NOISE IMPACT ANALYSIS

TTM 37803

PERRIS, CALIFORNIA

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PROJECT DESCRIPTION

The approximate 53.13 gross-acre project site is located at the southwest corner of Metz Road and A Street in the City of Perris in Riverside County. The site is vacant with some native vegetation and numerous rock outcroppings throughout the site. The project applicant is proposing the development of 145 single-family detached residential units. There are two points of site access including an entry at Metz Road on the north and San Jacinto Avenue on the south. The project would require approximately 946,211 cubic yards of cut and 946,211 cubic yards of fill and balance on site. The project would be completed in approximately three years.

NOISE SETTING

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise is generally considered to be 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. In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level.

Loud or soft, noisy or quiet, high-and-low pitch are all qualitative terms used to describe sound. These terms are relative descriptions. The science of acoustics attempts to quantify the human perception of sound into a quantitative and measurable basis. Amplitude is the measure of the pressure exerted by sound waves. Amplitude may be so small as to be inaudible by humans, or so great as to be painful. Frequency refers to pitch or tone. The unit of measure is in cycles per second called “hertz”. Very low frequency bass tones and ultra-high frequency treble are difficult for humans to detect. Many noise generators in the ambient world are multi-spectral.

The decibel (dB) scale is used to quantify sound pressure levels. Although decibels are most commonly associated with sound, "dB" is a generic descriptor that is equal to ten times the logarithmic ratio of any physical parameter versus some reference quantity. For sound, the reference level is the faintest sound detectable by a young person with good auditory acuity.

Since the human ear is not equally sensitive to all sound frequencies within the entire auditory spectrum, human response is factored into sound descriptions by weighting sounds within the range of maximum human sensitivity more heavily in a process called “A-weighting,” written as dB(A). Any further reference in this discussion to decibels written as "dB" should be understood to be A-weighted.

Leq is a time-averaged sound level; a single-number value that expresses the time-varying sound level for the specified period as though it were a constant sound level with the same total sound energy as the time-varying level. Its unit is the decibel (dB). The most common averaging period for Leq is hourly.

Because community receptors are more sensitive to unwanted noise intrusion during more sensitive evening and nighttime hours, state law requires that an artificial dBA increment be added to quiet time noise levels. The 24-hour noise descriptor with a specified evening and nocturnal

penalty is called the Community Noise Equivalent Level (CNEL). CNEL's are a weighted average of hourly Leq's.

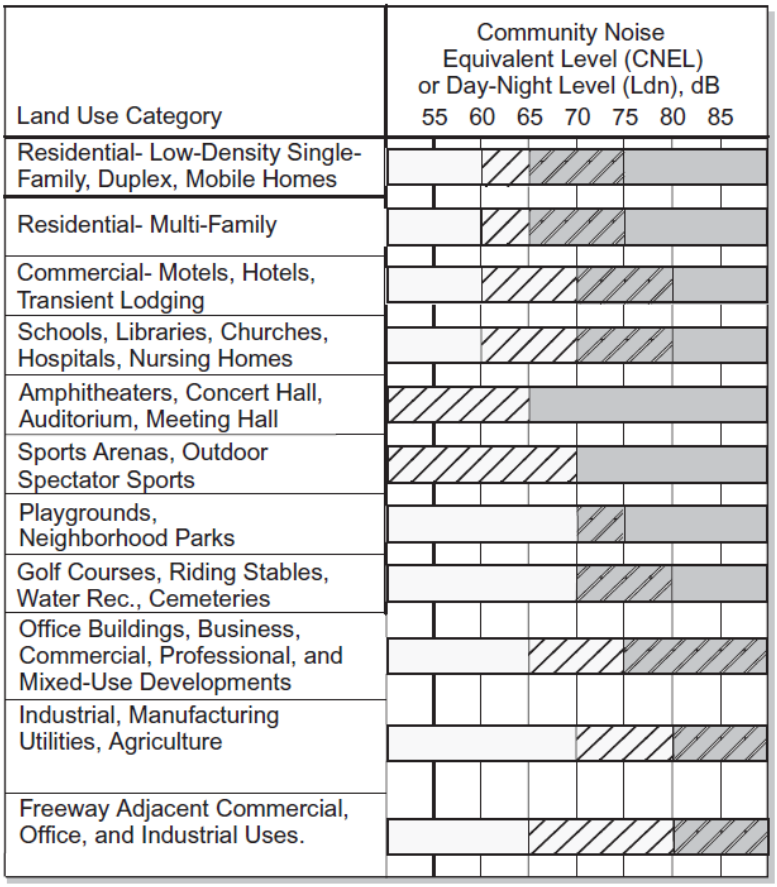
PLANNING STANDARDS

The City of Perris has established guidelines for acceptable community noise levels that are based upon the CNEL rating scale to ensure that noise exposure is considered in any development. CNEL-based standards apply to noise sources whose noise generation is preempted from local control (such as from on-road vehicles, trains, airplanes, etc.) and are used to make land use decisions as to the suitability of a given site for its intended use. These CNEL-based standards are articulated in the Noise Element of the General Plan.

Figure 1 shows the noise compatibility guidelines for various uses. These guidelines would apply in usable outdoor space such as patios, yards, spas, etc. The guidelines indicate that an exterior noise level of 60 dB CNEL is considered to be a "normally acceptable" noise level for single family, duplex and mobile homes involving normal conventional construction, without any special noise insulation requirements. Exterior noise levels up to 65 dB CNEL are typically considered "conditionally acceptable", and residential construction should only occur after a detailed analysis of the noise reduction requirements is made and needed noise attenuation features are included in the project design. Exterior noise attenuation features include, but are not limited to, setbacks to place structures outside the conditionally acceptable noise contour, orienting structures so no windows open to the noise source, and /or installing noise barriers such as berms or solid walls.

An interior CNEL of 45 dB is mandated by the State of California Noise Insulation Standards (CCR, Title 24, Part 6, Section T25-28) for multiple family dwellings and hotel and motel rooms. In 1988, the State Building Standards Commission expanded that standard to include all habitable rooms in residential use, included single-family dwelling units. Since normal noise attenuation within residential structures with closed windows is 20-30 dB, an exterior noise exposure of 65-75 dB CNEL allows the interior standard to be met without any specialized structural attenuation (dual paned windows, etc.), but with closed windows and fresh air supply systems or air conditioning in order to maintain a comfortable living environment.

Figure 1
Noise Compatibility Guidelines
(Perris General Plan)



Nature of the noise environment where the CNEL or Ldn level is:

Below 55 dB
Relatively quiet suburban or urban areas, no arterial streets within 1 block, no freeways within 1/4 mile.

55-65 dB
Most somewhat noisy urban areas, near but not directly adjacent to high volumes of traffic.

65-75 dB
Very noisy urban areas near arterials, freeways or airports.

75+ dB
Extremely noisy urban areas adjacent to freeways or under airport traffic patterns. Hearing damage with constant exposure outdoors.

Normally Acceptable

Specific land use is satisfactory, based on the assumption that any building is of normal conventional construc-tion, without any special

Conditionally Acceptable

New construction or development should be undertaken only after a detailed analysis of noise reduction require-ments is made and needed noise insulation features included in design. Conventional construction, but with closed windows and fresh air supply systems

Normally Unacceptable

New construction or development should generally be discour-aged. If new construc-tion or development does proceed, a de-tailed analysis of noise reduction requirements must be made and needed noise insulation features included in design.

Clearly Unacceptable

New construction or development should generally not be undertaken.

Noise standards applicable to those sources not preempted from local control (i.e., not from traffic on public streets, airplanes, trains, etc.) are contained in the Perris Municipal Code. Section 7.34.060 of the Code provides the following provision regarding construction noise:

- It is unlawful for any person between the hours of 7:00 p.m. of any day and 7:00 a.m. of the following day, or on a legal holiday, with the exception of Columbus Day and Washington's birthday, or on Sundays to erect, construct, demolish, excavate, alter or repair any building or structure in such a manner as to create disturbing, excessive or offensive noise. Construction activity shall not exceed 80 dBA in residential zones in the city. (Code 1972, § 7.34.060; Ord. No. 1082, § 2(part), 2000)

Sec. 16.22.030 in the Municipal Code provides the following requirement for noise impacted projects:

- Residential projects, or portions thereof, which are exposed to a community noise equivalent level (CNEL) of 60 dB or greater are considered to be impacted by excessive noise. Such projects shall be required to include noise isolation design and construction such that the exterior and interior noise standards of the city's noise element of its general plan are not exceeded

BASELINE NOISE LEVELS

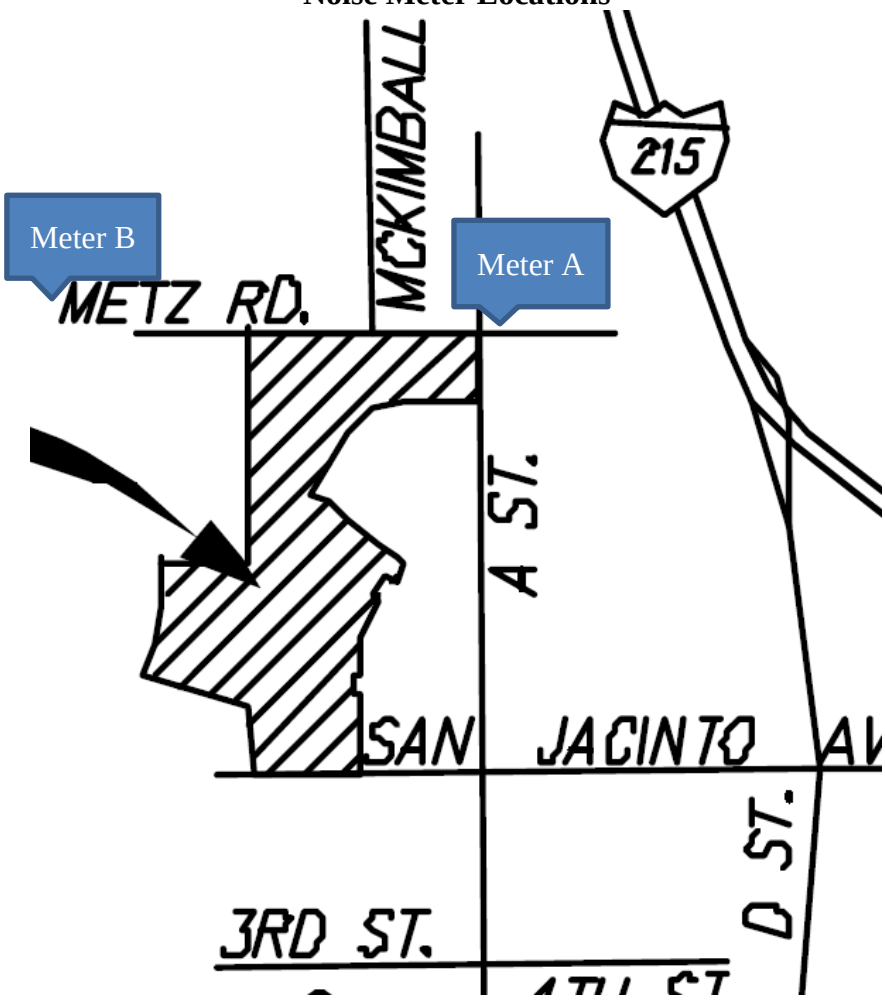
A noise study was conducted by Giroux & Associates on Friday, June 7, 2019. Two short term noise readings were made along in the project vicinity. The noise measurement results are shown below in Table 1 and the location of the monitors is shown on Figure 1.

Table 1
Short-Term Noise Measurements (dB[A])

Meter	Location	Leq	Lmax	Lmin
A	Metz and “A” Street	49	67	35
B	Metz and Delines Road	48	41	36

The meters all displayed low levels of ambient noise which would be expected in the sparsely developed rural area. Daily CNELs are difficult to extrapolate from short term readings, but typically are roughly 3 dBA higher than midafternoon Leq readings. This would suggest CNELs ranging from 51-52 dBA. This is consistent with calculated traffic noise levels shown later in this report.

Figure 2
Noise Meter Locations



NOISE IMPACTS

STANDARDS OF SIGNIFICANCE

Noise impacts are considered significant if they expose persons to levels in excess of standards established in local general plans or noise ordinances. The most desirable exterior noise standard for the City of Perris for residential uses is 60 dBA CNEL in usable recreational space such as backyards, decks, patios, etc. Exterior noise levels of up to 65 dBA CNEL are permissible if a noise study is performed. If required, attenuation through setback and project perimeter barriers is anticipated to be used to reduce traffic noise. An inability to achieve less than a 65 dBA CNEL goal through the application of reasonably available mitigation measures would be considered a significant impact.

Impacts may also be significant if they create either a substantial permanent or temporary increase. The term "substantial" is not quantified in CEQA guidelines. In most environmental analyses, "substantial" is taken to mean a level that is clearly perceptible to humans. In practice, this is at least a +3 dB increase. Some agencies, such as Caltrans, require substantial increases to be +10 dB or more if noise standards are not exceeded by the increase. For purposes of this analysis, a following noise impacts attributed to project development would be considered significant:

1. If construction activities create a noise level of 80 dBA Leq at sensitive receptor locations.

2. If project traffic noise were to cause an increase by a perceptible amount and also expose receivers to levels exceeding city compatibility noise standards.

    - Less than 3 dBA, less than significant
    - Between 3 dBA and 5 dBA: less than significant if noise levels at sensitive receptors remain below 65 dBA CNEL
    - 5 dBA or greater: significant

3. If future noise levels were to expose sensitive receivers to levels exceeding compatibility standards of 65 dB CNEL exterior at any outdoor uses or 45 dB CNEL interior noise levels in any habitable space.

SENSITIVE USES

There are residential uses surrounding the project site. Below is information relating to the most impacted homes. Homes that are farther away than the ones noted below will not only benefit from distance attenuation but will be shielded by the closest homes and will experience much lower noise levels.

> North: There are scattered residences across Metz Road. Metz Road will be 50 feet wide at project completion. The closest structure is 25 feet north of Metz Road. Therefore, there is a minimal 75-foot separation between the northern project property line and off-site residences.

West: Although parcels are zoned residential there is no existing housing.

South. The site is bound on the south by San Jacinto Avenue. San Jacinto Avenue will ultimately be 91 feet wide. Existing homes have a minimal 10-foot setback from the roadway. Therefore, there is at least 100 feet of separation between the project property line and residences to the south.

East: There are several project lots adjacent to the site along the eastern perimeter. These homes take access from A Street (Lots 8-24). Existing homes to the east that are adjacent to these lots are all single story and take access from Roadrunner Way. Separating the buildable site pads from the property line is a 20-foot-wide drainage easement with a 2/1 slope. Very little construction equipment can operate within the 2/1 drainage easement. The homes on Roadrunner Way are minimally 10 feet from the property line. Property within a 10-foot lot line setback would not be considered outdoor recreational space. The project lots adjacent to Roadrunner Way are 100 to 150 feet deep. Rear yards will be at least 20 feet from the top of slope to maximize usable outdoor space. Therefore, other than minimal grading, construction of the closest project structure will minimally be 50 feet from the closest existing home off Roadrunner Way. Existing homes adjacent to Lots 8-24 will likely experience the highest project related construction noise levels.

CONSTRUCTION NOISE SIGNIFICANCE

The Perris Noise Ordinance regulates construction noise. Construction is not permitted between the hours of 7:00 p.m. of any day and 7:00 a.m. of the following day, or on a legal holiday, with the exception of Columbus Day and Washington's birthday, or on Sundays. Construction activity should not exceed 80 dBA in residential zones in the city.

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 by large, earth-moving equipment sources for demolition and grading. During construction and paving, equipment is generally less noisy.

In 2006, the Federal Highway Administration (FHWA) published the Roadway Construction Noise Model that includes a national database of construction equipment reference noise emissions levels. In addition, the database provides an acoustical usage factor to estimate the fraction of time each piece of construction equipment is operating at full power during a construction phase. The usage factor is a key input variable that is used to calculate the average Leq noise levels.

Table 1 identifies highest (Lmax) noise levels associated with each type of equipment identified for use, then adjusts this noise level for distance to the closest sensitive receptor and the extent of equipment usage (usage factor), which is represented as Leq. The table is organized by construction activity and equipment associated with each activity

Quantitatively, the primary noise prediction equation is expressed as follows for the hourly average noise level (Leq) at distance D between the source and receiver (dBA):

Leq = Lmax @ 50' – 20 log (D/50') + 10log (U.F%/100) – I.L.(bar)
Where:
Lmax @ 50' is the published reference noise level at 50 feet
U.F.% is the usage factor for full power operation per hour
I.L.(bar) is the insertion loss for intervening barriers

For the proposed project, the construction fleet would include equipment as shown in Table 2. Table 2 describes the noise level for each piece of equipment at a reference 50-foot distance after adjusting for usage.

Table 2
Construction Equipment Noise Levels

Phase Name	Equipment	Usage Factor[1]	Max Noise @ 50 feet (dB)[2]	Average Noise Level @ 50 feet (dB))
Grading	Grader	40%	85	81
	Scraper	40%	84	80
	Dozer	40%	85	82
	Excavator	40%	81	77
	Loader/Backhoe	37%	78	74
Construction	Crane	16%	81	73
	Loader/Backhoe	37%	78	74
	Welders	46%	74	71
	Generator Set	50%	81	78

	Forklift	20%	75	69
Paving	Paver	50%	77	74
	Paving Equipment	40%	76	72
	Roller	20%	80	74

Source: FHWA's Roadway Construction Noise Model, 2006

1. Estimates the fraction of time each piece of equipment is operating at full power during a construction operation
2. The Lmax values presented are the actual measured values summarized in the Roadway Noise Model User Guide (FHWA 2006) unless the actual is unavailable in which case the equipment specifications were used.

After adjusting for setback distance, the noise levels shown in Table 3 would likely be observed at receptors.

Table 3
Maximum Construction Noise Equipment Levels at Off-Site Sensitive Uses (dBA Leq)

Phase Name	Equipment	Noise Level at Residential Receptors		
		Northern	Southern	Eastern
Grading	Grader	78	75	81
	Scraper	77	74	80
	Dozer	79	76	82
	Excavator	74	71	77
	Loader/Backhoe	71	68	74
Construction	Crane	70	67	73
	Loader/Backhoe	71	68	74
	Welders	68	65	71
	Generator Set	75	72	78
	Forklift	66	63	69
Paving	Paver	71	68	74
	Paving Equipment	69	66	72
	Roller	71	68	74

Homes to the south and north could experience noise levels as high as 76-79 dBA Leq respectively. Homes to the east could experience noise slightly above the city threshold of 80 dBA Leq when a grader or dozer operates less than 50 feet from the property line. By 75 feet, noise levels for graders and dozers would be less than the 80 dBA Leq threshold. Therefore, the following mitigation measure would ensure than the closest sensitive uses to the east would not experience exterior construction noise greater than the 80 dBA threshold:

- Heavy equipment such as graders and dozers shall maintain a minimal 75 feet setback distance from the shared residential property line for Lots 8-24. Any grading shall be done with smaller equipment such as a loader/backhoe or bobcat which are much quieter.

Interior noise levels would be approximately 25-30 dBA lower assuming closed windows. Since the homes are older and may not have dual paned windows a 25 dBA reduction was assumed. This would mean that adjacent residences could experience an interior noise level as high as 55 dBA during construction activities.

For indoor noise environments, the highest noise level that permits relaxed conversation with 100 percent intelligibility throughout the room is 45 dBA. Speech interference is considered to be highly intrusive when normal conversation is precluded at 3 feet, which occurs when ambient noise levels substantially exceed 65 dBA. An interior noise level of 55 dBA at indoor locations would maintain a moderately acceptable interior noise environment with closed windows. In some cases, this noise reduction could be maintained only on a temporary basis, since it requires that windows remain closed at all times assuming homes have air conditioning.

The potential for construction-related noise to adversely affect nearby residential receptors would depend on the location and proximity of construction activities to these receptors. Because the site is large, most construction equipment will operate at much greater setbacks than the worst-case examples provided in Table 2. The Table 2 noise levels would only be realized when heavy equipment operates immediately adjacent to the closest property line.

CONSTRUCTION ACTIVITY VIBRATION

Ground-borne vibration occurs when heavy equipment travels over unpaved surfaces or when it is engaged in soil movement. The effects of ground-borne vibration include discernable movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Vibration related problems generally occur due to resonances in the structural components of a building because structures amplify groundborne vibration. Within the "soft" sedimentary surfaces of much of Southern California, ground vibration is quickly damped out. Groundborne vibration is almost never annoying to people who are outdoors (FTA 2006).

Groundborne vibrations from construction activities rarely reach levels that can damage structures. Because vibration is typically not an issue, very few jurisdictions have adopted vibration significance thresholds. Vibration thresholds have been adopted for major public works construction projects, but these relate mostly to structural protection (cracking foundations or stucco) rather than to human annoyance.

The vibration descriptor commonly used to determine structural damage is the peak particle velocity (ppv) which is defined as the maximum instantaneous positive or negative peak of the vibration signal, usually measured in in/sec. The range of such vibration is shown in Table 4.

Table 4
Human Response To Transient Vibration

Average Human Response	ppv (in/sec)
Severe	2.00
Strongly perceptible	0.90
Distinctly perceptible	0.24
Barely perceptible	0.03

Source: Caltrans Transportation and Construction Vibration Guidance Manual, 2013.

Over the years, numerous vibration criteria and standards have been suggested by researchers, organizations, and governmental agencies. There are no Caltrans or Federal Highway Administration standards for vibration.

According to Caltrans, the threshold for structural vibration damage for modern structures is 0.5 in/sec for intermittent sources, which include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment. The American Association of State Highway and Transportation Officials (AASHTO) (1990) identifies maximum vibration levels for preventing damage to structures from intermittent construction or maintenance activities for residential buildings in good repair with gypsum board walls to be 0.4–0.5 in/sec. The damage threshold criterion of 0.2 in/sec is appropriate for fragile buildings. For this analysis, because adjacent area residences can be older, the 0.2 in/sec damage threshold for older fragile buildings is used as the evaluation criteria. Below this level there is virtually no risk of building damage. Table 5 shows the predicted vibration levels generated by construction equipment at varying distances.

Table 5
Estimated Vibration Levels During Project Construction

Equipment	PPV at 10 ft (in/sec)	PPV at 15 ft (in/sec)	PPV at 25 ft (in/sec)	PPV at 50 ft (in/sec)	PPV at 75 ft (in/sec)
Large Bulldozer	0.352	0.191	0.089	0.031	0.021
Loaded trucks	0.300	0.163	0.076	0.027	0.019
Jackhammer	0.138	0.075	0.035	0.012	0.008
Small Bulldozer	0.012	0.006	0.003	0.001	<0.001

Source: FHWA Transit Noise and Vibration Impact Assessment

The calculation to determine PPV at a given distance is:

PPVdistance = PPVref*(25/D)^1.5

Where:

PPVdistance = the peak particle velocity in inches/second of the equipment adjusted for distance,

PPVref = the reference vibration level in inches/second at 25 feet, and

D = the distance from the equipment to the receiver.

Except for minimal grading, the closest sensitive uses to the east adjacent to the project building envelope have a minimal 50-foot setback. At this distance vibration is below the threshold of perception. Typically, equipment will operate at much greater setbacks than the worst-case condition analyzed. However, if heavy grading equipment such as a bulldozer were to operated 10-feet from the shared property line within the v-ditch, vibration levels could exceed recommended levels. The same mitigation measure used for construction noise would apply to

vibration as well. Adherence to this measure would ensure that vibration would not be perceptible to or cause damage to adjacent residences:

- Heavy equipment such as graders and dozers shall maintain a minimal 75 feet setback distance from the shared residential property line for Lots 8-24. Any grading shall be done with smaller equipment such as a loader/backhoe or bobcat.

VEHICULAR NOISE IMPACTS

Long-term noise concerns from the residential uses at the project site can be derived from vehicular operations on project area roadways. These concerns were addressed using the California specific vehicle noise curves (CALVENO) in the federal roadway noise model (the FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108). The model calculates the Leq noise level for a reference set of input conditions, and then makes a series of adjustments for site-specific traffic volumes, distances, speeds, or noise barriers.

Table 5 summarizes the 24-hour CNEL level at 50 feet from the roadway centerline along area roadway segments. The noise calculations utilize data from the project traffic analysis, prepared by the traffic consultant for this project. Since only peak hour traffic volumes were available, daily ADT was calculated assuming 10 hours per day of peak afternoon traffic. Two traffic years were evaluated; existing conditions ("with project" and "without project"), and opening year 2021, ("with project" and "without project"). Traffic speeds were obtained from the traffic report for most roadways.

Because the area is rural and not built out, project traffic can create a large impact when compared added to existing traffic. As shown in Table 6, there are three roadway segments which could experience potentially significant impacts of more than +3 dBA. Two of the segments are on San Jacinto Avenue, immediately adjacent to the site entrance. The other is on Metz Road also adjacent to the site entrance.

Table 6
Traffic Noise Impact Analysis
(dBA CNEL at 50 feet from centerline)

Segment		Existing No Project	Existing With Project	2021 No Project	2021 With Project	Project Impact Existing*	Project Impact 2021*
San Jacinto/	W of Site Entrance	42.6	42.6	42.6	42.6	0.0	0.0
	E of Site Entrance	54.1	57.8	54.3	57.9	**3.7**	**3.6**
	W of A St	53.5	57.7	53.8	57.8	**4.2**	**4.0**
	E of A St	47.8	47.8	47.8	47.8	0.0	0.0
Jazz/	S of Entrance	51.1	51.1	51.3	51.3	0.0	0.0
W Metz Rd/	W of Mckimball Rd	52.8	52.8	54.7	54.7	0.0	0.0
	Mckimball Rd-A St	53.2	56.9	55.4	58.0	**3.7**	2.6
	E of A St	54.6	54.6	54.9	54.9	0.0	0.0
Mckimball Rd/	N of Site	45.2	45.2	48.0	48.0	0.0	0.0
Nuevo Rd/	W of A St	59.9	59.9	61.8	61.8	0.0	0.0
	E of A St	53.7	53.7	53.9	53.9	0.0	0.0
A St/	N of San Jacinto	61.0	61.2	62.9	63.0	0.2	0.1
	S of Metz	60.8	61.0	62.8	62.9	0.2	0.1

S of Nuevo	59.9	60.6	62.2	62.6	0.7	0.4
N Site Entrance/	DNE	51.6	DNE	51.6	-	-
S Site Entrance/	DNE	49.9	DNE	49.9	-	-

DNE=Does Not Exist bolded numbers are potentially significant noise increases
*may be off by +/- 0.1 due to round off in excel

Current roadway utilization for San Jacinto Avenue in the project vicinity is extremely low. There are less than 42 peak hour afternoon trips in the existing time frame. Because existing volumes are so low, the addition of 58 project trips would more than double the peak hour traffic. However, even with the project, the daily CNEL is less than the recommended 65 dBA compatibility threshold and the project related noise increase is less than 5 dBA and is considered less than significant.

On Metz Road adjacent to the site there are currently 63 pm peak hour trips. The project would add an additional 86 trips. Since a doubling in traffic volumes creates a +3 dBA impact, the with project scenario would create a +3.7 dBA impact in the existing time frame. By 2021 however, due to area growth, there are an expected 105 pm trips per hour such that the addition of 86 project trips would be diluted and project impact decreases to +2.6 dBA. Again however, the overall traffic noise environment would be less than 65 dBA CNEL and the project related contribution is less than 5 dBA so would not be considered a significant impact.

Aside from immediately adjacent to the two site entrances, impacts are quite low and would be less than even the threshold of human perception.

Even at the project entrances, noise levels interior to the site are expected to be less than 60 dBA CNEL at completion. Project residences must also be able to achieve the 45 dB CNEL interior noise threshold.

For typical wood-framed construction with stucco and gypsum board wall assemblies, the exterior to interior noise level reduction is as follows:

Partly open windows – 12 dBA

Closed single-paned windows – 20 dBA

Closed dual-paned windows – 30 dBA

Use of dual-paned windows is required by the California Building Code (CBC) for energy conservation in new residential construction.

Interior standards will be met as long as residents have the option to close their windows. Where window closure is needed to shut out noise, supplemental ventilation is required by the CBC with some specified gradation of fresh air. Central air conditioning or a fresh air inlet on a whole house fan would meet this requirement.

BLASTING NOISE AND VIBRATION

Excavation for the project will include some explosive blasting of rock. Most blasting locations will not be adjacent to existing uses with the exception possible blasting in the south. The size of the explosive charges to be used is not yet determined. However, instantaneous sound levels from typical construction blasting has been documented as approximately 93 to 94 dBA at a distance of 50 feet (Hoover and Keith, 1981). In comparison with other construction sound, the sound from blasting will be higher, but brief and relatively infrequent. Though as stated some limited and minor blasting may be conducted at locations proximal to residential properties, most blasting will be conducted at locations several hundred feet from receptors. The SDEIS contain numerous mitigation measures relating to blasting, including providing pre-blast notification to people with ¼ mile who wish to be notified in the hour before blasts will be made.

If blasting occurs, it would consist of a drill and blast method for removal of the rock. The rock blasting will involve drilling blast holes, placing explosive charges in each of the blast holes, detonation, and the removal of spoils.

Drilling into the rock is necessary to create bore holes for the blasting materials. The average depth for this project is anticipated to be 6 feet with a range of 1-12 feet. Rock drills generate airborne noise levels of approximately 81 dB at a distance of 50 feet as shown in the Federal Highway Noise Construction Handbook (11/30/2015).

The primary noise source of drill-blast operations is the drilling, not the blasting, due to the short duration of the subsurface-contained blast. When explosive charges detonate in rock, almost all of the available energy from the explosion is used in breaking and displacing the rock mass. However, some blast energy does escape into the atmosphere as a sequence of airborne sound waves (a phenomenon known as "air blast over-pressure"), which are very low frequency, below the human audible range. Very high blast over-pressure levels can rattle or sometimes break windows. However, air-blast over-pressure rarely reaches levels that could cause building damage with modern blasting practices.

With respect to blast- induced vibration, because of the controlled nature of any required blasting, charges required would likely be relatively small if there were any nearby vibration-sensitive uses. When explosive charges detonate in rock, almost all of the available energy from the explosion is used in breaking and displacing the rock mass. However, a small portion of the energy is released in the form of vibration waves that radiate away from the charge location. The strength, or "amplitude," of the waves is reduced as the distance from the charge increases. The rate of amplitude decay depends on local geological conditions but can be estimated with a reasonable degree of consistency, which allows regulatory agencies to control blasting operations by means of relationships between distance and explosive quantity.

Noise from blasting is primarily composed of sound pressures at frequencies below the threshold-of- hearing for humans (16 to 20 Hz). Therefore, blast noise is not typically measured with an A-weighted scale (dBA). Typical acoustical noise analyses conducted for the purpose of monitoring compliance with local noise ordinances almost always use weighted scales that discriminate against low frequency noise. Thus, A- weighted scales will usually record significantly lower

levels of noise than linear scaled noise levels. For this reason, blast noise (dB) cannot be compared to local noise ordinances.

The California Department of Transportation (Caltrans) provides guidelines for assessing human response to blasting related activities related to blasting in a publication titled, "Transportation- and- Construction- Induced Vibration Manual." As indicated by Caltrans in this publication, human response to vibration and overpressures from blasting is difficult to quantify. Furthermore, it is anticipated that ground and air overpressures can be felt at levels that are well below those required to produce any damage to structures. Caltrans does provide human response guidelines to blasting ground vibration as shown in Table 7.

Table 7
Human Response to Blasting Ground Vibration and Air Overpressure

Average Human Response	PPV (in/second)	Airblast (dB)
Barely to distinctly perceptible	0.02-0.10	50-70
Distinctly to strongly perceptible	0.10-0.50	70-90
Strongly perceptible to mildly unpleasant	0.50-1.00	120-140
Distinctly unpleasant to intolerable	1.00-2.00	140-170

Source: Caltrans 2004

A U.S. Bureau of Mines Report of Investigation 8507 (RI 8507) analyzed damage potential at 76 homes potentially affected by 219 production blasts. RI 8507 concluded that gypsum wall board construction was protected from cosmetic damage (minor cracks) at peak particle velocities (ppv) of approximately 0.75 inch/second below 40 Hz and 2.0 inches/second above that frequency.

The Office of Surface Mining Reclamation and Enforcement (OSMRE) published a document titled "Blasting Guidance Manual" that addresses the negative effects of blasting. The OSMRE Guidance Manual includes noise and vibration limits with respect to building damage and human perception. The OSMRE airblast limit for building damage associated with blasting related activities is a 120 dB peak noise level. This airblast limit set forth by the OSMRE is based on the minimal probability of superficial damage to residential type structures, and also takes into consideration subjective human response. Per the OSMRE, if an airblast can be kept at or below 120 dB, then annoyance would be minimal. Thus, for the purpose of this analysis, 120 dB is utilized in connection with the analytical evaluation of the potential human annoyance from the project's blasting generated noise level.

The Mining Safety Administration (MSA) offers two options to protect off-site uses from structural damage due to construction blasting. A "scaled distance formula" can be used that establishes maximum charge weight inversely proportional to the square of the blast-receiver separation. This formula is often excessively restrictive such that an alternative protection scheme may be employed. If the secondary approach is used, a geophysical firm approved by Riverside County, must monitor pre-blasting structural conditions (stucco, hard-scape, etc.) and noise and vibration levels during blasting activities. The geophysical firm shall ensure that vibration due to blasting during construction is limited to a peak particle velocity of 0.75 inches per second (in/sec) at the nearest sensitive receptor (i.e., residence) and a 120 dB peak noise level.

It is unlikely that noise impacts from rock drilling and blasting could occur simultaneously. For safety, the area needs to be cleared out for blasting. However, since it is feasible that noise impacts from either operation could exceed the significance threshold, impacts are potentially significant. For the Perris project, the following programmatic mitigation measures for blasting are identified to provide adequate setbacks to ensure noise levels at potential residential property lines of previously completed project phases would be reduced:

1. A blasting program shall be developed that provides for minimum off- site noise and vibration levels. Any blasting in the vicinity of sensitive uses shall be designed to reduce vibration and air over pressure including limiting the size of blasting charges.
2. Advanced notification of proposed blasting activities shall be provided to all residences within 1,000 feet of such activities. The notification should identify potential noise, work hours and time frame, and contact information.
3. Site specific noise and vibration shall be monitored by a blasting expert. The blasting program should provide for response and investigation of complaints. If complaints are received blasting shall not resume until it has been determined whether an alternative blasting strategy or site-specific mitigation needs to be implemented.

SUMMARY AND MITIGATION

It is unlawful for any person between the hours of 7:00 p.m. of any day and 7:00 a.m. of the following day, or on a legal holiday, with the exception of Columbus Day and Washington's birthday, or on Sundays to erect, construct, demolish, excavate, alter or repair any building or structure in such a manner as to create disturbing, excessive or offensive noise. Construction activity shall not exceed 80 dBA in residential zones in the city. In order to achieve noise levels below the 80 dBA threshold at all adjacent receptors to the east, the following mitigation measure is required:

- Heavy equipment such as graders and dozers shall maintain a minimal 75 feet setback distance from the shared residential property line at Lots 8-24. Any required grading shall be done with smaller equipment such as loader/backhoes or bobcats.

In addition, the following construction practices are recommended:

- All mobile equipment shall have properly operating and maintained mufflers.

At the two site entrances, because of very low background traffic, the project impacts are the highest. However, because area traffic, even for the "with project" conditions will be below 60 dBA CNEL, and because the project related impact contribution is less than + 5 dBA, the impacts are considered to be less than significant.

Habitable interior space will be adequately noise protected to achieve 45 dB with only the ability to close windows at perimeter units. Where window closure is needed for policy compliance, supplemental fresh air ventilation such as air conditioning will be provided at rates specified in the California Building Code.

Blasting occurring within 1,000 feet of an off-site residence should follow measures to provide adequate setbacks and to ensure noise is minimized:

1. A blasting program shall be developed that provides for minimum off-site noise and vibration levels. Any blasting in the vicinity of sensitive uses shall be designed to reduce vibration and air over pressure including limiting the size of blasting charges.
2. Advanced notification of proposed blasting activities shall be provided to all residences within 1,000 feet of such activities. The notification should identify potential noise, work hours and time frame, and contact information.
3. Site specific noise and vibration shall be monitored by a blasting expert. The blasting program should provide for response and investigation of complaints. If complaints are received blasting shall not resume until it has been determined whether an alternative blasting strategy or site-specific mitigation needs to be implemented.