Code. Provisions related to noise are contained within the Noise Element of the Alameda County General Plan, Chapter 6.60 of the County Code, and section 1207.11 of the California Building Code. Additionally, Castro Valley is subject to the new Castro Valley General Plan, adopted by the Alameda County Board of Supervisors on March 30, 2012.

Project Overview

The proposed Project would entail the demolition of three residential houses and miscellaneous structures, along with the Village Car Wash building. Following demolition, construction of the proposed 25,000 square foot department store is anticipated to commence in 2013 and be completed in approximately 6 months. On-going processes at the Project will consist of workers and patrons traveling to and shopping at the retail store, mechanical equipment operations, merchandise deliveries, and trash processing/haul-off. The store will be open for business from 9:30 a.m. to 9:30 p.m. on Monday through Saturday and 11:00 a.m. to 8:00 p.m. on Sunday. The total number of employees will be 55-60 depending on the time of year. The total number of employees in the store at peak hours will be 12 to 14.

Terminology and Noise Descriptors

The following are brief definitions of noise terminology:



Sound. A disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.

Noise. Sound that is loud, unpleasant, unexpected, or otherwise undesirable.

Decibel (dB). A unitless measure of sound on a logarithmic scale.

A-Weighted Decibel (dBA). An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.

Equivalent Continuous Noise Level (Leq). The mean of the noise level averaged over the measurement period, regarded as an energy-average level.

Day-Night Level (L_{dn}). The energy average of the A-weighted sound levels occurring during a 24-hour period with 10 dB added to the sound levels occurring from 10 PM to 7 AM to account for increased sensitivity and potential sleep disturbance during those hours.

Community Noise Equivalent Level (CNEL). The energy average of the A-weighted sound levels occurring during a 24-hour period with 5 dB added to the levels occurring from 7 PM to 10 PM and 10 dB added to the sound levels occurring from 10 PM to 7 AM. The CNEL metric is quite similar to the L_{dn} metric, but with the added adjustment during three evening hours (which makes a CNEL-based limit slightly more restrictive than an L_{dn} limit). Note that for general community noise the L_{dn} and CNEL values rarely differ by more than 1 dB. Thus, as a matter of common practice, the L_{dn} and CNEL values are considered to be equivalent and are treated as such in this assessment.

Characteristics of Sound

Sound is a pressure wave transmitted through the air. It is described in terms of loudness or amplitude (measured in decibels [dB]), frequency or pitch (measured in Hertz [Hz] or cycles per second), and duration (measured in seconds or minutes). The standard unit of measurement of the loudness of sound is the decibel. Changes of 1 to 3 dB are detectable under quiet, controlled conditions and changes of less than 1 dBA are usually indiscernible. A 3 dB change in noise levels is considered the minimum change that is detectable with human hearing in outside environments. A change of 5 dB is readily discernible to most people in an exterior environment whereas a 10 dBA change is perceived as a doubling (or halving) of the sound. Table N-1 presents the subjective effect of changes in sound pressure levels.

Table N-1
Differences in Sound Pressure Levels

Change in Sound Pressure Level, dB	Change in Apparent Loudness
± 3 dB	Threshold of human perceptibility
± 5 dB	Clearly noticeable change in noise level
± 10 dB	Half or twice as loud
± 20 dB	Much quieter or louder

Source: Bies and Hansen 2003.



The human ear is not equally sensitive to all frequencies. Sound waves below 16 Hz are not heard at all and are "felt" more as a vibration. Similarly, while people with extremely sensitive hearing can hear sounds as high as 20,000 Hz, most people cannot hear above 15,000 Hz. In all cases, hearing acuity falls off rapidly above about 10,000 Hz and below about 200 Hz. Since the human ear is not equally sensitive to sound at all frequencies, a special frequency dependent rating scale is usually used to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear.

Noise is defined as unwanted sound, and is known to have several adverse effects on people, including hearing loss, speech and sleep interference, physiological responses, and annoyance. Based on these known adverse effects of noise, the federal government, the State of California, and many local governments have established criteria to protect public health and safety and to prevent disruption of certain human activities.

Point Noise Sources and Line Noise Sources

Noise may be generated from a point source, such as a piece of construction equipment, or from a line source, such as a road containing moving vehicles. Because noise spreads in an ever-widening pattern, the given amount of noise striking an object, such as an eardrum, is reduced with distance from the source. This is known as "spreading loss." The typical spreading loss for point source noise is 6 dBA per doubling of the distance from the noise source.

A line source of noise, such as vehicles proceeding down a roadway, would also be reduced with distance, but the rate of reduction is affected by both distance and the type of terrain over which the noise passes. Hard sites, such as developed areas with paving, reduce noise at a rate of 3 dBA per doubling of the distance while soft sites, such as undeveloped areas, open space and vegetated areas reduce noise at a rate of 4.5 dBA per doubling of the distance. These represent the extremes and most areas would actually contain a combination of hard and soft elements with the noise reduction placed somewhere in between these two factors. Unfortunately the only way to actually determine the absolute amount of attenuation that an area provides is through field measurement under operating conditions with subsequent noise level measurements conducted at varying distances from a constant noise source.

Objects that block the line of sight attenuate the noise source if the receptor is located within the "shadow" of the blockage (such as behind a sound wall). If a receptor is located behind the wall, but has a view of the source, the wall would do little to reduce the noise. Additionally, a receptor located on the same side of the wall as the noise source may experience an increase in the perceived noise level, as the wall would reflect noise back to the receptor compounding the noise.

Measurement of Sound

Sound intensity is measured through the A-weighted measure to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound similar to the human ear's de-emphasis of these frequencies.

Unlike linear units such as inches or pounds, decibels are measured on a logarithmic scale, representing points on a sharply rising curve. On a logarithmic scale, an increase of 10 dB is 10 times more intense than 1 dB, while 20 dB is 100 times more intense, and 30 dB is 1,000 times more intense. A sound as soft as human breathing is



about 10 times greater than 0 dB. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. Ambient sounds generally range from 30 dBA (very quiet) to 100 dBA (very loud).

Sound dissipates exponentially with distance from the noise source. This phenomenon is known as “spreading loss.” For a single-point source, sound levels decrease by approximately 6 dB for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by on-site operations from stationary equipment or activity at a Project site. If noise is produced by a line source, such as highway traffic, the sound decreases by 3 dB for each doubling of distance in a hard site environment. Line source noise in a relatively flat environment with absorptive vegetation decreases by 4.5 dB for each doubling of distance.

Time variation in noise exposure is typically expressed in terms of a steady-state energy level equal to the energy content of the time varying period (called L_{eq}), or alternately, as a statistical description of the sound level that is exceeded over some fraction of a given observation period. For example, the L_{50} noise level represents the noise level that is exceeded 50 percent of the time. Half the time the noise level exceeds this level and half the time the noise level is less than this level. This level is also representative of the level that is exceeded 30 minutes in an hour. Similarly, the L_2 , L_8 and L_{25} values represent the noise levels that are exceeded 2, 8, and 25 percent of the time or 1, 5, and 15 minutes per hour. These “L” values are typically used to demonstrate compliance for stationary noise sources with a city’s noise ordinance, as discussed below. Other values typically noted during a noise survey are the L_{min} and L_{max} . These values represent the minimum and maximum root-mean-square noise levels obtained over the measurement period.

Psychological and Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects our entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions, and thereby affecting blood pressure, functions of the heart, and the nervous system. In comparison, extended periods of noise exposure above 90 dBA could result in permanent hearing damage. The ambient or background noise is widespread and generally more concentrated in urban areas than in outlying, less-developed areas. As a frame of reference for readers unfamiliar with sound pressure levels, Table N-2 provides common outdoor and indoor activities and their associated noise level(s).



*Table N-2
Typical Noise Levels from Noise Sources*

<i>Common Outdoor Activities</i>	<i>Noise Level (dBA)</i>	<i>Common Indoor Activities</i>
	110	Rock Band
Jet Flyover at 1,000 feet		
	100	
Gas Lawn Mower at three feet		
	90	
Diesel Truck at 50 feet, at 50 mph		Food Blender at 3 feet Garbage Disposal at 3 feet
	80	
Noisy Urban Area, Daytime		
	70	Vacuum Cleaner at 10 feet Normal speech at 3 feet
Commercial Area Heavy Traffic at 300 feet		
	60	
Quiet Urban Daytime		Large Business Office Dishwasher Next Room
	50	
Quiet Urban Nighttime Quiet Suburban Nighttime		Theater, Large Conference Room (background)
	40	
	30	Library Bedroom at Night, Concert Hall (background)
Quiet Rural Nighttime		
	20	
	10	Broadcast/Recording Studio
	0	
Lowest Threshold of Human Hearing		Lowest Threshold of Human Hearing

Source: Caltrans 2009, Table 2-5, Typical Noise Levels.

Vibration Fundamentals

Vibration is a trembling, quivering, or oscillating motion of the earth. Like noise, vibration is transmitted in waves, but in this case through the earth or solid objects. Unlike noise, vibration is typically of a frequency that is felt rather than heard.

Vibration can be either natural as in the form of earthquakes, volcanic eruptions, sea waves, landslides, or man-made as from explosions, the action of heavy machinery or heavy vehicles such as trains. Both natural and man-made vibration may be continuous such as from operating machinery, or transient as from an explosion.



As with noise, vibration can be described by both its amplitude and frequency. Amplitude may be characterized in three ways: displacement, velocity, and acceleration. Particle displacement is a measure of the distance that a vibrated particle travels from its original position and for the purposes of soil displacement is typically measured in inches or millimeters. Particle velocity is the rate of speed at which soil particles move in inches per second (in/sec) or millimeters per second (mm/sec). Particle acceleration is the rate of change in velocity with respect to time and is measured in in/sec or mm/sec. Typically, particle velocity (measured in in/sec or mm/sec) and/or acceleration (measured in gravities) are used to describe vibration. Table N-3 presents the human reaction to various levels of peak particle velocity (PPV).

Table N-3
Human Reaction to Typical Vibration Levels

Vibration Level Peak Particle Velocity(PPV) (in/sec)	Human Reaction	Effect on Buildings
0.006–0.019	Threshold of perception, possibility of intrusion	Vibrations unlikely to cause damage of any type
0.08	Vibrations readily perceptible	Recommended upper level of vibration to which ruins and ancient monuments should be subjected
0.10	Level at which continuous vibration begins to annoy people	Virtually no risk of “architectural” (i.e., not structural) damage to normal buildings
0.20	Vibrations annoying to people in buildings	Threshold at which there is a risk to “architectural” damage to normal dwelling – houses with plastered walls and ceilings
0.4–0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause “architectural” damage and possibly minor structural damage

Source: Caltrans 2004.

Vibrations also vary in frequency and this affects perception. Typical construction vibrations fall in the 10 to 30 Hz range and usually occur around 15 Hz. Traffic vibrations exhibit a similar range of frequencies; however, due to their suspension systems, buses often generate frequencies around 3 Hz at high vehicle speeds. It is less common, but possible, to measure traffic frequencies above 30 Hz.

The way in which vibration is transmitted through the earth is called propagation. Propagation of earthborn vibrations is complicated and difficult to predict because of the endless variations in the soil through which waves travel. There are three main types of vibration propagation: surface, compression and shear waves. Surface waves, or Raleigh waves, travel along the ground’s surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by throwing a rock into a pool of water. Compression waves, or P-waves, are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal (i.e., in a “push-pull” fashion). P-waves are analogous to airborne sound waves. Shear waves, or S-waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse or “side-to-side and perpendicular to the direction of propagation.”



As vibration waves propagate from a source, the energy is spread over an ever-increasing area such that the energy level striking a given point is reduced with the distance from the energy source. This geometric spreading loss is inversely proportional to the square of the distance. Wave energy is also reduced with distance as a result of material damping in the form of internal friction, soil layering, and void spaces. The amount of attenuation provided by material damping varies with soil type and condition as well as the frequency of the wave.

Regulatory Framework

Federal, State, regional and local laws, regulations, plans, or guidelines that are potentially applicable to the proposed Project are summarized below.

State of California

The 2007 California Building Code sets environmental noise limits for habitable interior spaces in new residential developments¹. Though the Project would be adjacent to existing residences, no new residences are proposed as part of the Project. Thus, the State of California Building Code requirements are not applicable.

Alameda County General Plan Noise Element

The Alameda County Noise Element contains goals, objectives, and implementation programs for the entire County to provide its residents with an environment that is free of excessive noise and promote compatibility of land uses with respect to noise. The County-wide Noise Element does not explicitly specify an acceptable outdoor noise level for the backyards of homes or common outdoor spaces of multi-family housing projects, however the noise element does recognize the noise level standards for residential land uses of an exterior L_{dn} of 55 dBA and an interior L_{dn} of 45 dBA identified by the Federal Environmental Protection Agency (EPA) as those requisite with the protection of public health and welfare, with an adequate margin of safety. The Noise Element also references noise and land use compatibility standards developed by an Association of Bay Area Governments (ABAG)-sponsored study. The ABAG study establishes that a CNEL (approximately equivalent to the L_{dn} noise metric²) of 65 dBA or less is expected to result in little noise impact on residential land uses, that levels between 65 and 70 would produce moderate impacts, and that a CNEL above 70 dBA would cause significant impacts.

Alameda County Code of Ordinances

The County Code defines a "noise disturbance" as "any sound as judged by any person empowered to enforce this chapter, which (A) endangers or injures the safety or health of human beings or animals, or (B) endangers or injures personal or real property, or (C) annoys or disturbs a reasonable person of normal sensitivity."

The County Code offers a non-exhaustive list of factors used in determining whether a sound could reasonably be judged to be annoying or disturbing:

1. The relative sound level of the objectionable noise to the ambient noise;

¹ The State of California Building Code, Chapter 12, Appendix Section 1207.11.2 limits interior noise levels at any habitable room (due to exterior noise) to 45 dBA L_{dn} or, equivalently, 45 dBA CNEL (see introduction for definition of technical terms).

² For general community/environmental noise, CNEL and L_{dn} values rarely differ by more than 1 dB. As a matter of practice, L_{dn} and CNEL values are considered to be equivalent/interchangeable and are treated as such in this assessment.



2. The proximity of the objectionable noise to residential sleeping facilities or public camping facilities;
3. The number of persons affected by the objectionable noise;
4. The day of the week and time of day or night the objectionable noise occurs;
5. The duration of the objectionable noise and its tonal, informational or musical content;
6. Whether the objectionable noise is continuous, recurrent or intermittent;
7. The nature and zoning of the area within which the objectionable noise emanates.³

The County Code further establishes absolute noise limits for various time periods, activities, and land uses. The County Code specifies that any noise measurements must be made using a calibrated noise monitor, using the A-weighted decibel scale, and using the slow-response meter setting (or, in the case of impulsive noise, using fast-response meter setting). The County Code permits sound levels to be measured at any point on the affected property and requires that such measurements be taken at three to five feet above the ground and away from sound-reflective surfaces.⁴ In the event that a studied noise source cannot be eliminated for the measurement of ambient noise, the total measured noise level will be compared to the standards set out in the County Code.⁵ Table N-4 shows the exterior noise standards for non-commercial properties and Table N-5 shows the exterior noise standards for commercial properties.

Table N-4
Receiving Land Use — Single- or Multiple-Family Residential, School, Hospital, Church or Public Library Properties Noise Level Standards, dB(A)

Category	Cumulative Number of Minutes in any one hour time period (equivalent X statistical sound level)	Daytime 7 a.m. to 10 p.m.	Nighttime 10 p.m. to 7 a.m.
1	30 (equivalent to L ₅₀)	50	45
2	15 (equivalent to L ₂₅)	55	50
3	5 (equivalent to L ₈)	60	55
4	1 (equivalent to L ₂)	65	60
5	0 (equivalent to L _{max})	70	65

Source: Alameda County Code of Ordinances, 6.60.040

³ Alameda County Code of Ordinances, Section 6.60.020 - Definitions

⁴ Alameda County Code of Ordinances, 6.60.030 - Noise measurement criteria

⁵ Alameda County Code of Ordinances, 6.60.040 - Exterior noise level standards



Table N-5
Receiving Land Use — Commercial Properties Noise Level Standards, dB(A)

Category	Cumulative Number of Minutes in any one hour time period (equivalent X statistical sound level)	Daytime 7 a.m. to 10 p.m.	Nighttime 10 p.m. to 7 a.m.
1	30 (equivalent to L ₅₀)	65	60
2	15 (equivalent to L ₂₅)	70	65
3	5 (equivalent to L ₈)	75	70
4	1 (equivalent to L ₂)	80	75
5	0 (equivalent to L _{max})	85	80

Source: Alameda County Code of Ordinances, 6.60.040

In the event that ambient noise levels exceed the limits specified in either of these tables, the applicable limit is adjusted to equal the ambient noise level. Additionally, speech, music, tones, and impulsive noises, since they are more attention-getting, are subject to limits five decibels lower than those shown the Tables N-2 and N-3.⁶

The County Code also prohibits operating or permitting the operating of any device which causes perceptible vibration on adjacent private property, or within 150 feet, if on public land.

Subsection E of section 6.60.070 of the County Code exempts construction from these noise and vibration limits, provided that constructions does not take place between 7 p.m. and 7 a.m. on weekdays or between 5 p.m. and 8 a.m. on Saturday and Sunday. That is, construction is allowed between 7 a.m. and 7 p.m. on weekdays and between 8 a.m. and 5 p.m. on weekend days.

Vibration Standards

The County has no standards or regulations with respect to vibration. For the purpose of this analysis, the vibration criteria are based on the vibration levels presented in Table N-3 and on thresholds established by the Federal Transit Administration (FTA), that are commonly used of CEQA analyses. Table N-6 shows the level at which vibration becomes perceptible based on various types of land uses that are sensitive to vibration.

⁶ Alameda County Code of Ordinances, 6.60.040 - Exterior noise level standards



Table N-6
Vibration Perceptibility

<i>Land Use Category</i>	<i>Max L_v (VdB)¹</i>	<i>Description</i>
Workshop	90	Distinctly felt vibration. Appropriate to workshops and non-sensitive areas
Office	84	Felt vibration. Appropriate to offices and non-sensitive areas.
Residential – Daytime	78	Barely felt vibration. Adequate for computer equipment.
Residential – Nighttime	72	Vibration not felt, but groundborne noise may be audible inside quiet rooms.

Source: FTA 2006.

¹ As measured in 1/3 octave bands of frequency over the frequency ranges of 8 to 80 Hz.

In addition to the vibration standards for human annoyance, the FTA also has vibration standards for architectural damage, as shown in Table N-7. Architectural damage is possible when the peak particle velocity (PPV) exceeds 0.2 inch per second. This criterion is the threshold at which there is a risk of damage to residential buildings. For structures of reinforced concrete, steel, or timber, architectural damage is possible when the PPV exceeds 0.5 inch per second.

Table N-7
Groundborne Vibration Impact Criteria, Architectural Damage

<i>Building Category</i>	<i>PPV (inches per second)¹</i>	<i>VdB</i>
I. Reinforced concrete, steel, or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Source: FTA 2006.

¹ RMS velocity calculated from vibration level (VdB) using the reference of one micro-inch per second.

Existing Ambient Noise Environment

The primary noise sources in Castro Valley stem from traffic, on Interstate 580 and major arterials such as Castro Valley Boulevard and Redwood Road/"A" Street, and passing BART trains.⁷ Both the BART tracks and Interstate 580 are located in the southern portion of Castro Valley, however, depending on weather conditions, the sound from these two sources can travel outside the immediate area. Additional noise sources include helicopters associated with the Sutter Medical Center, located at 20103 Lake Chabot Road. Of these area noise sources, the source that dominates the Project site is roadway noise from Redwood Road and, to a lesser extent, vehicle movements along Jamison Way and the rest of the Castro Village Center. Potential increases in localized noise from Project-related traffic flow increases are discussed below in the Noise and Vibration Impact Assessment, item a).

⁷ Alameda County Community Development Agency, *Castro Valley General Plan EIR*, April 2007, page 3.8-2.



Sensitive Receptors

Nearby receptors to the proposed Project site are: office and retail spaces (that are part of the Castro Village Center) to the west, Castro Village Center retail uses to the south, a dental office to the east with single-family residences beyond, and single-family and multi-family residences to the north (across Jamison Way).

For this analysis, the residential areas – located approximately 50 feet from the Project boundary across Jamison Way – are considered to be closest noise-sensitive receptors to the Project site. These receptors consist of single- and multi-family homes. The residences to the east of the site are approximately 130 feet from the eastern boundary and would experience lower noise levels from the proposed facility than the Jamison Way houses due to the increased sound propagation distances and the barrier/shielding effects from intervening structures (primarily the dental office).

While the dental office to the east of the Project site is classified as a commercial land use and would typically not be considered as a sensitive noise or vibration receptor, since the activities in this building involve the use of precision power tools, fine tolerances, and exacting processes, a conservative approach was taken to consider this land use as the closest sensitive vibration receptor to the Project facilities.

NOISE AND VIBRATION IMPACT ANALYSIS

Thresholds of Significance

According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would result in:

- 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) 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.
- e) For a project located within an airport land use plan or where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels.
- f) For a project within the vicinity of a private airstrip, expose people residing or working the project area to excessive noise levels.

Noise and Vibration Assessments

- a) Would the Project result in 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?



Concerns for noise exposures in excess of establish standards would fall under

- (i) noise compatibility with respect to the County General Plan,
- (ii) on-site noise sources, and
- (iii) (iii) Project-related traffic noise.

i) Noise Compatibility

The Alameda County Noise Element contains goals, objectives, and implementation programs for the entire County to provide its residents with an environment that is free of excessive noise and promote compatibility of land uses with respect to noise. The County-wide Noise Element does not explicitly specify an acceptable outdoor noise level for the backyards of homes or common outdoor spaces of multi-family housing projects, however the noise element does recognize the noise level standards for residential land uses of an exterior L_{dn} of 55 dBA and an interior L_{dn} of 45 dBA identified by the Federal Environmental Protection Agency (EPA) as those requisite with the protection of public health and welfare, with an adequate margin of safety. The Noise Element also references noise and land use compatibility standards developed by an Association of Bay Area Governments (ABAG)-sponsored study. The ABAG study establishes that a CNEL (approximately equivalent to the L_{dn} noise metric⁸) of 65 dBA or less is expected to result in little noise impact on residential land uses, that levels between 65 and 70 would produce moderate impacts, and that a CNEL above 70 dBA would cause significant impacts.

Since the proposed Project is simply an extension of the existing shopping center and its current commercial/retail configuration, there would be no change to the fundamental noise conditions for the area. Thus, the Project will present no significant impacts to land use compatibility and will have a *less-than-significant* impact.

ii) On-Site Noise Sources

The Project would generate noise from vehicles traveling to and from the Project site (discussed below), truck loading/unloading, and stationary-source noise associated with machinery and heating, ventilation, and air conditioning (HVAC) equipment. Project operation including machinery and HVAC units would be required to be installed to comply with the applicable noise standards, which requires that noise at nearby commercial land uses does not exceed 65 dBA for a cumulative period of more than 30 minutes in any hour (equivalent to the L_{50} noise metric) during the daytime and not more than 60 dBA L_{50} during the nighttime.⁹ These limits would apply to the adjacent dental offices to the east, which are approximately 65 feet from the eastern façade of the proposed building. The nearest residential land uses are beyond the dental offices to the east (approximately 130 feet from the Project building) and across Jamison Way to the north (approximately 90 feet from the Project building). For these residential receptors, the basic noise standard limits noise to 50 dBA dBA for a cumulative period of more

⁸ For general community/environmental noise, CNEL and L_{dn} values rarely differ by more than 1 dB. As a matter of practice, L_{dn} and CNEL values are considered to be equivalent/interchangeable and are treated as such in this assessment.

⁹ In addition to the basic L_{50} standard (i.e. noise levels above the standard for 30 minutes of any given hour), the code limits daytime noise at *commercial* receptors to less than 70 dBA for a cumulative period of more than 15 minutes in any hour (L_{25} metric), 75 dBA for a cumulative period of more than 5 minutes in any hour (L_8 metric), 80 dBA for a cumulative period of more than 1 minutes in any hour (L_2 metric), or a maximum ($L_{max} = L_0$) of 85 dBA. All these limits are reduced by 5 dB for the nighttime period (i.e., 10:00 p.m. to the following 7:00 a.m.).



than 30 minutes in any hour (equivalent to the L_{50} noise metric) during the daytime and not more than 45 dBA L_{50} during the nighttime¹⁰.

Truck deliveries will take place three to four times per week except during the fourth quarter when they could be six to seven times per week. Delivery times could be as early as 5:00 a.m. and as late as 11:00 a.m. Trucks will be 33 feet in size and all delivery truck maneuvering will take place in the parking lot which is within the shopping center. Deliveries and trash haul-off will only occur on the delivery ramp (the east side of the building) and these activities will be screened by the building from residential streets. Additional sound attenuation for this ramp area will be provided by a wall 11 feet tall that would extend from the northeast corner of the building. This design feature is expected to provide between 10 and 20 dB of sound attenuation for delivery/haul-off noise propagating to the northeast and east of the Project site. While early-morning deliveries may be audible (particularly, the back-up alarm 'beeping') at the closest residences, these noises will be relatively short-lived and are not expected to exceed the applicable requirements of the County Noise Code; even with the 5 dB more-restrictive limitations for deliveries between 5:00 a.m. and 7:00 a.m. Likewise, noise from operation of the compactor machinery is anticipated to comply with the daytime requirements of the Noise Code given the sound attenuation afforded by the noise-blocking features of the delivery/haul-off area. Lastly, noise emissions from on-going operations of the heating, ventilation, and air conditioning (HVAC) equipment will be comparable to similar equipment at the center's other, existing buildings and at comparable distances/orientations to the nearest residences across Jamison Way. As such, compliance with the Noise Code is also anticipated for normal operations of this HVAC equipment. Since all on-site noise sources are expected to operate within County Noise Code limits, these noise emissions would be less than significant and no mitigation measures are necessary.

iii) Roadway Noise Exposure

In lieu of an incremental noise increase standard in the Alameda County Noise Element, a conservative increment of 3 dB was chosen as the threshold for a significant impact due to Project-related traffic. To increase traffic noise levels by more than 3 dB, Project-related vehicle flows would have to double the existing roadway volumes.¹¹ As discussed in Section XV, Transportation and Traffic, operation of the proposed Project would generate 1,073 average daily vehicle trips (ADT). According to the traffic study, the majority of the trips generated would be distributed onto Redwood Road and Jamison Way.¹² The existing vehicle volumes range from approximately 1,360 average daily trips along Jamison Way to between 20,660 and 21,660 daily vehicle trips along Redwood Road.¹³ Additional details may be found in Attachment A to this report. Based on the traffic study, Project-generated trips would result in increases from 0.0 to 0.2 dB in the ambient noise environment when compared to the existing conditions. Such small increases in traffic noise and would be completely negligible. In addition, as the Project is proposed retail and would be consistent with the other

¹⁰ In addition to the basic L_{50} standard (i.e. noise levels above the standard for 30 minutes of any given hour), the code limits daytime noise at *residential* receptors to less than 55 dBA for a cumulative period of more than 15 minutes in any hour (L_{25} metric), 60 dBA for a cumulative period of more than 5 minutes in any hour (L_8 metric), 65 dBA for a cumulative period of more than 1 minutes in any hour (L_2 metric), or a maximum ($L_{max} = L_0$) of 70 dBA. All these limits are reduced by 5 dB for the nighttime period (i.e., 10:00 p.m. to the following 7 a.m.).

¹¹ Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, May 2006.

¹² Abrams Associations, *Traffic Engineering Review of Proposed TJ Maxx Store in the Castro Village Shopping Center*, November 14, 2012.

¹³ Assumes that the PM-peak hour turning volumes represent 10 percent of average daily trips, per common practice in the traffic and transportation industry.



surrounding retail land uses, it would generate similar types of vehicle trips and would not introduce new types of mobile-source noise. Therefore, Project-generated traffic would not substantially increase ambient noise levels and traffic noise impacts at off-site locations would be less than significant.

b) Would the Project result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

Groundborne vibration due to the Project may be of concern during the construction phase and for on-going operations. For the latter, since the Castro Village Project would result only in the addition of a new retail store to an existing shopping center and since there are no significant vibration-generating sources as part of the proposed Project, on-going operations would not generate substantial levels of vibration. Therefore, this potential impact requires no further analysis.

Construction activities, however, can generate varying degrees of ground vibration, depending on the construction procedures, the equipment items used, and the proximity to vibration-sensitive uses. Operation of construction equipment generates vibrations that spread through the ground and diminish in amplitude with distance from the source. The effect on buildings near a construction site varies depending on soil type, ground strata, and receptor building construction. The generation of vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibrations at moderate levels, to slight damage at the highest levels. Ground vibrations from construction activities rarely reach levels that can damage structures, but can achieve the perceptible ranges in buildings close to a construction site.

For this Project, construction would involve on-site activities to demolish the existing structures, to grade the lots, and to construct the buildings (and the associated parking and driveway areas). Heavy earthmoving equipment would be required during the grading phase. However, since the site is essentially flat, grading quantities have been estimated at 1,500 cubic yards of cut and 2,000 cubic yards of fill to provide the necessary store pad elevation and site drainage features. It is expected that the grading portion of the construction would last for a few weeks during the total construction duration of approximately six months.

i) Architectural Damage from Groundborne Vibration

The nearest structure from the Project site boundary is the commercial/office building located approximately 65 feet to the east. The thresholds at which there is a risk of architectural damage are 0.5 inch per second (in./sec.) peak particle velocity (PPV) for reinforced concrete, steel, or timber buildings. The threshold at which there is a risk of architectural damage to normal houses with plastered walls and ceilings is a peak particle velocity (PPV) of 0.2 inches per second (in./sec). Groundborne vibration generated by construction projects is usually highest during pile driving and rock blasting, but none of these activities are anticipated for the proposed Project. Loaded truck and heavy earthmoving equipment typically generate vibration levels of less than 0.1 inches per second PPV at a reference distance of 25 feet.¹⁴ Given the distance to the nearest receptor buildings (i.e. 50 feet to existing offices/stores to the west, 65 feet to the dental office to the east, and 90 or more feet to the nearest houses to the north) and the lack of extensive earthwork (such as subterranean facilities), there would be no risk of architectural damage at nearby buildings and potential damage impacts would be *less than significant*. Additional details may be found in Attachment B to this report.

¹⁴ Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, May 2006.



ii) Annoyance from Groundborne Vibration

While groundborne vibration dissipates rapidly with distance (from the source to the receptor building), the use of heavy construction equipment may generate sporadic vibration levels that could be perceptible at the adjacent commercial building and/or the closest residences during the grading portion of the construction phase. Vibration is typically noticed nearby when objects in a building generate noise from rattling windows or picture frames (i.e. groundborne noise effects). It is typically not perceptible outdoors and, therefore, impacts are normally based on the distance to the nearest building.¹⁵ The FTA criterion for perceptible levels of vibration (i.e., the onset of annoyance) during the daytime is 78 VdB for residential uses and 84 VdB for offices and other, non-sensitive uses. Nominally, the 78 VdB threshold would apply to the houses to the east and north of the Project site, both along Jamison Way, while the 84 VdB threshold would apply to the existing offices/stores to the west and to the dental offices to the east. However, since the dental office involves the use of precision power tools, fine tolerances, and exacting processes, a conservative approach would be to employ the more-restrictive 78 VdB threshold to this receptor location. Such an approach would be consistent with providing a reassuring and calm environment for both the dental staff and their patients with respect to potential vibration intrusions during procedures.

For the 84 VdB threshold, the distance that a large bulldozer¹⁶ or a loaded truck would be expected to generate groundborne vibration levels that would be above the onset of annoyance is approximately 40 feet. As all commercial uses are beyond this range, there would be no significant vibration effects from Project construction at these receptors. Likewise, the nearest homes are at least 90 feet from Project activities, so expected vibration levels, even from heavy equipment such as a large bulldozer, would be at least 2 dB below the significance threshold. Residential structures farther from the Project site would have lower vibration effects, due to the greater distances between the sources and the receptors (for example, houses at 200 feet from the nearest heavy construction equipment would have predicted levels 9 to 10 dB below the significance threshold). Thus, all existing retail uses and the nearby residential land uses would be expected to be below the significance threshold for on-site vibration activities; even from large bulldozers or loaded haul trucks. With the conservative threshold for the dental offices, though, the use of heavy bulldozers near the Project site eastern boundary would result in estimated groundborne vibration levels of 79 VdB at the nearest portion of the dental offices; or 1 dB above the significance level. If vibratory rollers are employed near the Project site eastern boundary, then estimated vibration levels would be approximately 86 VdB, which is 8 dB over the conservative threshold and 2 dB above the nominal threshold (for typical office buildings). Therefore, depending on the construction equipment employed at the site, its use in grading and site preparation activities, and its proximity to the dental offices, a potentially *significant* groundborne vibration impact may result. Additional details may be found in Attachment B to this report.

The following mitigation measure is intended to reduce these potential impacts.

¹⁵ Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, May 2006.

¹⁶ A "large" bulldozer is taken to have operating weights from 85,000 to 230,000 pounds; approximately equivalent to Caterpillar D8 to D11 class machines. A "medium" bulldozer is taken to have operating weights from 28,000 to 57,000 pounds; approximately equivalent to Caterpillar D6 and D7 class machines. A "small" bulldozer is taken to have operating weights below 20,000 pounds; approximately equivalent to Caterpillar D3 to D5 class machines (or smaller).



Mitigation Measure NOISE-1: The Project contractor shall prepare a construction vibration control plan prior to commencement of construction activities. Specification of the approved vibration control measures shall be included in all construction documents and implemented during construction activities. The construction vibration control plan shall include the following:

- ◆ At least six weeks prior to the beginning of any site disturbance activities, the Project manager shall meet with the construction contractor to discuss the minimization for using vibratory rollers and/or 'large' or 'medium' bulldozers and/or large haul trucks at the Project site; particularly near the site boundaries. Alternatively, less vibration-intensive methods for demolition, site preparation, and/or grading processes ('less-intensive' as compared to large bulldozers, large haul trucks, and vibratory rollers) is recommended.
- ◆ One month prior to the beginning of any demolition, site preparation, and/or grading activities, the construction contractor shall coordinate with all residences, businesses, retail establishments, and office users that are within 150 feet of any Project site boundary regarding the (a) proposed construction schedule, (b) expected equipment usage, and (c) likelihood of vibration (and noise) disturbances from construction activities.
- ◆ The construction contractor shall coordinate with the dental office management no less than three working days prior to the use of vibration-producing equipment in proximity to the dental building. Specifically, this coordination shall take place if (a) medium or large bulldozers are to be used within 75 feet of the dental building or (b) loaded trucks are to be used within 75 feet of the dental building or (c) vibratory rollers are to be used within 150 feet of the dental building. To avoid potential vibration impacts at the dental offices, the use of the above types of equipment within the indicated distances is encouraged to take place during the allowable hours on Saturdays and/or Sundays for construction activities; namely, between 8 a.m. and 5 p.m. on weekend days.
- ◆ The above coordination between the construction contractor, the Project manager, the nearby retail and residential uses, and the nearby office uses shall continue on an as-needed basis throughout the construction phases of the Project to minimize or avoid potential disruption of off-site commercial and/or medical activities. To that end, the construction contractor shall appoint a designated noise and vibration contact person who will be responsible for addressing noise and vibration issues during the construction period. The contact person's phone number shall be made available to all interested parties. Legitimate complaints or concerns shall be addressed within 24 hours of the receipt of communications from any off-site party.
- ◆ Large haul trucks shall follow a speed limit of 15 miles per hour while on the Project site.
- ◆ Discontinuities between roadway surfaces, paved or bare dirt, shall not exceed three inches. Any potholes deeper than three inches below the surrounding grade level and any bumps larger than three inches above the surrounding grade level shall be filled-in or flattened as quickly as possible.

With the above mitigation measure, annoyance impacts from groundborne vibration during the construction phase will be reduced to less than significant levels at the dental offices. All other nearby receptors, while below the threshold of significance without the Mitigation Measure, will be exposed to further-reduced vibration effects as a by-product of mitigation implementation.



In summary, vibration from construction equipment would normally be imperceptible at the nearby receptors, except during occasional periods of heavy activity that will be at the closest portions of the Project site. Even with occasional perceptibility, vibration impacts for both architectural damage and annoyance would be *less than significant* with the delineated Mitigation Measure.

c) Would the Project result in a substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project?

As described in Item a) above, increases in noise levels related to the proposed Project would not significantly increase ambient noise levels in the vicinity of the Project site; either from increased traffic flows or from on-going operations (of on-site equipment). Therefore, there would be no substantial permanent increase in ambient noise levels due to the Project and permanent noise impacts would be *less than significant*. No mitigation measures are necessary.

d) Would the Project result in a substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project?

Temporary noise impacts due to the Project would primarily involve the short-term activities of the construction phase. The proposed Project requires construction of the proposed commercial/retail building along with the associated parking lot and driveways. Prior to the erection of the building, demolition of three existing houses and an existing self-service car wash will take place. Total construction would last approximately six months and the grading/site preparation portion is expected to last for a few weeks. Construction noise would be associated with vehicles entering and leaving the Project site as well as from on-site equipment activities.

i) Construction-related Vehicles

The transport of workers and equipment to the construction site would incrementally increase noise levels along site access roadways and on properties adjacent to the site. The primary access routes for construction vehicles would be Redwood Road and Castro Valley Boulevard, with equipment and personnel generally avoiding the use of Jamison Way and the associated residential uses.

Although there would be a relatively high single-event noise exposure potential with passing trucks (a maximum noise level of 86 dBA at 50 feet), given the size of the proposed Project, the expected volume of workers and trucks is relatively low. Specifically, the existing roadway volumes are between 20,660 and 21,660 daily vehicle trips along the key construction route, Redwood Road.¹⁷ The envisioned worst-case scenario of 45 worker/vendor daily trips,¹⁸ when compared to the existing daily volumes represents Project-generated increments of less than 1/4 percent (i.e., $45/22,000 = 0.21\%$). The corresponding increment in traffic noise is much less than 0.1 dB, which

¹⁷ Abrams Associations, *Traffic Engineering Review of Proposed TJ Maxx Store in the Castro Village Shopping Center*, November 14, 2012.

¹⁸ This value was calculated from the Project's Air Quality modeling programs using default values for this type and size of project. Also, this value is a worst-case scenario as the building construction, paving, and architectural finishing phases were conservatively assumed to overlap; leading to a higher evaluated number of vendor trips than would realistically happen in practice.



is a totally negligible increase. In addition, the truck trips would be spread throughout the workday and would primarily occur during non-peak traffic periods. Therefore, noise impacts from construction-related truck traffic would be less than significant at noise-sensitive receptors along the construction routes and no mitigation measures are necessary

ii) On-site Construction Equipment and Activities

Noise generated during construction is based on the type of equipment used, the location of the equipment relative to sensitive receptors, and the timing and duration of the noise-generating activities. Noise levels are the average noise levels for each construction phase. Each stage involves the use of different kinds of construction equipment and, therefore, has its own distinct noise characteristics.

Noise levels from construction activities are usually dominated by the loudest piece of construction equipment. Noise levels from Project-related construction activities were calculated from the use of all applicable construction equipment and located at the center of the indicated activity zone. The distances from Project construction zones to the nearest existing noise-sensitive receptor structures and are shown in Table N-8. These structures include residential buildings located to the east, north, and west of the Project site, as described above in the vibration section. These measurements are the distance from these sensitive structures to the approximate center of the Project site. Additional details may be found in Attachment C to this report.

Table N-8
Average Construction Noise Levels^a (dBA L_{eq})

Construction Phase	Residences North of Project Site (145 Feet)	Residences East of Project Site (235 Feet)	Residences South of Project Site (420 Feet)
Ground Clearing/Demolition	75	71	66
Excavation	80	76	71
Foundation Construction	69	65	60
Building Construction	76	72	67
Finishing and Site Cleanup	80	76	71

^a Assuming all applicable equipment is in use...noise levels as reported in Bolt, Beranek, and Newman, 1976 are used based on the construction equipment mix provided by the Project applicant.

Source: Bolt, Beranek and Newman 1976, "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances," prepared for the USEPA, December 31, 1971 based on analysis for office building, hotel, hospital, school, and public works projects.

As shown in the table, average noise levels at the nearest existing residential properties would range from 60 to 80 dBA L_{eq} during the approximate 4.5 month duration of construction activities. The highest potential noise exposure would be from grading operations. While the magnitude of the average noise levels may at times be higher compared than the ambient noise environment, construction activities would fluctuate throughout the



workday because equipment would not be in use at one location for an extended period of time. In addition, completion of the proposed retail building exterior shell would attenuate noise from interior construction activities. Furthermore, construction activities would comply with the Alameda County Code that limits the hours of construction from 7:00 a.m. to 7:00 p.m. Monday through Friday and 8:00 a.m. to 5:00 p.m. on Saturdays and Sundays. Thus, construction activities would generally be restricted to the least noise-sensitive portions of the day, and maximum noise levels would be infrequent throughout the workday. Finally, the Alameda County Code generally exempts construction from its noise and vibration limitations.

In summary, the Project would involve off-site construction vehicle trips and the use of (on-site) construction equipment; both of which have the potential to generate short-term, intermittent noise from construction-related activities that could be audible to adjacent receptors. However, the construction-related vehicle trips would contribute inconsequential noise levels to the existing traffic flows. Further, the on-site activities would comply with the Alameda County Code with respect to hours of allowable construction activities. Therefore, noise impacts from construction activities would be less than significant at noise-sensitive receptors and no mitigation measures are necessary.

e) For a Project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the Project expose people residing or working in the Project area to excessive noise levels?

The proposed Project is not within an airport land use plan or within two miles of a public airport or public-use airport. The nearest public airport or public-use airport is the Hayward Air Terminal/Executive Airport (FAA designator HWD) which is 3.65 miles to the southwest of the site.¹⁹ This is a general aviation airport which predominantly serves small, single-engine airplanes.²⁰ The closest commercial airport is Oakland International Airport (OAK) which is 8.0- miles to the west-northwest of the Project site.²¹ Additional details may be found in Attachment D to this report. The proposed Project would not expose people to excessive noise levels; therefore, *no impact* would occur.

f) For a Project within the vicinity of a private airstrip, would the Project expose people residing or working in the Project area to excessive noise levels?

The nearest private airport/airstrip is the Sutter Medical Center Castro Valley Heliport (FAA designator OCA1) which is 0.75 miles to the west of the site.²² Additional details may be found in Attachment D to this report. This facility is primarily used for medevac helicopter operations to the hospital. Helicopter take-offs and landings are at a sufficient distance from the Project site that these aircraft operations would not substantially increase noise levels at the Project site. Further, helicopter operations in the area are infrequent, sporadic, and short-term. People at the Project site (which is not a noise-sensitive land use) would not be exposed to excessive noise levels from helicopter operations, and there would be no private airstrip noise impacts. Therefore, *no impact* would occur.

¹⁹ AirNav (<http://www.airnav.com/>), GoogleEarth, 2012.

²⁰ AirNav (<http://www.airnav.com/>), GoogleEarth, 2012.

²¹ AirNav (<http://www.airnav.com/>), GoogleEarth, 2012.

²² AirNav (<http://www.airnav.com/>), GoogleEarth, 2012.



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Attachment A

Traffic Noise Calculation Details



Attachment B Construction Vibration Calculation Details



Attachment C Construction Noise Calculation Details



Attachment D Details on Nearest Airports/Airfields



Attachment A
Traffic Noise Calculation Details

Redwood Road - North of Jamison Way

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT*</u>
AM Peak Hour		37					630			846		24	1537	15370
PM Peak Hour		62					1021			904		74	2061	20610

Redwood Road - South of Jamison Way to Northern Redwood Road Entrance

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT*</u>
AM Peak Hour			41				630	31		846			1548	15480
PM Peak Hour			74				1021	67		904			2066	20660

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT*</u>
AM Peak Hour		11					664			904		21	1600	16000
PM Peak Hour		14					1070			907		31	2022	20220

Roadway ADT 20660

Redwood Road - Northern Redwood Road Entrance to Southern Redwood Road Entrance

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT*</u>
AM Peak Hour			24				664	31		904			1623	16230
PM Peak Hour			21				1070	44		907			2042	20420

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT*</u>
AM Peak Hour		40				18	604			707	6	83	1458	14580
PM Peak Hour		116				31	969			779	12	116	2023	20230

Roadway ADT 20420

Redwood Road - South of Southern Redwood Road Entrance

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT*</u>
AM Peak Hour			61		14		604	67	13	707			1466	14660
PM Peak Hour			164		21		969	191	42	779			2166	21660

Roadway ADT 21660

Jamison Way

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT*</u>
AM Peak Hour		37	41										78	780
PM Peak Hour		62	74										136	1360

Roadway ADT 1360

Source: Figure 2 and Figure 3, Abrams Associates. 2012, November 14. *Traffic Engineering Review of Proposed TJ Maxx Store in the Castro Village Shopping Center*

* assumes that total daily ADT is 10 times the peak hour flow rate

- EBT=eastbound through
- EBL=eastbound left
- EBR=eastbound right
- WBT=westbound through
- WBL=westbound left
- WBR=westbound right
- NBT=northbound through
- NBL=northbound left
- NBR=northbound right
- SBT=southbound through
- SBL=southbound left
- SBR=southbound right

Redwood Road - North of Jamison Way

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT</u>
AM Peak Hour		39					630			846		27	1542	15420
PM Peak Hour		65					1021			904		76	2066	20660

Redwood Road - South of Jamison Way to Northern Redwood Road Entrance

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT</u>
AM Peak Hour			43				630	32		846			1551	15510
PM Peak Hour			74				1021	68		904			2067	20670

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT</u>
AM Peak Hour		13					664			904		23	1604	16040
PM Peak Hour		19					1070			907		37	2033	20330

Roadway ADT 20670

Redwood Road - Northern Redwood Road Entrance to Southern Redwood Road Entrance

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT</u>
AM Peak Hour			26				664	34		904			1628	16280
PM Peak Hour			26				1070	52		907			2055	20550

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT</u>
AM Peak Hour		40				18	607			710	6	83	1464	14640
PM Peak Hour		116				31	977			784	12	116	2036	20360

Roadway ADT 20550

Redwood Road - South of Southern Redwood Road Entrance

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT</u>
AM Peak Hour			61		14		607	67	13	710			1472	14720
PM Peak Hour			164		21		977	191	42	784			2179	21790

Roadway ADT 21790

Jamison Way

	<u>EBT</u>	<u>EBL</u>	<u>EBR</u>	<u>WBT</u>	<u>WBL</u>	<u>WBR</u>	<u>NBT</u>	<u>NBL</u>	<u>NBR</u>	<u>SBT</u>	<u>SBL</u>	<u>SBR</u>	<u>Total</u>	<u>ADT</u>
AM Peak Hour		39	43										82	820
PM Peak Hour		65	77										142	1420

Roadway ADT 1420

Source: Figure 2 and Figure 3, Abrams Associates. 2012, November 14. *Traffic Engineering Review of Proposed TJ Maxx Store in the Castro Village Shopping Center*

* assumes that total daily ADT is 10 times the peak hour flow rate

- EBT=eastbound through
- EBL=eastbound left
- EBR=eastbound right
- WBT=westbound through
- WBL=westbound left
- WBR=westbound right
- NBT=northbound through
- NBL=northbound left
- NBR=northbound right
- SBT=southbound through
- SBL=southbound left
- SBR=southbound right

Roadway Segment	Existing ADT	Project ADT	Existing+Project ADT	Net Difference (dB CNEL)
Redwood Road				
<i>n/o Jamison Way</i>	20610	50	20660	0.01
<i>between Jamison Way and North Redwood Rd Entrance</i>	20660	10	20670	0.00
<i>btwn North and South Redwood Rd Entrance</i>	20420	130	20550	0.03
<i>s/o South Redwood Rd Entrance</i>	21660	130	21790	0.03
Jamison Way	1360	60	1420	0.19



Attachment B
Construction Vibration Calculation Details

Construction-Generated Vibration

Project: Nahas/Castro Village TJMaxx

RTNC-01.0

data to be entered

Vibration Annoyance Criteria

Receptor:	Dental offices to east	Closest Distance (feet):	65
Equipment	Maximum Vibration Levels, Approximate Velocity Level at 25 ft, VdB	Approximate Velocity Level, VdB	Impact?
Large bulldozer	87	79	Yes
Small bulldozer	58	50	No
Loaded trucks	86	78	No
Criteria		78	

Receptor:	Homes across Jamison	Average Distance (feet):	200
Equipment	Maximum Vibration Levels, Approximate Velocity Level at 25 ft, VdB	Approximate Velocity Level, VdB	Impact?
Large bulldozer	87	69	No
Small bulldozer	58	40	No
Loaded trucks	86	68	No
Criteria		78	

Structural Damage Criteria

Receptor:	Dental offices to east	Closest Distance (feet):	65
Equipment	Maximum Vibration Levels, Approximate RMS a Velocity at 25 ft, inch/second	Approximate RMS Velocity Level, inch/second	Impact?
Large bulldozer	0.089	0.0212	No
Small bulldozer	0.003	0.0007	No
Loaded trucks	0.076	0.0181	No
Criteria		0.200	

Receptor:	Homes across Jamison	Closest Distance (feet):	90
Equipment	Maximum Vibration Levels, Approximate RMS a Velocity at 25 ft, inch/second	Approximate RMS Velocity Level, inch/second	Impact?
Large bulldozer	0.089	0.0130	No
Small bulldozer	0.003	0.0004	No
Loaded trucks	0.076	0.0111	No
Criteria		0.200	

Notes: RMS velocity calculated from vibration level (VdB) using the reference of one microinch/second.

Source: Based on methodology from the United States Department of Transportation Federal Transit Administration, *Transit Noise and Vibration Impact Assessment* (2006).



Attachment C
Construction Noise Calculation Details

Average Construction Generated Noise

Project: Nahas/Castro Village TJMaxx

RTNC-01.0

data to be entered

Construction Phase	REFERENCE Construction Noise at 50 Feet (dBA Leq)		Dist (feet) 50	hard or soft? 0
	All Applicable Equipment in Use ¹	Minimum Required Equipment in Use ¹		
Ground Clearing/Demolition	84	84		
Excavation	89	79		
Foundation Construction	78	78		
Building Construction	85	76		
Finishing and Site Cleanup	89	76		
Residences to north of site (across Jamison Way)			Construction Noise with:	145
Construction Phase	All Applicable Equipment in Use ¹	Minimum Required Equipment in Use ¹		
Ground Clearing/Grading	75	75		
Excavation	80	70		
Foundation Construction	69	69		
Building Construction	76	67		
Finishing and Site Cleanup	80	67		
Residences to east of site (beyond dental office)			Construction Noise with:	235
Construction Phase	All Applicable Equipment in Use ¹	Minimum Required Equipment in Use ¹		
Ground Clearing/Grading	71	71		
Excavation	76	66		
Foundation Construction	65	65		
Building Construction	72	63		
Finishing and Site Cleanup	76	63		
Residences to south of site			Construction Noise with:	420
Construction Phase	All Applicable Equipment in Use ¹	Minimum Required Equipment in Use ¹		
Ground Clearing/Grading	66	66		
Excavation	71	61		
Foundation Construction	60	60		
Building Construction	67	58		
Finishing and Site Cleanup	71	58		

¹ Source: Bolt, Beranek and Newman, "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances," prepared for the USEPA, December 31, 1971. Based on analysis for Office Building, Hotel, Hospital, School,



Attachment D Details on Nearest Airports/Airfields

All nearby cities were searched for facilities within 10 miles of the Castro Village project site. This included Castro Valley, Oakland, Dublin, Pleasanton, Hayward, San Leandro, Fremont, and Alameda. Per AirNav.com:

Sutter Medical Center Castro Valley Heliport <1 Mile from project site

Castro Valley, California, USA

FAA Identifier: OCA1

Lat/Long: 37-41-56.2000N / 122-05-21.3000W

37-41.936667N / 122-05.355000W

37.6989444 / -122.0892500

(estimated)

Elevation: 224 ft. / 68 m (estimated)

From city: 1 mile NNW of CASTRO VALLEY, CA

Time zone: UTC -7 (UTC -8 during Standard Time)

Zip code: 94541

Hayward Executive Airport 3.5 mi from project site

Hayward, CA

FAA Identifier: HWD

Lat/Long: 37-39-32.1000N / 122-07-18.3000W

37-39.535000N / 122-07.305000W

37.6589167 / -122.1217500

(estimated)

Elevation: 52 ft. / 15.8 m (surveyed)

Variation: 15E (2005)

From city: 2 miles W of HAYWARD, CA

Time zone: UTC -7 (UTC -8 during Standard Time)

Zip code: 94545

Naval Hospital Heliport 6.5 mi to project site

Oakland, CA

Location

FAA Identifier: 55CA

Lat/Long: 37-46-00.7410N / 122-09-03.8760W

37-46.012350N / 122-09.064600W

37.7668725 / -122.1510767

(estimated)

Elevation: 374 ft. / 114.0 m (surveyed)

Variation: 16E (1985)

From city: 6 miles SE of OAKLAND, CA

Time zone: UTC -7 (UTC -8 during Standard Time)

Zip code: 94605

Oakland International Airport 7.2 mi from project site

Oakland, CA

FAA Identifier: OAK

Lat/Long: 37-43-16.7000N / 122-13-14.6000W

37-43.278333N / 122-13.243333W

37.7213056 / -122.2207222

(estimated)

Elevation: 9 ft. / 2.7 m (surveyed)

Variation: 16E (1995)

From city: 4 miles S of OAKLAND, CA

Time zone: UTC -7 (UTC -8 during Standard Time)

Zip code: 94502

Camp Parks Heliport 10.0 mi from project site

Pleasanton, CA

FAA Identifier: 4CA3

Lat/Long: 37-42-29.7460N / 121-53-33.8470W

37-42.495767N / 121-53.564117W

37.7082628 / -121.8927353

(estimated)

Elevation: 361 ft. / 110 m (estimated)

Variation: 16E (1985)

From city: 1 mile N of PLEASANTON, CA

Time zone: UTC -7 (UTC -8 during Standard Time)

Zip code: 94568