801 Opal Avenue

NOISE IMPACT ANALYSIS

COUNTY OF SAN BERNARDINO

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LIST OF ABBREVIATED TERMS

(1)	Reference
ADT	Average Daily Traffic
ANSI	American National Standards Institute
Calveno	California Vehicle Noise
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dBA	A-weighted decibels
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
Hz	Hertz
INCE	Institute of Noise Control Engineering
Leq	Equivalent continuous (average) sound level
Lmax	Maximum level measured over the time interval
Lmin	Minimum level measured over the time interval
mph	Miles per hour
OPR	Office of Planning and Research
PPV	Peak particle velocity
Project	801 Opal Avenue
REMEL	Reference Energy Mean Emission Level
RMS	Root-mean-square
s.f.	Square feet
VdB	Vibration Decibels

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EXECUTIVE SUMMARY

Urban Crossroads, Inc. has prepared this noise study to determine the noise exposure and the necessary noise mitigation measures for the proposed 801 Opal Avenue development ("Project"). The Project site is located on the northeast corner of Opal Avenue and East Colton Avenue in unincorporated County of San Bernardino. The total development is proposed to consist of 126,224 square feet (sf) of manufacturing use and 115,329 sf of warehousing use within the two currently vacant existing buildings. At the time this noise analysis was prepared, the future tenants of the proposed Project were unknown, and therefore, this noise study includes a conservative analysis of the proposed Project uses. This study has been prepared to satisfy applicable County of San Bernardino standards and thresholds of significance based on guidance provided by Appendix G of the California Environmental Quality Act (CEQA) Guidelines. (1)

OFF-SITE TRAFFIC NOISE ANALYSIS

Traffic generated by the operation of the proposed Project will influence the traffic noise levels in surrounding off-site areas. To quantify the off-site traffic noise increases on the surrounding off-site areas, the changes in traffic noise levels on nine study-area roadway segments were calculated based on the change in the average daily traffic (ADT) volumes. The traffic noise levels provided in this analysis are based on the traffic forecasts found in the *801 Opal Avenue Traffic Impact Analysis* prepared by Urban Crossroads, Inc. (2) To assess the off-site noise level impacts associated with the proposed Project, noise contour boundaries were developed for Existing, Opening Year 2018, and Horizon Year 2040 traffic conditions. The analysis shows that the Project-related traffic noise level increases under all traffic scenarios will be *less than significant*.

OPERATIONAL NOISE AND VIBRATION ANALYSIS

Using reference noise levels to represent the expected noise sources from the 801 Opal Avenue site, this analysis estimates the Project-related stationary-source noise levels at nearby sensitive receiver locations. The normal activities associated with the proposed 801 Opal Avenue are anticipated to include idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, parking lot vehicle movements, roof-top air conditioning units, and outdoor storage activities for finished products. The operational noise analysis shows that the Project-related stationary-source noise levels will exceed the County of San Bernardino Development Code daytime exterior noise level standards at receiver location R2; the residential home located on Opal Avenue which is surrounded by the northwestern portion of the Project site boundaries. The Project operational noise levels at all other receiver locations are shown to satisfy the County of San Bernardino daytime exterior noise level standards. (3)

Therefore, mitigation measures are required to reduce the potentially significant operational noise levels to *less than significant* impacts. To satisfy the County of San Bernardino daytime exterior noise level standards, the operational noise mitigation measures include a 10-foot high barrier at the eastern residential property line of receiver location R2, 6-foot high noise barriers at the northern and southern property lines, and a 75-foot buffer zone restricting truck-related storage activity east of R2.. With the operational noise mitigation measures identified in this

noise study, the Project-related operational noise level impacts will be *less than significant*. The operation noise mitigation measures identified in this noise study are required for the existing residential home located on light industrial-designated land use surrounded by the northwestern portion of the Project site boundaries, which requires compliance with the lower, more conservative residential daytime operational noise level limits.

Further, this analysis demonstrates that the Project will not contribute a long-term operational noise level impact to the existing ambient noise environment at any of the sensitive receiver locations. Therefore, the operational noise level impacts associated with the proposed 24-hour seven days per week Project activities, such as the idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, parking lot vehicle movements, roof-top air conditioning units, and outdoor storage activities for finished products, are considered *less than significant* with mitigation.

The operation of the Project site will include heavy trucks moving on site to and from the loading dock areas. Truck vibration levels are dependent on vehicle characteristics, load, speed, and pavement conditions. Typical vibration levels for the 801 Opal Avenue heavy truck activity at normal traffic speeds will approach 0.001 in/sec PPV, based on the Federal Transit Administration (FTA) *Transit Noise Impact and Vibration Assessment*. (4) Truck deliveries transiting on site will be travelling at very low speeds so it is expected that delivery truck vibration impacts at nearby homes will satisfy the peak particle velocity (PPV) vibration threshold of 0.2 in/sec, and therefore, will be *less than significant*.

OPERATIONAL NOISE MITIGATION MEASURES

The following operational noise mitigation measures have been identified to reduce potential operational noise levels received at nearby noise-sensitive receiver locations to *less than significant* impacts:

- If at the time a tenant is identified for the Project site, a tenant-specific noise study shall be required for any special noise generators or equipment which are not already included in this analysis: idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, parking lot vehicle movements, roof-top air conditioning units, and outdoor storage activities for finished products.
- Construct the following noise barriers, as shown on Exhibit 9-B, which shall provide a weight of at least 4 pounds per square foot of face area or provide a minimum transmission loss of 20 dBA. (5) The barriers shall consist of a solid face from top to bottom. Unnecessary openings or decorative cutouts shall not be made. All gaps (except for weep holes) should be filled with grout or caulking.
    - A 10-foot high noise barrier at the eastern property line of the residential home in the northwestern portion of the Project site (receiver location R2);
    - 6-foot high noise barriers at the northern and southern property lines of the residential home in the northwestern portion of the Project site (receiver location R2). A 6 to 8-foot high transition to the 10-foot high eastern property line barrier is recommended.

  - The noise barriers may be constructed using the following materials capable of providing a minimum transmission loss of 20 dBA.:
    - Masonry block;
    - Stucco veneer over wood framing (or foam core), or 1-inch-thick tongue and groove wood of sufficient weight per square foot
    - Glass (1/4-inch-thick), or other transparent material with sufficient weight per square foot
    - Earthen berm
    - Any combination of these construction materials
- A 75-foot buffer zone shall be enforced at the Project site, as shown on Exhibit 9-B, in which the following activities shall not be allowed within 75 feet of the eastern property line of the residential home in the northwestern portion of the Project site (receiver location R2):
  - Truck activity of any kind, including the pick-up or drop-off of finished products or storage materials, the use of back-up alarms, idling, and parking
  - Back-up alarms for any alternative transport methods used to store finished products or materials within the buffer zone.
- All on-site operating equipment under the control of the building user that is used in outdoor areas (including but not limited to trucks, tractors, forklifts, and hostlers), shall be operated with properly functioning and well-maintained mufflers.
- The truck access gates and loading docks within the truck court on the Project site shall be posted with signs which state:
  - Truck drivers shall turn off engines when not in use;
  - Diesel trucks servicing the Project shall not idle for more than five (5) minutes; and
  - Telephone numbers of the building facilities manager and the California Air Resources Board (CARB) to report violations.

CONSTRUCTION NOISE AND VIBRATION ANALYSIS

Construction noise represents a short-term increase on the ambient noise levels. Construction-related noise impacts are expected to create temporary and intermittent high-level noise conditions at receivers surrounding the Project site. Using sample reference noise levels to represent the planned construction activities of the 801 Opal Avenue site, this analysis estimates the Project-related construction noise levels at nearby sensitive receiver locations. The Project-related short-term construction noise levels are expected to approach 80.7 dBA Leq and will satisfy the 85 dBA Leq threshold identified by the National Institute for Occupational Safety and Health (NIOSH) at all receiver locations. Therefore, based on the results of this analysis, all nearby sensitive receiver locations will experience *less than significant* impacts due to Project construction noise levels.

Further, to describe the temporary Project construction noise level contributions to the existing ambient noise environment, the Project construction noise levels were combined with the existing ambient noise levels measurements at the off-site receiver locations. A temporary noise level increase of 12 dBA Leq is considered a potentially significant impact based on the Caltrans

substantial noise level increase criteria which is used to assess the Project-construction noise level increases. (6) The analysis shows that the Project will contribute unmitigated, worst-case construction noise level increases approaching 27.3 dBA Leq during the daytime construction hours. Since the worst-case temporary noise level increase of up to 27.3 dBA Leq during Project construction will exceed the 12 dBA Leq significance threshold, the unmitigated construction noise level increases are considered *potentially significant* temporary noise impacts at receiver locations R1 and R2.

Therefore, construction noise mitigation is required to reduce the short-term noise level increases at receiver locations R1 and R2. With the mitigation measures identified in this noise study, all nearby sensitive receiver locations will experience *less than significant* impacts due to temporary Project construction noise levels. The construction noise analysis presents a conservative approach with the highest noise-level-producing equipment for each stage of Project construction operating at the closest point from construction activity to the nearby sensitive receiver locations. This scenario is unlikely to occur during typical construction activities and likely overstates the construction noise levels which will be experienced at each receiver location.

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods used, distance to the affected structures and soil type. It is expected that ground-borne vibration from Project construction activities would cause only intermittent, localized intrusion. This analysis shows the highest construction vibration levels are expected to approach a peak particle velocity (PPV) of 0.04 in/sec at the nearby receiver locations which is below the vibration standard of 0.2 in/sec PPV at all receiver locations during Project construction. Therefore, the Project-related vibration impacts are considered *less than significant* during the construction activities at the Project site.

Further, the Project-related construction vibration levels do not represent levels capable of causing building damage to nearby residential homes. The FTA identifies construction vibration levels capable of building damage ranging from 0.12 to 0.5 in/sec PPV. (4) The peak Project-construction vibration levels will approach 0.04 in/sec PPV, and are below the FTA vibration levels for building damage at the residential homes near the Project site. Further, the impacts at the site of the closest sensitive receivers are unlikely to be sustained during the entire construction period, but will occur rather only during the times that heavy construction equipment is operating adjacent to the Project site perimeter nearest the closest sensitive receiver. Construction at the Project site will be restricted to daytime hours consistent with City requirements thereby eliminating potential vibration impact during the sensitive nighttime hours.

CONSTRUCTION NOISE MITIGATION MEASURES

Though construction noise is temporary, intermittent and of short duration, and will not present any long-term impacts, the following mitigation measures would reduce noise level increases produced by the construction equipment to the nearby noise-sensitive residential land uses:

- Install minimum 10-foot high temporary construction noise barriers at the Project's western site boundaries adjacent to sensitive receivers on Opal Avenue, as shown on Exhibit 10-A, for the duration of Project construction. The noise control barriers must have a solid face from top to bottom. The noise control barriers must meet the minimum height and be constructed as follows:
    - The temporary noise barriers shall provide a minimum transmission loss of 20 dBA (Federal Highway Administration, Noise Barrier Design Handbook). The noise barrier shall be constructed using an acoustical blanket (e.g. vinyl acoustic curtains or quilted blankets) attached to the construction site perimeter fence or equivalent temporary fence posts;
    - The noise barrier must be maintained and any damage promptly repaired. Gaps, holes, or weaknesses in the barrier or openings between the barrier and the ground shall be promptly repaired;
    - The noise control barrier and associated elements shall be completely removed and the site appropriately restored upon the conclusion of the construction activity.
- The use of dozers shall be prohibited within 150 feet of nearby occupied sensitive residential homes (receiver locations R1 and R2) to reduce the noise levels during Project construction.
- Prior to approval of grading plans and/or issuance of building permits, plans shall include a note indicating that noise-generating Project construction activities shall only occur between the hours of 7:00 a.m. to 7:00 p.m.; with no activity on Sundays and Federal holidays (Section 83.01.080(g)(3) of the County of San Bernardino Development Code).
- During all Project site construction, the construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturers' standards. The construction contractor shall place all stationary construction equipment so that emitted noise is directed away from the noise sensitive receptors nearest the Project site.
- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receivers nearest the Project site (i.e., to the center) during all Project construction.
- The construction contractor shall limit haul truck deliveries to the same hours specified for construction equipment (between the hours of 7:00 a.m. to 7:00 p.m.; with no activity on Sundays and Federal holidays). The contractor shall design delivery routes to minimize the exposure of sensitive land uses or residential dwellings to delivery truck-related noise, consistent with County of San Bernardino General Plan Noise Element, Policy N 1.5.

SUMMARY OF SIGNIFICANCE FINDINGS

The results of this 801 Opal Avenue Noise Impact Analysis are summarized below based on the significance criteria in Section 4 of this report. Table ES-1 shows the findings of significance for each potential noise and/or vibration impact before and after any required mitigation measures.

TABLE ES-1: SUMMARY OF SIGNIFICANCE FINDINGS

Analysis	Report Section	Significance Findings	
		Unmitigated	Mitigated
Off-Site Traffic Noise	7	*Less Than Significant*	*n/a*
Operational Noise	9	*Potentially Significant*	*Less Than Significant*
Operational Vibration		*Less Than Significant*	*n/a*
Construction Noise Level Compliance	10	*Less Than Significant*	*n/a*
Construction Noise Level Increases		*Potentially Significant*	*Less Than Significant*
Construction Vibration		*Less Than Significant*	*n/a*

1 INTRODUCTION

This noise analysis has been completed to determine the noise impacts associated with the development of the proposed 801 Opal Avenue ("Project"). This noise study briefly describes the proposed Project, provides information regarding noise fundamentals, describes the local regulatory setting, provides the study methods and procedures for traffic noise analysis, and evaluates the future exterior noise environment. In addition, this study includes an analysis of the potential Project-related long-term operational and short-term construction noise impacts.

1.1 SITE LOCATION

The proposed 801 Opal Avenue site is located on the northeast corner of Opal Avenue and East Colton Avenue in unincorporated County of San Bernardino, as shown on Exhibit 1-A. Industrial land uses are located north and west of the Project site, and the Redlands East Valley High School is located south of the Project site. Residential land uses are located north and east of the Project site; with one residential home (non-conforming use) encompassed in the northwest site boundaries on Opal Avenue. Interstate 10 (I-10) is located roughly 1.7 miles southwest of the Project site. The Redlands Municipal Airport is located roughly 1.3 miles north of the Project site.

1.2 PROJECT DESCRIPTION

Exhibit 1-B illustrates the preliminary Project site plan. The total development is proposed to consist 126,224 square feet (sf) of manufacturing use and 115,329 sf of warehousing use within the two currently vacant existing buildings. The Project is anticipated to be developed in a single phase with a projected Opening Year of 2018.

At the time this noise analysis was prepared, the future tenants of the proposed Project were unknown. Based on information provided by the *Letter of Intent* for the Project, this analysis assumes the Project would be operational Monday to Friday between the hours of 7:00 a.m. to 7:00 p.m. The on-site Project-related noise sources are expected to include: idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, parking lot vehicle movements, roof-top air conditioning units, and outdoor storage activities for finished products. This noise analysis is intended to describe noise level impacts associated with the expected typical manufacturing and warehouse use activities at the Project site.

Per the *801 Opal Avenue Traffic Impact Analysis* prepared by Urban Crossroads, Inc., the Project is expected to generate a net total of approximately 893 trip-ends per day (actual vehicles) with 127 AM peak hour trips and 129 PM peak hour trips. (2) The net Project trip generation includes 188 truck trip-ends per day from the proposed buildings within the Project site. This noise study relies on the net Project trips (as opposed to the passenger car equivalents) to accurately account for the effect of individual truck trips on the study area roadway network.

EXHIBIT 1-A: LOCATION MAP

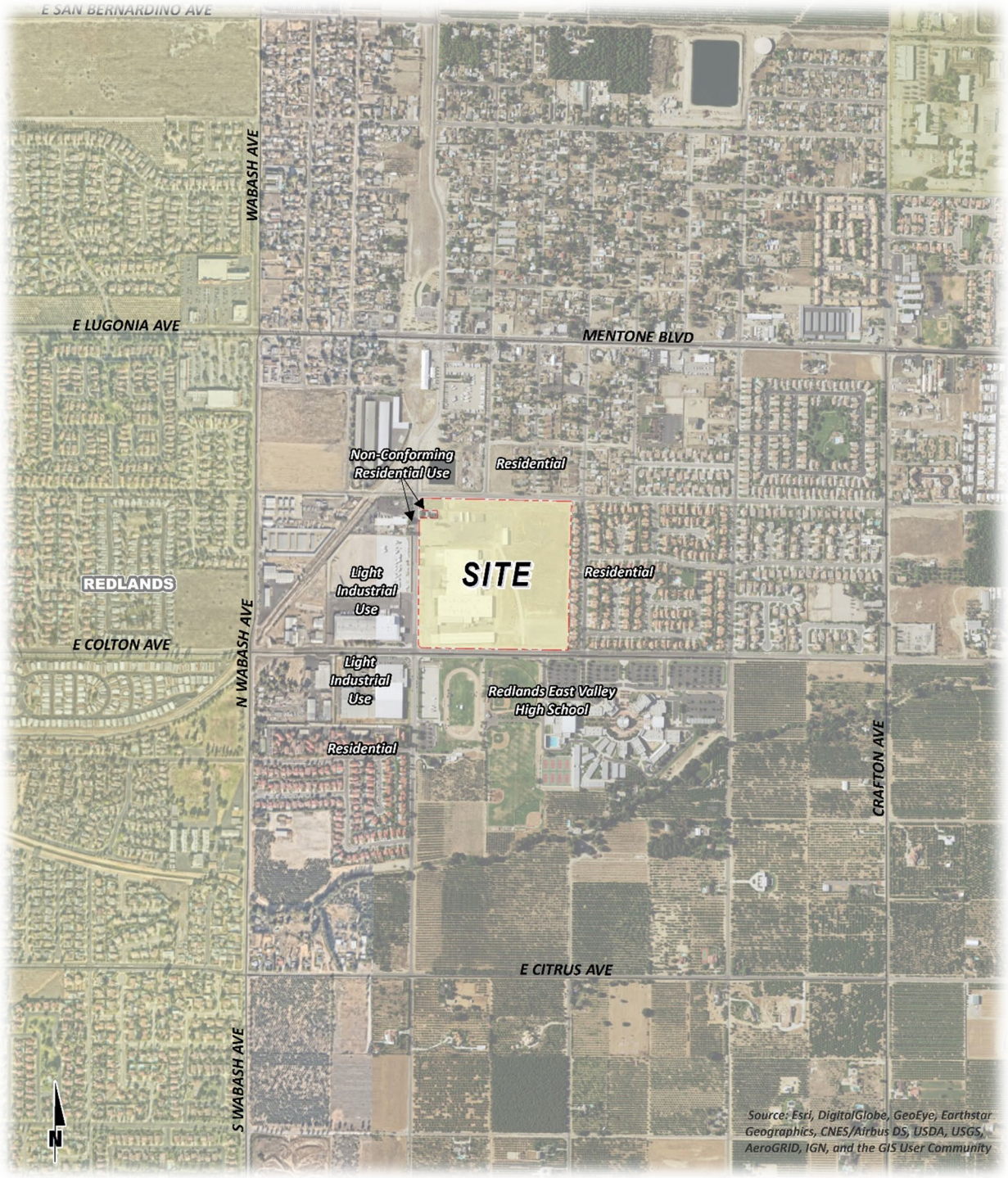
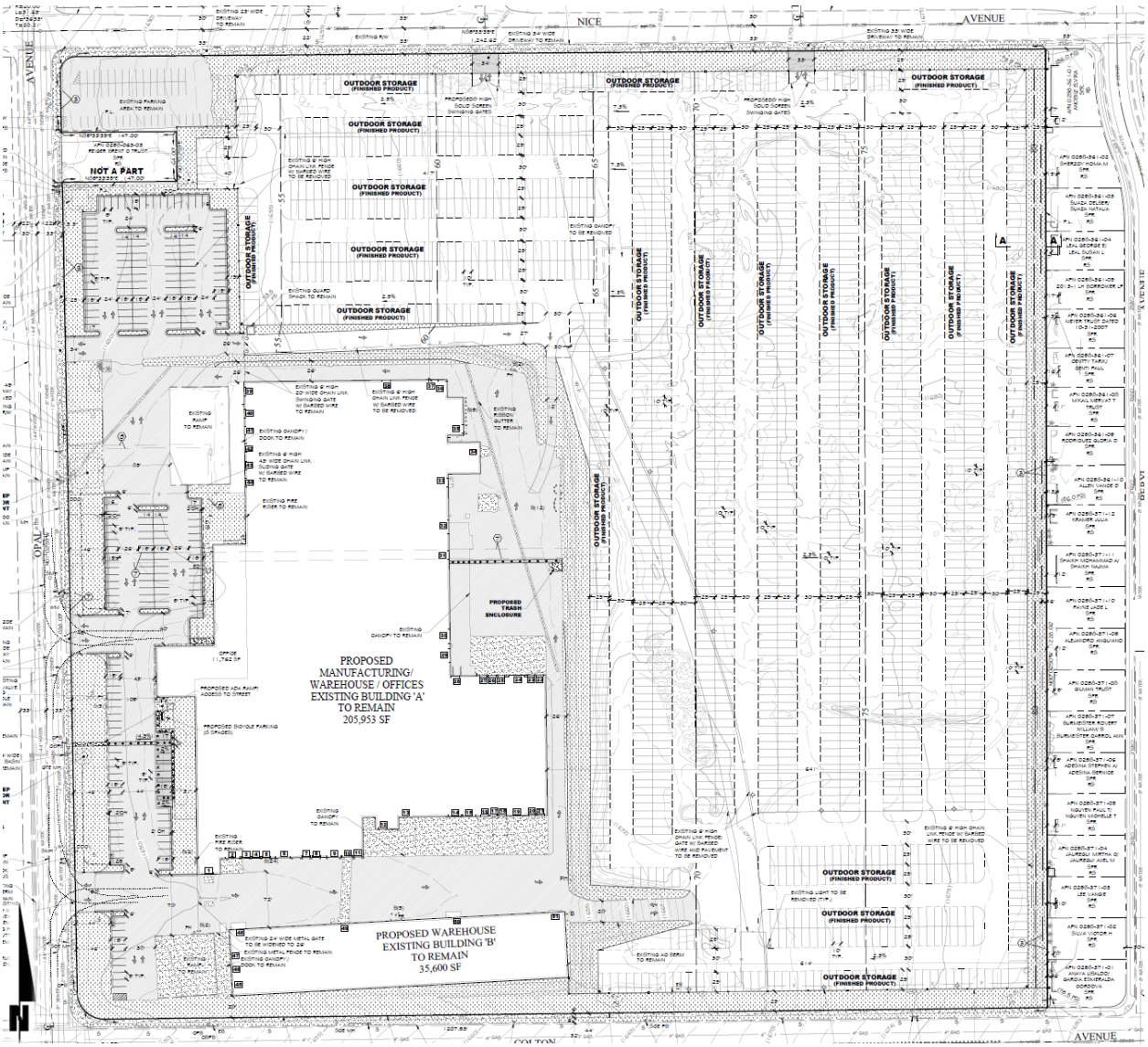


EXHIBIT 1-B: SITE PLAN



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2 FUNDAMENTALS

Noise has been simply defined as "unwanted sound." Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm or when it has adverse effects on health. Noise is measured on a logarithmic scale of sound pressure level known as a decibel (dB). A-weighted decibels (dBA) approximate the subjective response of the human ear to broad frequency noise source by discriminating against very low and very high frequencies of the audible spectrum. They are adjusted to reflect only those frequencies which are audible to the human ear. Exhibit 2-A presents a summary of the typical noise levels and their subjective loudness and effects that are described in more detail below.

EXHIBIT 2-A: TYPICAL NOISE LEVELS

COMMON OUTDOOR ACTIVITIES	COMMON INDOOR ACTIVITIES	A - WEIGHTED SOUND LEVEL dBA	SUBJECTIVE LOUDNESS	EFFECTS OF NOISE
THRESHOLD OF PAIN		140	INTOLERABLE OR DEAFENING	HEARING LOSS
NEAR JET ENGINE		130		
		120		
JET FLY-OVER AT 300m (1000 ft)	ROCK BAND	110		
LOUD AUTO HORN		100	VERY NOISY	
GAS LAWN MOWER AT 1m (3 ft)		90		
DIESEL TRUCK AT 15m (50 ft), at 80 km/hr (50 mph)	FOOD BLENDER AT 1m (3 ft)	80		SPEECH INTERFERENCE
NOISY URBAN AREA, DAYTIME	VACUUM CLEANER AT 3m (10 ft)	70	LOUD	
HEAVY TRAFFIC AT 90m (300 ft)	NORMAL SPEECH AT 1m (3 ft)	60		
QUIET URBAN DAYTIME	LARGE BUSINESS OFFICE	50	MODERATE	SLEEP DISTURBANCE
QUIET URBAN NIGHTTIME	THEATER, LARGE CONFERENCE ROOM (BACKGROUND)	40		
QUIET SUBURBAN NIGHTTIME	LIBRARY	30	FAINT	NO EFFECT
QUIET RURAL NIGHTTIME	BEDROOM AT NIGHT, CONCERT HALL (BACKGROUND)	20		
	BROADCAST/RECORDING STUDIO	10	VERY FAINT	
LOWEST THRESHOLD OF HUMAN HEARING	LOWEST THRESHOLD OF HUMAN HEARING	0		

Source: Environmental Protection Agency Office of Noise Abatement and Control, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (EPA/ONAC 550/9-74-004) March 1974.

2.1 RANGE OF NOISE

Since the range of intensities that the human ear can detect is so large, the scale frequently used to measure intensity is a scale based on multiples of 10, the logarithmic scale. The scale for measuring intensity is the decibel scale. Each interval of 10 decibels indicates a sound energy ten times greater than before, which is perceived by the human ear as being roughly twice as loud. (7) The most common sounds vary between 40 dBA (very quiet) to 100 dBA (very loud). Normal conversation at three feet is roughly at 60 dBA, while loud jet engine noises equate to 110 dBA

at approximately 100 feet, which can cause serious discomfort. (8) Another important aspect of noise is the duration of the sound and the way it is described and distributed in time.

2.2 NOISE DESCRIPTORS

Environmental noise descriptors are generally based on averages, rather than instantaneous, noise levels. The most commonly used figure is the equivalent level (Leq). Equivalent sound levels are not measured directly but are calculated from sound pressure levels typically measured in A-weighted decibels (dBA). The equivalent sound level (Leq) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period and is commonly used to describe the "average" noise levels within the environment.

To describe the time-varying character of environmental noise, the statistical or percentile noise descriptors L_{50}, L_{25}, L_8 and L_2, are commonly used. The percentile noise descriptors are the noise levels equaled or exceeded during 50 percent, 25 percent, 8 percent, and 2 percent of a stated time. Sound levels associated with the L_2 and L_8 typically describe transient or short-term events, while levels associated with the L_{50} describe the steady state (or median) noise conditions. While the L_{50} describes the median noise levels occurring 50 percent of the time, the Leq accounts for the total energy (average) observed for the entire hour. Therefore, the Leq noise descriptor is generally 1-2 dBA higher than the L_{50} noise level.

Peak hour or average noise levels, while useful, do not completely describe a given noise environment. Noise levels lower than peak hour may be disturbing if they occur during times when quiet is most desirable, namely evening and nighttime (sleeping) hours. To account for this, the Community Noise Equivalent Level (CNEL), representing a composite 24-hour noise level is utilized. The CNEL is the weighted average of the intensity of a sound, with corrections for time of day, and averaged over 24 hours. The time of day corrections require the addition of 5 decibels to dBA Leq sound levels in the evening from 7:00 p.m. to 10:00 p.m., and the addition of 10 decibels to dBA Leq sound levels at night between 10:00 p.m. and 7:00 a.m. These additions are made to account for the noise sensitive time periods during the evening and night hours when sound appears louder. CNEL does not represent the actual sound level heard at any time, but rather represents the total sound exposure. The County of San Bernardino relies on the 24-hour CNEL level to assess land use compatibility with transportation related noise sources.

2.3 SOUND PROPAGATION

When sound propagates over a distance, it changes in level and frequency content. The way noise reduces with distance depends on the following factors.

2.3.1 GEOMETRIC SPREADING

Sound from a localized source (i.e., a stationary point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to

as cylindrical spreading. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source. (7)

2.3.2 GROUND ABSORPTION

The propagation path of noise from a highway to a receptor is usually very close to the ground. Noise attenuation from ground absorption and reflective wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 ft. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receptor, such as a parking lot or body of water), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receptor such as soft dirt, grass, or scattered bushes and trees), an excess ground attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dB per doubling of distance from a line source. (9)

2.3.3 ATMOSPHERIC EFFECTS

Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects. (7)

2.3.4 SHIELDING

A large object or barrier in the path between a noise source and a receptor can substantially attenuate noise levels at the receptor. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Shielding by trees and other such vegetation typically only has an “out of sight, out of mind” effect. That is, the perception of noise impact tends to decrease when vegetation blocks the line-of-sight to nearby resident. However, for vegetation to provide a substantial, or even noticeable, noise reduction, the vegetation area must be at least 15 feet in height, 100 feet wide and dense enough to completely obstruct the line-of sight between the source and the receiver. This size of vegetation may provide up to 5 dBA of noise reduction. The FHWA does not consider the planting of vegetation to be a noise abatement measure. (9)

2.4 NOISE CONTROL

Noise control is the process of obtaining an acceptable noise environment for an observation point or receptor by controlling the noise source, transmission path, receptor, or all three. This concept is known as the source-path-receptor concept. In general, noise control measures can be applied to these three elements.

2.5 NOISE BARRIER ATTENUATION

Effective noise barriers can reduce noise levels by 10 to 15 dBA, cutting the loudness of traffic noise in half. A noise barrier is most effective when placed close to the noise source or receptor. Noise barriers, however, do have limitations. For a noise barrier to work, it must be high enough and long enough to block the path of the noise source. (9)

2.6 LAND USE COMPATIBILITY WITH NOISE

Some land uses are more tolerant of noise than others. For example, schools, hospitals, churches, and residences are more sensitive to noise intrusion than are commercial or industrial developments and related activities. As ambient noise levels affect the perceived amenity or livability of a development, so too can the mismanagement of noise impacts impair the economic health and growth potential of a community by reducing the area's desirability as a place to live, shop and work. For this reason, land use compatibility with the noise environment is an important consideration in the planning and design process. The FHWA encourages State and Local government to regulate land development in such a way that noise-sensitive land uses are either prohibited from being located adjacent to a highway, or that the developments are planned, designed, and constructed in such a way that noise impacts are minimized. (10)

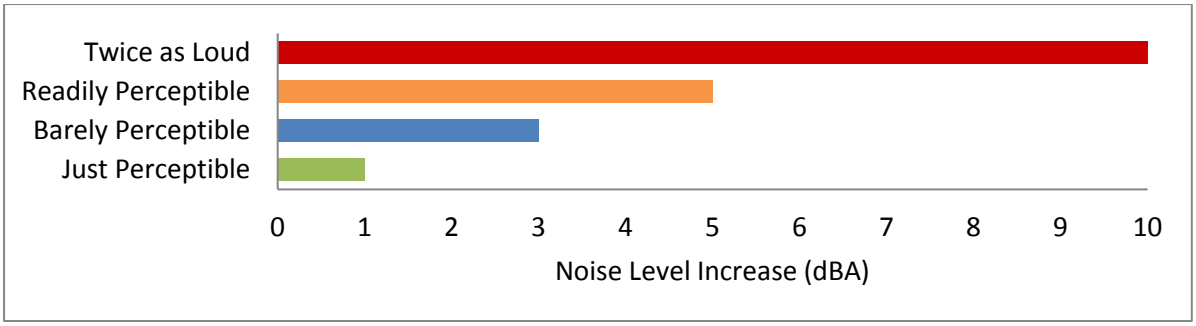
2.7 COMMUNITY RESPONSE TO NOISE

Community responses to noise may range from registering a complaint by telephone or letter, to initiating court action, depending upon everyone's susceptibility to noise and personal attitudes about noise. Several factors are related to the level of community annoyance including:

- Fear associated with noise producing activities;
- Socio-economic status and educational level;
- Perception that those affected are being unfairly treated;
- Attitudes regarding the usefulness of the noise-producing activity;
- Belief that the noise source can be controlled.

Approximately ten percent of the population has a very low tolerance for noise and will object to any noise not of their making. Consequently, even in the quietest environment, some complaints will occur. Another twenty-five percent of the population will not complain even in very severe noise environments. Thus, a variety of reactions can be expected from people exposed to any given noise environment. (11) Surveys have shown that about ten percent of the people exposed to traffic noise of 60 dBA will report being highly annoyed with the noise, and each increase of one dBA is associated with approximately two percent more people being highly annoyed. When traffic noise exceeds 60 dBA or aircraft noise exceeds 55 dBA, people may begin to complain. (11) Despite this variability in behavior on an individual level, the population can be expected to exhibit the following responses to changes in noise levels as shown on Exhibit 2-B. An increase or decrease of 1 dBA cannot be perceived except in carefully controlled laboratory experiments, a change of 3 dBA are considered *barely perceptible*, and changes of 5 dBA are considered *readily perceptible*. (9)

EXHIBIT 2-B: NOISE LEVEL INCREASE PERCEPTION



2.8 EXPOSURE TO HIGH NOISE LEVELS

The Occupational Safety and Health Administration (OSHA) sets legal limits on noise exposure in the workplace. The permissible exposure limit (PEL) for a worker over an eight-hour day is 90 dBA. The OSHA standard uses a 5 dBA exchange rate. This means that when the noise level is increased by 5 dBA, the amount of time a person can be exposed to a certain noise level to receive the same dose is cut in half. The National Institute for Occupational Safety and Health (NIOSH) has recommended that all worker exposures to noise should be controlled below a level equivalent to 85 dBA for eight hours to minimize occupational noise induced hearing loss. NIOSH also recommends a 3 dBA exchange rate so that every increase by 3 dBA doubles the amount of the noise and halves the recommended amount of exposure time. (12)

OSHA has implemented requirements to protect all workers in general industry (e.g. the manufacturing and the service sectors) for employers to implement a Hearing Conservation Program where workers are exposed to a time weighted average noise level of 85 dBA or higher over an eight-hour work shift. Hearing Conservation Programs require employers to measure noise levels, provide free annual hearing exams and free hearing protection, provide training, and conduct evaluations of the adequacy of the hearing protectors in use unless changes to tools, equipment and schedules are made so that they are less noisy and worker exposure to noise is less than the 85 dBA. This noise study does not evaluate the noise exposure of workers within a project or construction site based on CEQA requirements, and instead, evaluates Project-related operational and construction noise levels at the nearby sensitive receiver locations in the Project study area. Further, periodic exposure to high noise levels in short duration, such as Project construction, is typically considered an annoyance and not impactful to human health. It would take several years of exposure to high noise levels to result in hearing impairment. (13)

2.9 VIBRATION

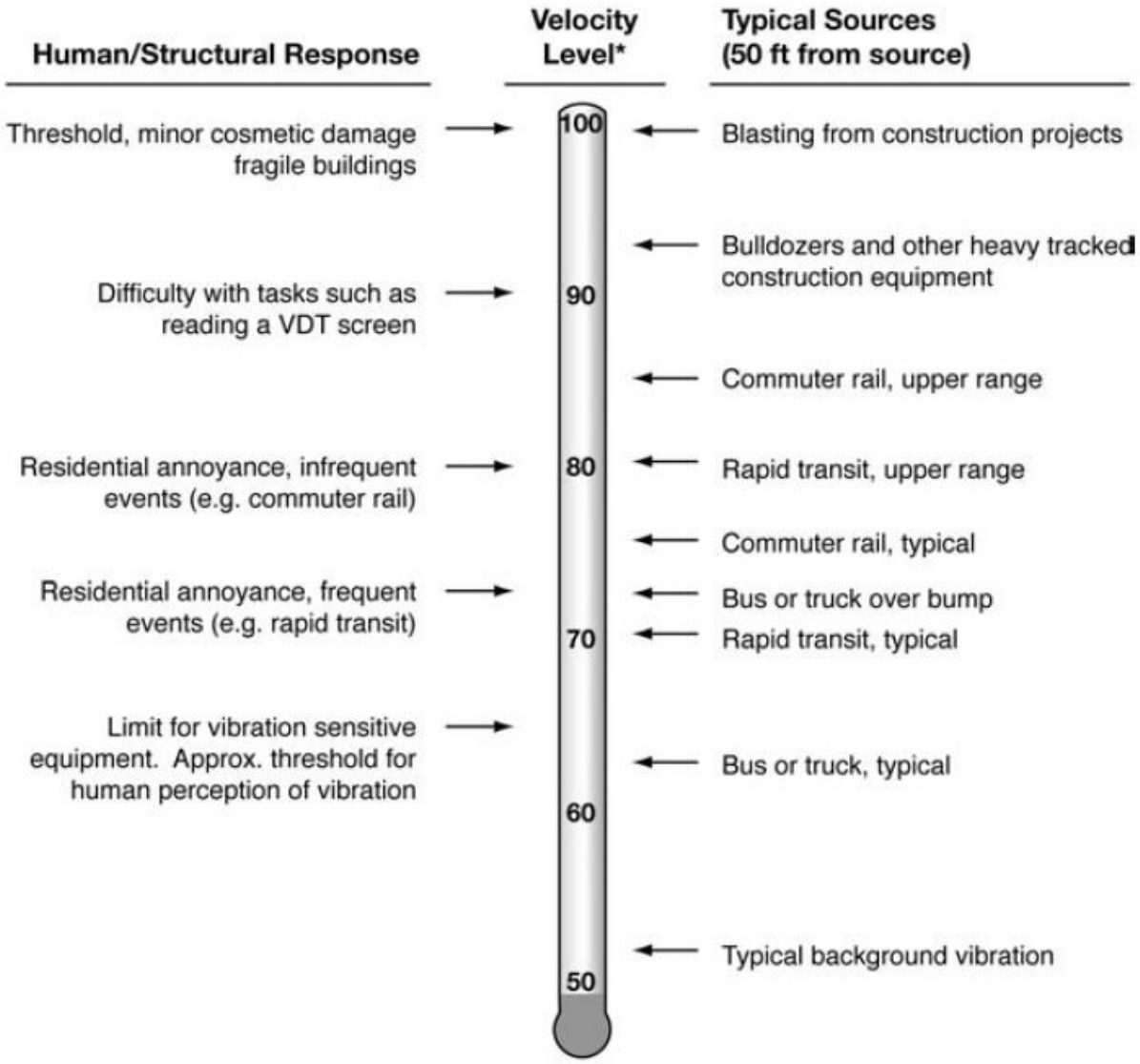
Per the Federal Transit Administration (FTA) *Transit Noise Impact and Vibration Assessment* (4), vibration is the periodic oscillation of a medium or object. The rumbling sound caused by the vibration of room surfaces is called structure-borne noise. Sources of ground-borne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, such as factory machinery, or transient, such as explosions.

As is the case with airborne sound, ground-borne vibrations may be described by amplitude and frequency.

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings, but is not always suitable for evaluating human response (annoyance) because it takes some time for the human body to respond to vibration signals. Instead, the human body responds to average vibration amplitude often described as the root mean square (RMS). The RMS amplitude is defined as the average of the squared amplitude of the signal, and is most frequently used to describe the effect of vibration on the human body. Decibel notation (VdB) is commonly used to measure RMS. Decibel notation (VdB) serves to reduce the range of numbers used to describe human response to vibration. Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receivers for vibration include structures (especially older masonry structures), people (especially residents, the elderly, and sick), and vibration-sensitive equipment.

The background vibration-velocity level in residential areas is generally 50 VdB. Ground-borne vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels. Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground-borne vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings. Exhibit 2-C illustrates common vibration sources and the human and structural response to ground-borne vibration.

EXHIBIT 2-C: TYPICAL LEVELS OF GROUND-BORNE VIBRATION



** RMS Vibration Velocity Level in VdB relative to 10^{-6} inches/second*

Source: Federal Transit Administration (FTA) Transit Noise Impact and Vibration Assessment.

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3 REGULATORY SETTING

To limit population exposure to physically and/or psychologically damaging as well as intrusive noise levels, the federal government, the State of California, various county governments, and most municipalities in the state have established standards and ordinances to control noise. In most areas, automobile and truck traffic is the major source of environmental noise. Traffic activity generally produces an average sound level that remains constant with time. Air and rail traffic, and commercial and industrial activities are also major sources of noise in some areas. Federal, state, and local agencies regulate different aspects of environmental noise. Federal and state agencies generally set noise standards for mobile sources such as aircraft and motor vehicles, while regulation of stationary sources is left to local agencies.

3.1 STATE OF CALIFORNIA NOISE REQUIREMENTS

The State of California regulates freeway noise, sets standards for sound transmission, provides occupational noise control criteria, identifies noise standards, and provides guidance for local land use compatibility. State law requires that each county and city adopt a General Plan that includes a Noise Element which is to be prepared per guidelines adopted by the Governor's Office of Planning and Research (OPR). (14) The purpose of the Noise Element is to *limit the exposure of the community to excessive noise levels*.

3.2 STATE OF CALIFORNIA GREEN BUILDING STANDARDS CODE

The 2014 State of California's Green Building Standards Code contains mandatory measures for non-residential building construction in Section 5.507 on Environmental Comfort. (15) These noise standards are applied to new construction in California for controlling interior noise levels resulting from exterior noise sources. The regulations specify that acoustical studies must be prepared when non-residential structures are developed in areas where the exterior noise levels exceed 65 dBA CNEL, such as within a noise contour of an airport, freeway, railroad, and other areas where noise contours are not readily available. If the development falls within an airport or freeway 65 dBA CNEL noise contour, the combined sound transmission class (STC) rating of the wall and roof-ceiling assemblies must be at least 50. For those developments in areas where noise contours are not readily available and the noise level exceeds 65 dBA Leq for any hour of operation, a wall and roof-ceiling combined STC rating of 45, and exterior windows with a minimum STC rating of 40 are required (Section 5.507.4.1).

3.3 COUNTY OF SAN BERNARDINO GENERAL PLAN NOISE ELEMENT

The County of San Bernardino has adopted a Noise Element of the General Plan to limit the exposure of the community to excessive noise levels. (16) The most common sources of environmental noise in San Bernardino County are associated with roads, airports, railroad operations, and industrial activities. The facilities are used to transport residents, consumer products and provide basic infrastructure for the community. (16) To address these noise sources found in the County of San Bernardino, the following goals have been identified in the General Plan Noise Element:

N 1 The County will abate and avoid excessive noise exposures through noise mitigation measures incorporated into the design of new noise-generating and new noise-sensitive land uses, while protecting areas within the County where the present noise environment is within acceptable limits.

N 1.5 Limit truck traffic in residential and commercial areas to designated truck routes; limit construction, delivery, and through-truck traffic to designated routes; and distribute maps of approved truck routes to County traffic officers.

N 2 The County will strive to preserve and maintain the quiet environment of mountain, desert and other rural areas.

3.4 COUNTY OF SAN BERNARDINO DEVELOPMENT CODE

While the County of San Bernardino General Plan Noise Element provides guidelines and criteria to assess transportation noise on sensitive land uses, the County Code, Title 8 Development Code contains the noise level limits for mobile, stationary, and construction-related noise sources. (3)

3.4.1 TRANSPORTATION NOISE STANDARDS

Section 83.01.080(d), Table 83-3, contains the County of San Bernardino's mobile noise source-related standards, shown on Exhibit 3-A. Based on the County's mobile noise source standards, there are no exterior or interior noise level standards for the manufacturing or warehouse buildings of the Project. Exterior transportation (mobile) noise level standards for residential land uses are shown to be 60 dBA CNEL.

EXHIBIT 3-A: COUNTY OF SAN BERNARDINO MOBILE NOISE LEVEL STANDARDS

Noise Standards for Adjacent Mobile Noise Sources			
Land Use		*Ldn (or CNEL) dB(A)*	
Categories	*Uses*	*Interior (1)*	*Exterior (2)*
Residential	Single and multi-family, duplex, mobile homes	45	60(3)
Commercial	Hotel, motel, transient housing	45	60(3)
	Commercial retail, bank, restaurant	50	N/A
	Office building, research and development, professional offices	45	65
	Amphitheater, concert hall, auditorium, movie theater	45	N/A
Institutional/Public	Hospital, nursing home, school classroom, religious institution, library	45	65
Open Space	Park	N/A	65

Notes:

(1) The indoor environment shall exclude bathrooms, kitchens, toilets, closets and corridors.

(2) The outdoor environment shall be limited to:

- Hospital/office building patios
- Hotel and motel recreation areas
- Mobile home parks
- Multi-family private patios or balconies
- Park picnic areas
- Private yard of single-family dwellings
- School playgrounds

(3) An exterior noise level of up to 65 dB(A) (or CNEL) shall be allowed provided exterior noise levels have been substantially mitigated through a reasonable application of the best available noise reduction technology, and interior noise exposure does not exceed 45 dB(A) (or CNEL) with windows and doors closed. Requiring that windows and doors remain closed to achieve an acceptable interior noise level shall necessitate the use of air conditioning or mechanical ventilation.

CNEL = (Community Noise Equivalent Level). The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night from 10:00 p.m. to 7:00 a.m.

Source: County of San Bernardino County Code, Title 8 Development Code, Table 83-3.

3.4.2 OPERATIONAL NOISE STANDARDS

To analyze noise impacts originating from a designated fixed location or private property such as the 801 Opal Avenue Project, stationary-source (operational) noise such as the expected idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, parking lot vehicle movements, roof-top air conditioning units, and outdoor storage activities for finished products are typically evaluated against standards established under a jurisdiction's Municipal Code. Therefore, to accurately describe the potential Project-related operational noise levels, this analysis presents the appropriate stationary-source noise level standards from the County of San Bernardino County Code, Title 8 Development Code.

The County of San Bernardino County Code, Title 8 Development Code, Section 83.01.080(c) establishes the noise level standards for stationary noise sources. Since the Project will only operate during the daytime hours of 7:00 a.m. to 7:00 p.m., this analysis only evaluates the Project-related operational noise levels during the daytime hours (7:00 a.m. to 10:00 p.m.) identified in the Development Code. Since the Project's industrial land use will potentially impact adjacent residential homes, located immediately east of the Project site and adjacent to the northwest portion of the Project site, this noise study relies on the residential noise level

standards to describe potential operational noise impacts. For residential properties, the exterior noise level shall not exceed 55 dBA Leq during the daytime hours (7:00 a.m. to 10:00 p.m.) for both the whole hour, and for not more than 30 minutes in any hour. (3)

The exterior noise level standards shall apply for a cumulative period of 30 minutes in any hour, as well as plus 5 dBA cannot be exceeded for a cumulative period of more than 15 minutes in any hour, or the standard plus 10 dBA for a cumulative period of more than 5 minutes in any hour, or the standard plus 15 dBA for a cumulative period of more than 1 minute in any hour, or the standard plus 20 dBA for any period of time. The County of San Bernardino operational noise level standards are shown on Table 3-1 and included in Appendix 3.1.

TABLE 3-1: DAYTIME OPERATIONAL NOISE STANDARDS

Land Use[1]	Time Period	Daytime Exterior Noise Level Standards (dBA)[2]					
		Leq (E. Avg.)	L_{50} (30 mins)	L_{25} (15 mins)	L_8 (5 mins)	L_2 (1 min)	L_{max} (Anytime)
Residential	Daytime	55	55	60	65	70	75
Professional Services	Anytime	55	55	60	65	70	75
Other Commercial	Anytime	60	60	65	70	75	80
Industrial	Anytime	70	70	75	80	85	90

[1] Source: Section 83.01.080(c) of the County of San Bernardino County Code, Title 8 Development Code (Appendix 3.1).
[2] Leq represents a steady state sound level containing the same total energy as a time varying signal over a given sample period. The percent noise level is the level exceeded "n" percent of the time during the measurement period. L_{25} is the noise level exceeded 25% of the time.
"Daytime" = 7:00 a.m. to 10:00 p.m.; "E. Avg." = logarithmic (energy) average

3.4.3 CONSTRUCTION NOISE STANDARDS

To analyze noise impacts originating from the construction of the 801 Opal Avenue Project, noise from construction activities are typically limited to the hours of operation established under a jurisdiction's Municipal Code. Section 83.01.080(g)(3) of the County of San Bernardino Development Code, provided in Appendix 3.1, indicates that construction activity is considered exempt from the noise level standards between the hours of 7:00a.m. to 7:00 p.m. except on Sundays and Federal holidays, as shown on Table 3-1. (3) However, neither the County of San Bernardino General Plan or County Code establish numeric maximum acceptable construction source noise levels at potentially affected receivers, which would allow for a quantified determination of what CEQA constitutes a *substantial temporary or periodic noise increase*. Therefore, the following construction noise level threshold is used in this noise study.

To evaluate whether the Project will generate potentially significant construction noise levels at off-site sensitive receiver locations, a construction-related noise level threshold is adopted from the *Criteria for Recommended Standard: Occupational Noise Exposure* prepared by the National Institute for Occupational Safety and Health (NIOSH). (17) A division of the U.S. Department of Health and Human Services, NIOSH identifies a noise level threshold based on the duration of exposure to the source. The construction related noise level threshold starts at 85 dBA for more than eight hours per day, and for every 3 dBA increase, the exposure time is cut in half. This results in noise level thresholds of 88 dBA for more than four hours per day, 92 dBA for more

than one hour per day, 96 dBA for more than 30 minutes per day, and up to 100 dBA for more than 15 minutes per day. (17) For the purposes of this analysis, the lowest, more conservative construction noise level threshold of 85 dBA Leq is used as an acceptable threshold for construction noise at the nearby sensitive receiver locations. Since this construction-related noise level threshold represents the energy average of the noise source over a given time, they are expressed as Leq noise levels. Therefore, the noise level threshold of 85 dBA Leq over a period of eight hours or more is used to evaluate the potential Project-related construction noise level impacts at the nearby sensitive receiver locations.

The Occupational Safety and Health Administration (OSHA) requires hearing protection be provided by employers in workplaces where the noise levels may, over long periods of exposure to high noise levels, endanger the hearing of their employees. Standard 29 CFR, Part 1910 indicates the noise levels under which a hearing conservation program is required to be provided to workers exposed to high noise levels. (12) This analysis does not evaluate the noise exposure of construction workers within the Project site based on CEQA requirements, and instead, evaluates the Project-related construction noise levels at the nearby sensitive receiver locations in the Project study area. Further, periodic exposure to high noise levels in short duration, such as Project construction, is typically considered an annoyance and not impactful to human health. It would take several years of exposure to high noise levels to result in hearing impairment. (13)

TABLE 3-2: CONSTRUCTION NOISE STANDARDS

Jurisdiction	Permitted Hours of Construction Activity	Construction Noise Level Standards
County of San Bernardino[1]	Exempt between 7:00 a.m. to 7:00 p.m.; except Sundays and Federal holidays.	n/a

[1] Source: Section 83.01.080(g)(3) of the County of San Bernardino County Code, Title 8 Development Code (Appendix 3.1).
"n/a" = County Code does not identify maximum acceptable construction source noise levels.

3.4.4 CONSTRUCTION VIBRATION STANDARDS

To analyze vibration impacts originating from the operation and construction of the 801 Opal Avenue, vibration-generating activities are typically evaluated against standards established under a jurisdiction's Municipal Code. Therefore, the County of San Bernardino Development Code vibration level standards are used in this analysis to assess potential impacts at nearby sensitive receiver locations. The vibration standards are summarized on Table 3-3.

The County of San Bernardino Development Code, Section 83.01.090(a) states that vibration shall be no *greater than or equal to two-tenths inches per second measured at or beyond the lot line*. (3) Therefore, to determine if the vibration levels due to the operation and construction of the Project, the peak particle velocity (PPV) vibration level standard of 0.2 inches per second is used.

TABLE 3-3: VIBRATION STANDARDS

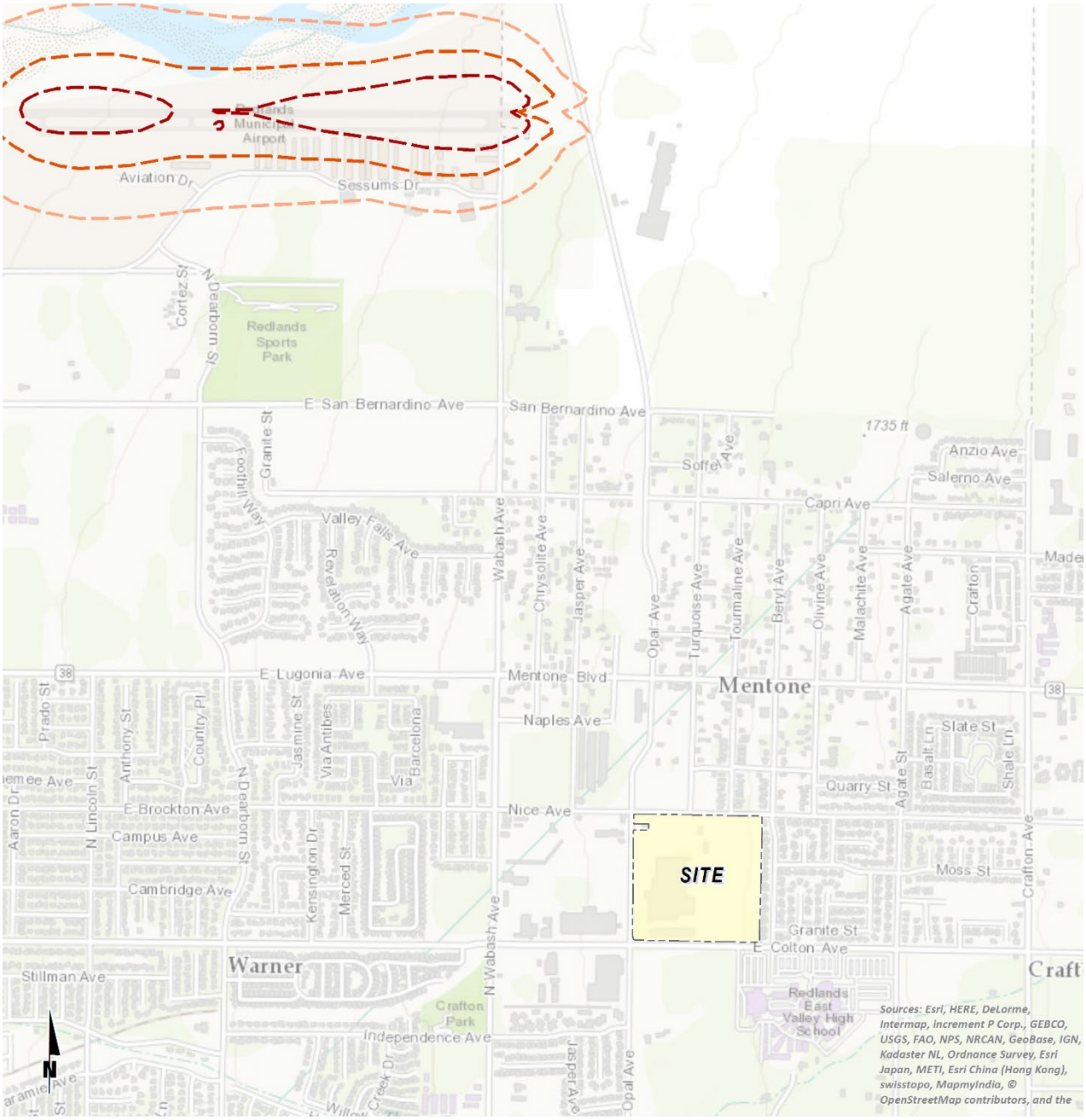
Jurisdiction	Peak Particle Velocity (PPV) (inches/second)
County of San Bernardino[1]	0.2 in/sec

[1] Source: Section 83.01.090(a) of the County of San Bernardino County Code, Title 8 Development Code (Appendix 3.1).

3.5 REDLANDS MUNICIPAL AIRPORT

The Redlands Municipal Airport is located roughly 1.3 miles north of the Project site. Land use compatibility criteria related to aircraft noise levels from Redlands Municipal Airport are based on the *Master Plan for Redlands Municipal Airport.* (18) As shown on Exhibit 3-B, the Project site is located well beyond the 60 dBA CNEL noise level contour boundaries of Redlands Municipal Airport, and therefore, is deemed *compatible* use per the *Master Plan for Redlands Municipal Airport*. No further aircraft-related noise analysis is included in this report.

EXHIBIT 3-B: FUTURE YEAR 2027 REDLANDS MUNICIPAL AIRPORT NOISE CONTOURS



LEGEND:

2027 Noise Level Contour Boundaries

Unmitigated 65 dBA CNEL Noise Level Contour Boundary

Unmitigated 70 dBA CNEL Noise Level Contour Boundary

Unmitigated 75 dBA CNEL Noise Level Contour Boundary

Source: Final Master Plan for Redlands Municipal Airport, Exhibit 5B.

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4 SIGNIFICANCE CRITERIA

The following significance criteria are based on guidance provided by Appendix G of the California Environmental Quality Act (CEQA) Guidelines. For the purposes of this report, impacts would be potentially significant if the Project results in or causes:

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 ground-borne vibration or ground-borne noise levels.

C. A substantial permanent increase in ambient noise levels in the Project vicinity above existing levels without the proposed Project; or

D. A substantial temporary or periodic increase in ambient noise levels in the Project vicinity above noise levels existing without the proposed 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 in the Project area to excessive noise levels.

While the CEQA Guidelines and the County of San Bernardino General Plan Guidelines provide direction on noise compatibility and establish noise standards by land use type that are sufficient to assess the significance of noise impacts under CEQA Guideline A, they do not define the levels at which increases are considered substantial for use under Guidelines B, C, and D. CEQA Guidelines E and F apply to nearby public and private airports, if any, and the Project's land use compatibility.

The Redlands Municipal Airport is located roughly 1.3 miles north of the Project site. As previously shown on Exhibit 3-B, the Project site is located well beyond the 60 dBA CNEL noise level contour boundaries of Redlands Municipal Airport, and therefore, is deemed *compatible* use per the *Master Plan for Redlands Municipal Airport*. (18) Further, the Project site is not located near a private airstrip. Therefore, the potential impacts under CEQA guidelines E and F are considered *less than significant*, and no further noise analysis is required for aircraft-related noise levels.

4.1 NOISE-SENSITIVE RECEIVERS

Noise level increases resulting from the Project are evaluated based on the Appendix N CEQA Guidelines described above at the closest sensitive receiver locations. Under CEQA, consideration must be given to the magnitude of the increase, the existing ambient noise levels, and the location of noise-sensitive receivers to determine if a noise increase represents a significant adverse environmental impact. This approach recognizes *that there is no single noise increase that renders the noise impact significant.* (19) Unfortunately, there is no completely satisfactory way to measure the subjective effects of noise or of the corresponding human

reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and differing individual experiences with noise. Thus, an important way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment to which one has adapted—the so-called *ambient* environment.

4.1.1 SUBSTANTIAL PERMANENT NOISE LEVEL INCREASES

In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will typically be judged. The Federal Interagency Committee on Noise (FICON) (20) developed guidance to be used for the assessment of project-generated increases in noise levels that consider the ambient noise level. The FICON recommendations are based on studies that relate aircraft noise levels to the percentage of persons highly annoyed by aircraft noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, these recommendations are often used in environmental noise impact assessments involving the use of cumulative noise exposure metrics, such as the average-daily noise level (CNEL) and equivalent continuous noise level (Leq).

For example, if the ambient noise environment is quiet (<60 dBA) and the new noise source greatly increases the noise levels, an impact may occur if the noise criteria may be exceeded. Therefore, for this analysis, FICON identifies a *readily perceptible* 5 dBA or greater project-related noise level increase is considered a significant impact when the noise criteria for a given land use is exceeded. Per FICON, in areas where the without project noise levels range from 60 to 65 dBA, a 3 dBA *barely perceptible* noise level increase appears to be appropriate for most people. When the without project noise levels already exceed 65 dBA, any increase in community noise louder than 1.5 dBA or greater is considered a significant impact if the noise criteria for a given land use is exceeded, since it likely contributes to an existing noise exposure exceedance. Table 4-1 below provides a summary of the potential noise impact significance criteria, based on guidance from FICON.

TABLE 4-1: SIGNIFICANCE OF NOISE IMPACTS AT NOISE-SENSITIVE RECEIVERS

Without Project Noise Level	Potential Significant Impact
< 60 dBA	5 dBA or more
60 - 65 dBA	3 dBA or more
> 65 dBA	1.5 dBA or more

Federal Interagency Committee on Noise (FICON), 1992.

4.1.2 SUBSTANTIAL TEMPORARY OF PERIODIC NOISE LEVEL INCREASES

Due to the temporary, short-term nature of noise-generating construction activities, the temporary or periodic noise level increases over the existing ambient conditions must be considered under CEQA Guideline D. Therefore, the Caltrans *Traffic Noise Analysis Protocol* 12 dBA Leq *substantial* noise level increase threshold is used in this analysis to assess temporary noise level increases. (6) If the Project-related construction noise levels generate a temporary noise level increase above the existing ambient noise levels of up to 12 dBA Leq, then the Project construction noise level increases will be considered a potentially significant impact. Although

the Caltrans recommendations were specifically developed to assess traffic noise impacts, the 12 dBA Leq substantial noise level increase threshold is used in California to address noise level increases with the potential to exceed existing conditions. (6)

4.2 SIGNIFICANCE CRITERIA SUMMARY

Noise impacts shall be considered significant if any of the following occur as a direct result of the proposed development. Table 4-2 shows the significance criteria summary matrix.

OFF-SITE TRAFFIC NOISE

- When the noise levels at existing and future noise-sensitive land uses (e.g. residential, etc.):
    - are less than 60 dBA CNEL and the Project creates a readily perceptible 5 dBA CNEL or greater Project-related noise level increase; or
    - range from 60 to 65 dBA CNEL and the Project creates a barely perceptible 3 dBA CNEL or greater Project-related noise level increase; or
    - already exceed 65 dBA CNEL, and the Project creates a community noise level impact of greater than 1.5 dBA CNEL (FICON, 1992).

OPERATIONAL NOISE

- If Project-related operational (stationary-source) noise levels:
    - exceed the exterior 55 dBA Leq daytime noise level standards for sensitive land uses. These standards shall not be exceeded for a cumulative period of 30 minutes (L_{50}), or plus 5 dBA cannot be exceeded for a cumulative period of more than 15 minutes (L_{25}) in any hour, or the standard plus 10 dBA for a cumulative period of more than 5 minutes (L_8) in any hour, or the standard plus 15 dBA for a cumulative period of more than 1 minute (L_2) in any hour, or the standard plus 20 dBA at any time (Lmax) (Section 83.01.080(c) of the County of San Bernardino County Code, Title 8 Development Code);
- If the existing ambient noise levels at the nearby noise-sensitive receivers near the Project site:
    - are less than 60 dBA Leq and the Project creates a readily perceptible 5 dBA Leq or greater Project-related noise level increase; or
    - range from 60 to 65 dBA Leq and the Project creates a barely perceptible 3 dBA Leq or greater Project-related noise level increase; or
    - already exceed 65 dBA, Leq and the Project creates a community noise level impact of greater than 1.5 dBA Leq (FICON, 1992).
- If Project operational vibration levels exceed the County of San Bernardino vibration standard of 0.2 in/sec PPV at sensitive receiver locations (Section 83.01.090(a) of the County of San Bernardino County Code, Title 8 Development Code).

CONSTRUCTION NOISE AND VIBRATION

- If Project-related construction activities:

- occur at any time other than the permitted hours of 7:00 a.m. to 7:00 p.m.; with no activity allowed on Sundays and Federal holidays (Section 83.01.080(g)(3) of the County of San Bernardino County Code, Title 8 Development Code); or
- create noise levels which exceed the 85 dBA Leq acceptable noise level threshold at the nearby sensitive receiver locations (NIOSH, Criteria for Recommended Standard: Occupational Noise Exposure);
- generate temporary Project construction-related noise level increases which exceed the 12 dBA Leq substantial noise level increase threshold at noise-sensitive receiver locations (Caltrans, Traffic Noise Analysis Protocol).

- If short-term Project construction vibration levels exceed the County of San Bernardino vibration standard of 0.2 in/sec PPV at sensitive receiver locations (Section 83.01.090(a) of the County of San Bernardino County Code, Title 8 Development Code).

TABLE 4-2: SIGNIFICANCE CRITERIA SUMMARY

Analysis	Receiving Land Use	Condition(s)	Significance Criteria	
			Daytime	Nighttime
Off-Site Traffic	Noise-Sensitive[1]	If ambient is < 60 dBA CNEL	≥ 5 dBA CNEL Project increase	
		If ambient is 60 - 65 dBA CNEL	≥ 3 dBA CNEL Project increase	
		If ambient is > 65 dBA CNEL	≥ 1.5 dBA CNEL Project increase	
Operational	Residential[2]	Hourly Leq	55	n/a
		≥ 30 Minutes L_{50}	55	n/a
		≥ 15 Minutes L_{25}	60	n/a
		≥ 5 Minutes L_8	65	n/a
		≥ 1 Minute L_2	70	n/a
		Anytime L_{max}	75	n/a
	Noise-Sensitive[1]	if ambient is < 60 dBA Leq	≥ 5 dBA Leq Project increase	
		if ambient is 60 - 65 dBA Leq	≥ 3 dBA Leq Project increase	
		if ambient is > 65 dBA Leq	≥ 1.5 dBA Leq Project increase	
Construction	Noise-Sensitive	Permitted between 7:00 a.m. to 7:00 p.m.; except Sundays and Federal holidays.[3]		
		Noise Level Threshold[4]	85 dBA Leq	n/a
		Noise Level Increase[5]	12 dBA Leq	n/a
		Vibration Level Threshold[6]	0.2 in/sec PPV	n/a

[1] Source: FICON, 1992.
[2] Source: Section 83.01.080(c) of the County of San Bernardino County Code, Title 8 Development Code (Appendix 3.1).
[3] Source: Section 83.01.080(g)(3) of the County of San Bernardino County Code, Title 8 Development Code (Appendix 3.1).
[4] Source: NIOSH, Criteria for Recommended Standard: Occupational Noise Exposure, June 1998.
[5] Source: Caltrans Traffic Noise Analysis Protocol, May 2011.
[6] Source: Section 83.01.090(a) of the County of San Bernardino County Code, Title 8 Development Code (Appendix 3.1).
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.; "n/a" = Project operation limited to the hours of 7:00 a.m. to 7:00 p.m. and construction activities are not permitted during the daytime hours; "PPV" = Peak Particle Velocity.

5 EXISTING NOISE LEVEL MEASUREMENTS

To assess the existing noise level environment, four 24-hour noise level measurements were taken at sensitive receiver locations in the Project study area. The receiver locations were selected to describe and document the existing noise environment within the Project study area. Exhibit 5-A provides the boundaries of the Project study area and the noise level measurement locations. To fully describe the existing noise conditions, noise level measurements were collected by Urban Crossroads, Inc. on Wednesday, May 10th, 2017. Appendix 5.1 includes study area photos.

5.1 MEASUREMENT PROCEDURE AND CRITERIA

To describe the existing noise environment, the hourly noise levels were measured during typical weekday conditions over a 24-hour period. By collecting individual hourly noise level measurements, it is possible to describe the daytime and nighttime hourly noise levels and calculate the 24-hour CNEL. The long-term noise readings were recorded using Piccolo Type 2 integrating sound level meter and dataloggers. The Piccolo sound level meters were calibrated using a Larson-Davis calibrator, Model CAL 150. All noise meters were programmed in "slow" mode to record noise levels in "A" weighted form. The sound level meters and microphones were equipped with a windscreen during all measurements. All noise level measurement equipment satisfies the American National Standards Institute (ANSI) standard specifications for sound level meters ANSI S1.4-2014/IEC 61672-1:2013. (21)

5.2 NOISE MEASUREMENT LOCATIONS

The long-term noise level measurements were positioned as close to the nearest sensitive receiver locations as possible to assess the existing ambient hourly noise levels surrounding the Project site. Both Caltrans and the FTA recognize that it is not reasonable to collect noise level measurements that can fully represent every part of a private yard, patio, deck, or balcony normally used for human activity when estimating impacts for new development projects. This is demonstrated in the Caltrans general site location guidelines which indicate that, *sites must be free of noise contamination by sources other than sources of interest. Avoid sites located near sources such as barking dogs, lawnmowers, pool pumps, and air conditioners unless it is the express intent of the analyst to measure these sources*. (7) Further, FTA guidance states, t*hat it is not necessary nor recommended that existing noise exposure be determined by measuring at every noise-sensitive location in the project area. Rather, the recommended approach is to characterize the noise environment for clusters of sites based on measurements or estimates at representative locations in the community*. (4)

Based on recommendations of Caltrans and the FTA, it is not necessary to collect measurements at each individual building or residence, because each receiver measurement represents a group of buildings that share acoustical equivalence. (4) In other words, the area represented by the receiver shares similar shielding, terrain, and geometric relationship to the reference noise source. Receivers represent a location of noise sensitive areas and are used to estimate the future noise level impacts. Collecting reference ambient noise level measurements at the nearby

sensitive receiver locations allows for a comparison of the before and after Project noise levels and is necessary to assess potential noise impacts due to the Project's contribution to the ambient noise levels.

5.3 NOISE MEASUREMENT RESULTS

The noise measurements presented below focus on the average or equivalent sound levels (Leq). The equivalent sound level (Leq) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period. Table 5-1 identifies the hourly daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) noise levels at each noise level measurement location. Appendix 5.2 provides a summary of the existing hourly ambient noise levels described below:

- Location L1 represents the noise levels on Opal Avenue adjacent to an existing residential home bounded by the Project site boundaries. The noise level measurements collected show an overall 24-hour exterior noise level of 56.1 dBA CNEL. The hourly noise levels measured at location L1 ranged from 45.3 to 56.0 dBA Leq during the daytime hours and from 41.2 to 52.9 dBA Leq during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 53.4 dBA Leq with an average nighttime noise level of 48.1 dBA Leq.
- Location L2 represents the noise levels north of the Project site at the intersection of Turquoise Avenue and Nice Avenue near existing residential homes. The noise level measurements collected show an overall 24-hour exterior noise level of 64.9 dBA CNEL. The hourly noise levels measured at location L2 ranged from 55.3 to 63.5 dBA Leq during the daytime hours and from 40.1 to 65.7 dBA Leq during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 60.8 dBA Leq with an average nighttime noise level of 57.5 dBA Leq.
- Location L3 represents the noise levels at the southeast corner of the Project site adjacent to an existing barrier for residential homes, and north of the Redlands East Valley High School. The 24-hour CNEL indicates that the overall exterior noise level is 64.0 dBA CNEL. At location L3 the background ambient noise levels ranged from 58.7 to 69.0 dBA Leq during the daytime hours to levels of 47.7 to 66.3 dBA Leq during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 64.0 dBA Leq with an average nighttime noise level of 59.2 dBA Leq.
- Located south of the Project site, location L4 represents the noise levels on Opal Avenue near existing residential homes and the Redlands East Valley High School. The noise level measurements collected show an overall 24-hour exterior noise level of 66.6 dBA CNEL. The hourly noise levels measured at location L4 ranged from 56.3 to 65.1 dBA Leq during the daytime hours and from 47.6 to 66.9 dBA Leq during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 62.4 dBA Leq with an average nighttime noise level of 59.5 dBA Leq.

Table 5-1 provides the (energy average) noise levels used to describe the daytime and nighttime ambient conditions. These daytime and nighttime energy average noise levels represent the average of all hourly noise levels observed during these time periods expressed as a single number. Appendix 5.2 provides summary worksheets of the noise levels for each hour as well as

the minimum, maximum, L_1, L_2, L_5, L_8, L_{25}, L_{50}, L_{90}, L_{95}, and L_{99} percentile noise levels observed during the daytime and nighttime periods.

The background ambient noise levels in the Project study area are dominated by the transportation-related noise associated with the arterial roadway network and background industrial land use activities. This includes the auto and heavy truck activities on study area roadway segments near the noise level measurement locations. The 24-hour existing noise level measurement results are shown on Table 5-1.

TABLE 5-1: 24-HOUR AMBIENT NOISE LEVEL MEASUREMENTS

Location[1]	Distance to Project Boundary (Feet)	Description	Energy Average Hourly Noise Level (dBA Leq)[2]		CNEL
			Daytime	Nighttime	
L1	0'	Located on Opal Avenue adjacent to an existing residential home bounded by the Project site boundaries.	53.4	48.1	56.1
L2	70'	Located north of the Project site at the intersection of Turquoise Avenue and Nice Avenue near existing residential homes.	60.8	57.5	64.9
L3	0'	Located at the southeast corner of the Project site adjacent to an existing barrier for residential homes, and north of the Redlands East Valley High School.	64.0	59.2	66.9
L4	670'	Located south of the Project site on Opal Avenue near existing residential homes and the Redlands East Valley High School.	62.4	59.5	66.6

[1] See Exhibit 5-A for the noise level measurement locations.
[2] Energy (logarithmic) average hourly levels. The long-term 24-hour measurement worksheets are included in Appendix 5.2.
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

EXHIBIT 5-A: NOISE MEASUREMENT LOCATIONS

6 METHODS AND PROCEDURES

The following section outlines the methods and procedures used to model and analyze the future traffic noise environment.

6.1 FHWA TRAFFIC NOISE PREDICTION MODEL

The expected roadway noise level increases from vehicular traffic were calculated by Urban Crossroads, Inc. using a computer program that replicates the Federal Highway Administration (FHWA) Traffic Noise Prediction Model- FHWA-RD-77-108. (22) The FHWA Model arrives at a predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL). In California the national REMELs are substituted with the California Vehicle Noise (Calveno) Emission Levels. (23) Adjustments are then made to the REMEL to account for: the roadway classification (e.g., collector, secondary, major or arterial), the roadway active width (i.e., the distance between the center of the outermost travel lanes on each side of the roadway), the total average daily traffic (ADT), the travel speed, the percentages of automobiles, medium trucks, and heavy trucks in the traffic volume, the roadway grade, the angle of view (e.g., whether the roadway view is blocked), the site conditions ("hard" or "soft" relates to the absorption of the ground, pavement, or landscaping), and the percentage of total ADT which flows each hour throughout a 24-hour period. Research conducted by Caltrans has shown that the use of soft site conditions is appropriate for the application of the FHWA traffic noise prediction model used in this analysis. (24)

6.2 OFF-SITE TRAFFIC NOISE PREDICTION MODEL INPUTS

Table 6-1 presents the roadway parameters used to assess the Project's off-site transportation noise impacts. Table 6-1 identifies the nine study area roadway segments, the distance from the centerline to adjacent land use based on the functional roadway classifications per the County of San Bernardino and City of Redlands General Plan Circulation Elements, and the posted vehicle speeds. The ADT volumes used in this study are presented on Table 6-1 are based on the *801 Opal Avenue Traffic Impact Analysis* prepared by Urban Crossroads, Inc., for the following traffic scenarios: Existing, Opening Year 2018, and Year 2040 conditions. (2) Table 6-3 provides the time of day (daytime, evening, and nighttime) vehicle splits.

TABLE 6-1: OFF-SITE ROADWAY PARAMETERS

ID	Roadway	Segment	Adjacent Planned (Existing) Land Use[1]	Distance from Centerline to Nearest Adjacent Land Use (Feet)[2]	Posted Vehicle Speed (mph)
1	Judson St.	s/o Colton Av.	Residential	44'	40
2	Wabash Av.	s/o Colton Av.	Light Industrial (Residential)	44'	40
3	Opal Av.	n/o Dwy. 1	Light Industrial (Residential)	25'	35
4	Mentone Bl.	w/o Opal Av.	Commercial	52'	40
5	Colton Av.	w/o Judson St.	Residential	44'	35
6	Colton Av.	e/o Judson St.	Residential	44'	35
7	Colton Av.	e/o Dearborn St.	Residential	44'	40
8	Colton Av.	e/o Wabash Av.	Light Industrial (Residential)	44'	35
9	Colton Av.	e/o Opal Av.	Public/Institutional (School)	44'	35

[1] Sources: County of San Bernardino General Plan, Mentone Community Plan and City of Redlands General Plan Map Figure 4.1.
[2] Distance to adjacent land use is based upon the right-of-way distances for each functional roadway classification provided in the General Plan Circulation Elements of the County of San Bernardino and City of Redlands.

TABLE 6-2: AVERAGE DAILY TRAFFIC VOLUMES

ID	Roadway	Segment	Average Daily Traffic Volumes[1]					
			Existing		Opening Year 2018		Horizon Year 2040	
			Without Project	With Project	Without Project	With Project	Without Project	With Project
1	Judson St.	s/o Colton Av.	6,669	6,810	7,628	7,769	9,087	9,228
2	Wabash Av.	s/o Colton Av.	6,439	6,549	6,832	6,942	10,118	10,228
3	Opal Av.	n/o Dwy. 1	1,243	1,371	1,418	1,546	1,690	1,818
4	Mentone Bl.	w/o Opal Av.	18,449	18,604	19,238	19,393	23,273	23,428
5	Colton Av.	w/o Judson St.	8,200	8,518	8,917	9,235	10,710	11,028
6	Colton Av.	e/o Judson St.	8,233	8,727	8,979	9,473	10,779	11,273
7	Colton Av.	e/o Dearborn St.	6,791	7,321	7,508	8,038	8,993	9,523
8	Colton Av.	e/o Wabash Av.	6,904	7,544	7,382	8,022	8,892	9,532
9	Colton Av.	e/o Opal Av.	6,552	6,623	7,173	7,244	8,606	8,677

[1] Source: 801 Opal Avenue Traffic Impact Analysis, Urban Crossroads, Inc., May 2017.

TABLE 6-3: TIME OF DAY VEHICLE SPLITS

Vehicle Type	Time of Day Splits[1]			Total of Time of Day Splits
	Daytime	Evening	Nighttime	
Autos	76.46%	12.14%	11.39%	100.00%
Medium Trucks	76.99%	10.94%	12.07%	100.00%
Heavy Trucks	94.64%	1.79%	3.57%	100.00%

[1] Based on existing 24-hour classification counts by vehicle type taken on Colton Avenue east of Judson Street (801 Opal Avenue Traffic Impact Analysis, Urban Crossroads, Inc., May 2017). Vehicle mix percentage values rounded to the nearest one-hundredth. "Daytime" = 7:00 a.m. to 7:00 p.m.; "Evening" = 7:00 p.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

Per the *801 Opal Avenue Traffic Impact Analysis* prepared by Urban Crossroads, Inc., the Project is expected to generate a net total of approximately 893 trip-ends per day (actual vehicles) with 127 AM peak hour trips and 129 PM peak hour trips. (2) The net Project trip generation includes 188 truck trip-ends per day from the proposed buildings within the Project site. This noise study relies on the net Project trips (as opposed to the passenger car equivalents) to accurately account for the effect of individual truck trips on the study area roadway network. To quantify the off-site noise levels, the Project related truck trips were added to the heavy truck category in the FHWA noise prediction model. The addition of the Project related truck trips increases the percentage of heavy trucks in the vehicle mix. This approach recognizes that the FHWA noise prediction model is significantly influenced by the number of heavy trucks in the vehicle mix.

The 188 daily Project truck trip-ends were assigned to the individual off-site study area roadway segments based on the Project truck trip distribution percentages documented in the *Traffic Impact Analysis*. Using the Project truck trips in combination with the Project trip distribution, Urban Crossroads, Inc. calculated the number of additional Project truck trips and vehicle mix percentages for each of the study area roadway segments. Table 6-4 shows the traffic flow by vehicle type (vehicle mix) used for all without Project traffic scenarios, and Tables 6-5 and 6-6 show the vehicle mixes used for the with Project traffic scenarios.

TABLE 6-4: WITHOUT PROJECT CONDITIONS VEHICLE MIX

Classification	Total % Traffic Flow[1]			Total
	Autos	Medium Trucks	Heavy Trucks	
All Segments	90.26%	9.03%	0.72%	100.00%

[1] Based on existing 24-hour classification counts by vehicle type taken on Colton Avenue east of Judson Street (801 Opal Avenue Traffic Impact Analysis, Urban Crossroads, Inc., May 2017). Vehicle mix percentage values rounded to the nearest one-hundredth.

TABLE 6-5: EXISTING WITH PROJECT CONDITIONS VEHICLE MIX

ID	Roadway	Segment	With Project[1]			
			Autos	Medium Trucks	Heavy Trucks	Total[2]
1	Judson St.	s/o Colton Av.	90.46%	8.84%	0.70%	100.00%
2	Wabash Av.	s/o Colton Av.	89.27%	9.19%	1.53%	100.00%
3	Opal Av.	n/o Dwy. 1	87.00%	9.35%	3.64%	100.00%
4	Mentone Bl.	w/o Opal Av.	89.73%	9.12%	1.15%	100.00%
5	Colton Av.	w/o Judson St.	90.62%	8.69%	0.69%	100.00%
6	Colton Av.	e/o Judson St.	90.81%	8.51%	0.68%	100.00%
7	Colton Av.	e/o Dearborn St.	90.96%	8.37%	0.67%	100.00%
8	Colton Av.	e/o Wabash Av.	90.09%	8.54%	1.37%	100.00%
9	Colton Av.	e/o Opal Av.	90.36%	8.93%	0.71%	100.00%

[1] Source: 801 Opal Avenue Traffic Impact Analysis, Urban Crossroads, Inc., May 2017.
[2] Total of vehicle mix percentage values rounded to the nearest one-hundredth.

TABLE 6-6: OPENING YEAR 2018 WITH PROJECT CONDITIONS VEHICLE MIX

ID	Roadway	Segment	With Project[1]			
			Autos	Medium Trucks	Heavy Trucks	Total[2]
1	Judson St.	s/o Colton Av.	90.43%	8.86%	0.70%	100.00%
2	Wabash Av.	s/o Colton Av.	89.33%	9.19%	1.48%	100.00%
3	Opal Av.	n/o Dwy. 1	87.37%	9.32%	3.31%	100.00%
4	Mentone Bl.	w/o Opal Av.	89.75%	9.12%	1.13%	100.00%
5	Colton Av.	w/o Judson St.	90.59%	8.72%	0.69%	100.00%
6	Colton Av.	e/o Judson St.	90.76%	8.56%	0.68%	100.00%
7	Colton Av.	e/o Dearborn St.	90.90%	8.43%	0.67%	100.00%
8	Colton Av.	e/o Wabash Av.	90.10%	8.57%	1.33%	100.00%
9	Colton Av.	e/o Opal Av.	90.35%	8.94%	0.71%	100.00%

[1] Source: 801 Opal Avenue Traffic Impact Analysis, Urban Crossroads, Inc., May 2017.
[2] Total of vehicle mix percentage values rounded to the nearest one-hundredth.

TABLE 6-7: HORIZON YEAR 2040 WITH PROJECT CONDITIONS VEHICLE MIX

ID	Roadway	Segment	With Project[1]			
			Autos	Medium Trucks	Heavy Trucks	Total[2]
1	Judson St.	s/o Colton Av.	90.41%	8.89%	0.71%	100.00%
2	Wabash Av.	s/o Colton Av.	89.63%	9.13%	1.24%	100.00%
3	Opal Av.	n/o Dwy. 1	87.80%	9.27%	2.92%	100.00%
4	Mentone Bl.	w/o Opal Av.	89.84%	9.10%	1.06%	100.00%
5	Colton Av.	w/o Judson St.	90.54%	8.77%	0.70%	100.00%
6	Colton Av.	e/o Judson St.	90.68%	8.63%	0.69%	100.00%
7	Colton Av.	e/o Dearborn St.	90.80%	8.52%	0.68%	100.00%
8	Colton Av.	e/o Wabash Av.	90.12%	8.64%	1.24%	100.00%
9	Colton Av.	e/o Opal Av.	90.34%	8.95%	0.71%	100.00%

[1] Source: 801 Opal Avenue Traffic Impact Analysis, Urban Crossroads, Inc., May 2017.
[2] Total of vehicle mix percentage values rounded to the nearest one-hundredth.

6.3 VIBRATION ASSESSMENT

This analysis focuses on the potential ground-borne vibration associated with vehicular traffic and construction activities. Ground-borne vibration levels from automobile traffic are generally overshadowed by vibration generated by heavy trucks that roll over the same uneven roadway surfaces. However, due to the rapid drop-off rate of ground-borne vibration and the short duration of the associated events, vehicular traffic-induced ground-borne vibration is rarely perceptible beyond the roadway right-of-way, and rarely results in vibration levels that cause damage to buildings in the vicinity.

However, while vehicular traffic is rarely perceptible, construction has the potential to result in varying degrees of temporary ground vibration, depending on the specific construction activities and equipment used. Ground vibration levels associated with various types of construction equipment are summarized on Table 6-8. Based on the representative vibration levels presented for various construction equipment types, it is possible to estimate the human response (annoyance) using the following vibration assessment methods defined by the FTA. To describe the human response (annoyance) associated with vibration impacts the FTA provides the following equation: $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$

TABLE 6-8: VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment	PPV (in/sec) at 25 feet
Small bulldozer	0.003
Jackhammer	0.035
Loaded Trucks	0.076
Large bulldozer	0.089

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006.

7 OFF-SITE TRANSPORTATION NOISE IMPACTS

To assess the off-site transportation CNEL noise level impacts associated with the proposed Project, noise contours were developed based on the *801 Opal Avenue Traffic Impact Analysis*. (2) Noise contour boundaries represent the equal levels of noise exposure and are measured in CNEL from the center of the roadway. Noise contours were developed for the following traffic scenarios:

- Existing Without / With Project: This scenario refers to the existing present-day noise conditions, without and with the proposed Project.
- Opening Year 2018 Without / With Project: This scenario below refers to the background noise conditions at future Year 2018 without and with the proposed Project plus ambient growth. This scenario corresponds to Year 2018 conditions, and includes all cumulative projects identified in the *Traffic Impact Analysis*.
- Horizon Year 2040 Without / With Project: This scenario below refers to the background noise conditions at future Year 2040 without and with the proposed Project plus ambient growth. This scenario corresponds to Year 2040 conditions, and includes all cumulative projects identified in the *Traffic Impact Analysis*.

7.1 TRAFFIC NOISE CONTOURS

To quantify the Project's operational traffic noise impacts on the surrounding areas, the changes in traffic noise levels on roadway segments surrounding the Project were calculated based on the changes in the average daily traffic volumes. Based on the noise impact significance criteria described in Section 4 and shown on Table 4-2, a significant off-site traffic noise level impact occurs:

- When the noise levels at existing and future noise-sensitive land uses (e.g. residential, etc.):
  - are less than 60 dBA CNEL and the Project creates a readily perceptible 5 dBA CNEL or greater Project-related noise level increase; or
  - range from 60 to 65 dBA CNEL and the Project creates a barely perceptible 3 dBA CNEL or greater Project-related noise level increase; or
  - already exceed 65 dBA CNEL, and the Project creates a community noise level impact of greater than 1.5 dBA CNEL (FICON, 1992).

Noise contours were used to assess the Project's incremental traffic-related noise impacts at land uses adjacent to roadways conveying Project traffic. The noise contours represent the distance to noise levels of a constant value and are measured from the center of the roadway for the 70, 65, and 60 dBA noise levels. The noise contours do not consider the effect of any existing noise barriers or topography that may attenuate ambient noise levels. In addition, because the noise contours reflect modeling of vehicular noise on area roadways, they appropriately do not reflect noise contributions from the surrounding stationary noise sources within the Project study area. Tables 7-1 through 7-6 present a summary of the exterior traffic noise levels, without barrier attenuation, for the nine study area roadway segments analyzed from the without Project to the with Project conditions in each of the three timeframes: Existing, Opening Year 2018, and

Horizon Year 2040 conditions. Appendix 7.1 includes a summary of the traffic noise level contours for each of the six traffic scenarios.

TABLE 7-1: EXISTING WITHOUT PROJECT CONDITIONS NOISE CONTOURS

ID	Road	Segment	Adjacent Planned Land Use[1]	CNEL at Nearest Adjacent Land Use (dBA)[2]	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	Judson St.	s/o Colton Av.	Residential	66.9	RW	59	128
2	Wabash Av.	s/o Colton Av.	Light Industrial (Residential)	66.8	RW	58	125
3	Opal Av.	n/o Dwy. 1	Light Industrial (Residential)	62.1	RW	RW	34
4	Mentone Bl.	w/o Opal Av.	Commercial	70.5	56	120	259
5	Colton Av.	w/o Judson St.	Residential	66.4	RW	55	118
6	Colton Av.	e/o Judson St.	Residential	66.4	RW	55	118
7	Colton Av.	e/o Dearborn St.	Residential	67.0	RW	60	129
8	Colton Av.	e/o Wabash Av.	Light Industrial (Residential)	65.7	RW	49	105
9	Colton Av.	e/o Opal Av.	Public/Institutional (School)	65.4	RW	47	101

[1] Sources: County of San Bernardino General Plan, Mentone Community Plan and City of Redlands General Plan Map Figure 4.1.
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the nearest adjacent land use.
[3] Does the CNEL at the adjacent land use exceed the General Plan noise standards/criteria for the given land use (Section 3.3)?
"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-2: EXISTING WITH PROJECT CONDITIONS NOISE CONTOURS

ID	Road	Segment	Adjacent Planned Land Use[1]	CNEL at Nearest Adjacent Land Use (dBA)[2]	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	Judson St.	s/o Colton Av.	Residential	67.0	RW	60	128
2	Wabash Av.	s/o Colton Av.	Light Industrial (Residential)	67.3	RW	62	134
3	Opal Av.	n/o Dwy. 1	Light Industrial (Residential)	63.9	RW	RW	46
4	Mentone Bl.	w/o Opal Av.	Commercial	70.7	58	125	269
5	Colton Av.	w/o Judson St.	Residential	66.5	RW	55	119
6	Colton Av.	e/o Judson St.	Residential	66.5	RW	56	120
7	Colton Av.	e/o Dearborn St.	Residential	67.2	RW	61	132
8	Colton Av.	e/o Wabash Av.	Light Industrial (Residential)	66.3	RW	54	115
9	Colton Av.	e/o Opal Av.	Public/Institutional (School)	65.4	RW	47	102

[1] Sources: County of San Bernardino General Plan, Mentone Community Plan and City of Redlands General Plan Map Figure 4.1.
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the nearest adjacent land use.
[3] Does the CNEL at the adjacent land use exceed the General Plan noise standards/criteria for the given land use (Section 3.3)?
"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-3: OPENING YEAR 2018 WITHOUT PROJECT CONDITIONS NOISE CONTOURS

ID	Road	Segment	Adjacent Planned Land Use[1]	CNEL at Nearest Adjacent Land Use (dBA)[2]	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	Judson St.	s/o Colton Av.	Residential	67.5	RW	65	140
2	Wabash Av.	s/o Colton Av.	Light Industrial (Residential)	67.0	RW	60	130
3	Opal Av.	n/o Dwy. 1	Light Industrial (Residential)	62.7	RW	RW	38
4	Mentone Bl.	w/o Opal Av.	Commercial	70.6	57	124	266
5	Colton Av.	w/o Judson St.	Residential	66.8	RW	58	124
6	Colton Av.	e/o Judson St.	Residential	66.8	RW	58	125
7	Colton Av.	e/o Dearborn St.	Residential	67.5	RW	64	138
8	Colton Av.	e/o Wabash Av.	Light Industrial (Residential)	65.9	RW	51	110
9	Colton Av.	e/o Opal Av.	Public/Institutional (School)	65.8	RW	50	108

[1] Sources: County of San Bernardino General Plan, Mentone Community Plan and City of Redlands General Plan Map Figure 4.1.
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the nearest adjacent land use.
[3] Does the CNEL at the adjacent land use exceed the General Plan noise standards/criteria for the given land use (Section 3.3)?
"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-4: OPENING YEAR 2018 WITH PROJECT CONDITIONS NOISE CONTOURS

ID	Road	Segment	Adjacent Planned Land Use[1]	CNEL at Nearest Adjacent Land Use (dBA)[2]	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	Judson St.	s/o Colton Av.	Residential	67.6	RW	65	140
2	Wabash Av.	s/o Colton Av.	Light Industrial (Residential)	67.5	RW	65	139
3	Opal Av.	n/o Dwy. 1	Light Industrial (Residential)	64.3	RW	RW	49
4	Mentone Bl.	w/o Opal Av.	Commercial	70.9	60	128	277
5	Colton Av.	w/o Judson St.	Residential	66.8	RW	58	126
6	Colton Av.	e/o Judson St.	Residential	66.9	RW	59	127
7	Colton Av.	e/o Dearborn St.	Residential	67.6	RW	65	141
8	Colton Av.	e/o Wabash Av.	Light Industrial (Residential)	66.5	RW	56	120
9	Colton Av.	e/o Opal Av.	Public/Institutional (School)	65.8	RW	50	108

[1] Sources: County of San Bernardino General Plan, Mentone Community Plan and City of Redlands General Plan Map Figure 4.1.
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the nearest adjacent land use.
[3] Does the CNEL at the adjacent land use exceed the General Plan noise standards/criteria for the given land use (Section 3.3)?
"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-5: HORIZON YEAR 2040 WITHOUT PROJECT CONDITIONS NOISE CONTOURS

ID	Road	Segment	Adjacent Planned Land Use[1]	CNEL at Nearest Adjacent Land Use (dBA)[2]	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	Judson St.	s/o Colton Av.	Residential	68.3	RW	73	157
2	Wabash Av.	s/o Colton Av.	Light Industrial (Residential)	68.7	RW	78	168
3	Opal Av.	n/o Dwy. 1	Light Industrial (Residential)	63.4	RW	RW	42
4	Mentone Bl.	w/o Opal Av.	Commercial	71.5	65	140	302
5	Colton Av.	w/o Judson St.	Residential	67.6	RW	65	140
6	Colton Av.	e/o Judson St.	Residential	67.6	RW	65	141
7	Colton Av.	e/o Dearborn St.	Residential	68.2	RW	72	156
8	Colton Av.	e/o Wabash Av.	Light Industrial (Residential)	66.8	RW	58	124
9	Colton Av.	e/o Opal Av.	Public/Institutional (School)	66.6	RW	56	121

[1] Sources: County of San Bernardino General Plan, Mentone Community Plan and City of Redlands General Plan Map Figure 4.1.
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the nearest adjacent land use.
[3] Does the CNEL at the adjacent land use exceed the General Plan noise standards/criteria for the given land use (Section 3.3)?
"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-6: HORIZON YEAR 2040 WITH PROJECT CONDITIONS NOISE CONTOURS

ID	Road	Segment	Adjacent Planned Land Use[1]	CNEL at Nearest Adjacent Land Use (dBA)[2]	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	Judson St.	s/o Colton Av.	Residential	68.3	RW	73	158
2	Wabash Av.	s/o Colton Av.	Light Industrial (Residential)	69.1	RW	82	177
3	Opal Av.	n/o Dwy. 1	Light Industrial (Residential)	64.9	RW	RW	53
4	Mentone Bl.	w/o Opal Av.	Commercial	71.7	67	145	312
5	Colton Av.	w/o Judson St.	Residential	67.6	RW	66	142
6	Colton Av.	e/o Judson St.	Residential	67.7	RW	66	143
7	Colton Av.	e/o Dearborn St.	Residential	68.3	RW	74	158
8	Colton Av.	e/o Wabash Av.	Light Industrial (Residential)	67.2	RW	62	134
9	Colton Av.	e/o Opal Av.	Public/Institutional (School)	66.6	RW	56	122

[1] Sources: County of San Bernardino General Plan, Mentone Community Plan and City of Redlands General Plan Map Figure 4.1.
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the nearest adjacent land use.
[3] Does the CNEL at the adjacent land use exceed the General Plan noise standards/criteria for the given land use (Section 3.3)?
"RW" = Location of the respective noise contour falls within the right-of-way of the road.

7.2 EXISTING CONDITIONS PROJECT TRAFFIC NOISE LEVEL CONTRIBUTIONS

Table 7-1 presents the Existing without Project conditions CNEL noise levels. The Exiting without Project exterior noise levels are expected to range from 62.1 to 70.5 dBA CNEL, without accounting for any noise attenuation features such as noise barriers or topography. Table 7-2 shows the Existing with Project conditions will range from 63.9 to 70.7 dBA CNEL. As shown on Table 7-7 the Project will generate noise level increases of up to 1.9 dBA CNEL on the study area roadway segments. Based on the significance criteria in Section 4 for noise-sensitive land uses, experiencing Project-related traffic noise level increases of up to 1.9 dBA CNEL, the Project-related increases represent a *less than significant* impact under Existing plus Project conditions.

TABLE 7-7: UNMITIGATED EXISTING OFF-SITE PROJECT-RELATED TRAFFIC NOISE IMPACTS

ID	Road	Segment	Adjacent Planned (Existing) Land Use[1]	CNEL at Adjacent Land Use (dBA)[2]			Noise-Sensitive Land Use?	Threshold Exceeded?[3]
				No Project	With Project	Project Addition		
1	Judson St.	s/o Colton Av.	Residential	66.9	67.0	0.0	Yes	No
2	Wabash Av.	s/o Colton Av.	Light Industrial (Residential)	66.8	67.3	0.5	Yes	No
3	Opal Av.	n/o Dwy. 1	Light Industrial (Residential)	62.1	63.9	1.9	Yes	No
4	Mentone Bl.	w/o Opal Av.	Commercial	70.5	70.7	0.3	No	No
5	Colton Av.	w/o Judson St.	Residential	66.4	66.5	0.1	Yes	No
6	Colton Av.	e/o Judson St.	Residential	66.4	66.5	0.1	Yes	No
7	Colton Av.	e/o Dearborn St.	Residential	67.0	67.2	0.1	Yes	No
8	Colton Av.	e/o Wabash Av.	Light Industrial (Residential)	65.7	66.3	0.6	Yes	No
9	Colton Av.	e/o Opal Av.	Public/Institutional (School)	65.4	65.4	0.0	Yes	No

[1] Sources: County of San Bernardino General Plan, Mentone Community Plan and City of Redlands General Plan Map Figure 4.1.
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the nearest adjacent land use.
[3] Significance Criteria (Section 4).

7.3 OPENING YEAR 2018 PROJECT TRAFFIC NOISE LEVEL CONTRIBUTIONS

Table 7-8 presents a comparison of the Opening Year 2018 without and with Project conditions CNEL noise levels. Table 7-3 shows that the exterior noise levels without accounting for any noise attenuation features are expected to range from 62.7 to 70.6 dBA CNEL without the Project. Table 7-4 presents the Opening Year 2018 with Project conditions noise level contours that are expected to range from 64.3 to 70.9 dBA CNEL. Based on the significance criteria in Section 4 for noise-sensitive land uses, experiencing Project-related traffic noise level increases of up to 1.7 dBA CNEL, the Project-related increases represent a *less than significant* impact under Opening Year 2018 with Project conditions.

TABLE 7-8: UNMITIGATED YEAR 2018 OFF-SITE PROJECT-RELATED TRAFFIC NOISE IMPACTS

ID	Road	Segment	Adjacent Planned (Existing) Land Use[1]	CNEL at Adjacent Land Use (dBA)[2]			Noise-Sensitive Land Use?	Threshold Exceeded?[3]
				No Project	With Project	Project Addition		
1	Judson St.	s/o Colton Av.	Residential	67.5	67.6	0.0	Yes	No
2	Wabash Av.	s/o Colton Av.	Light Industrial (Residential)	67.0	67.5	0.5	Yes	No
3	Opal Av.	n/o Dwy. 1	Light Industrial (Residential)	62.7	64.3	1.7	Yes	No
4	Mentone Bl.	w/o Opal Av.	Commercial	70.6	70.9	0.2	No	No
5	Colton Av.	w/o Judson St.	Residential	66.8	66.8	0.1	Yes	No
6	Colton Av.	e/o Judson St.	Residential	66.8	66.9	0.1	Yes	No
7	Colton Av.	e/o Dearborn St.	Residential	67.5	67.6	0.1	Yes	No
8	Colton Av.	e/o Wabash Av.	Light Industrial (Residential)	65.9	66.5	0.6	Yes	No
9	Colton Av.	e/o Opal Av.	Public/Institutional (School)	65.8	65.8	0.0	Yes	No

[1] Sources: County of San Bernardino General Plan, Mentone Community Plan and City of Redlands General Plan Map Figure 4.1.
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the nearest adjacent land use.
[3] Significance Criteria (Section 4).

7.4 HORIZON YEAR 2040 PROJECT TRAFFIC NOISE LEVEL CONTRIBUTIONS

Table 7-9 presents a comparison of the Horizon Year 2040 without and with Project conditions CNEL noise levels. Table 7-5 shows that the exterior noise levels without accounting for any noise attenuation features are expected to range from 63.4 to 71.5 dBA CNEL without the Project. Table 7-6 presents the Horizon Year 2040 with Project conditions noise level contours that are expected to range from 64.9 to 71.7 dBA CNEL. Based on the significance criteria in Section 4 for noise-sensitive land uses, which will experience Project-related traffic noise level increases of up to 1.4 dBA CNEL, the Project-related increases represent a *less than significant* impact under Horizon Year 2040 conditions.

TABLE 7-9: UNMITIGATED YEAR 2040 OFF-SITE PROJECT-RELATED TRAFFIC NOISE IMPACTS

ID	Road	Segment	Adjacent Planned (Existing) Land Use[1]	CNEL at Adjacent Land Use (dBA)[2]			Noise-Sensitive Land Use?	Threshold Exceeded?[3]
				No Project	With Project	Project Addition		
1	Judson St.	s/o Colton Av.	Residential	68.3	68.3	0.0	Yes	No
2	Wabash Av.	s/o Colton Av.	Light Industrial (Residential)	68.7	69.1	0.3	Yes	No
3	Opal Av.	n/o Dwy. 1	Light Industrial (Residential)	63.4	64.9	1.4	Yes	No
4	Mentone Bl.	w/o Opal Av.	Commercial	71.5	71.7	0.2	No	No
5	Colton Av.	w/o Judson St.	Residential	67.6	67.6	0.1	Yes	No
6	Colton Av.	e/o Judson St.	Residential	67.6	67.7	0.1	Yes	No
7	Colton Av.	e/o Dearborn St.	Residential	68.2	68.3	0.1	Yes	No
8	Colton Av.	e/o Wabash Av.	Light Industrial (Residential)	66.8	67.2	0.5	Yes	No
9	Colton Av.	e/o Opal Av.	Public/Institutional (School)	66.6	66.6	0.0	Yes	No

[1] Sources: County of San Bernardino General Plan, Mentone Community Plan and City of Redlands General Plan Map Figure 4.1.
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the nearest adjacent land use.
[3] Significance Criteria (Section 4).

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8 RECEIVER LOCATIONS

To assess the potential for long-term operational and short-term construction noise impacts, the following eight receiver locations, as shown on Exhibit 8-A, were identified as representative locations for analysis. Sensitive receivers are generally defined as locations where people reside or where the presence of unwanted sound could otherwise adversely affect the use of the land. Noise-sensitive land uses are generally considered to include: schools, hospitals, single-family dwellings, mobile home parks, churches, libraries, and recreation areas. Moderately noise-sensitive land uses typically include: multi-family dwellings, hotels, motels, dormitories, out-patient clinics, cemeteries, golf courses, country clubs, athletic/tennis clubs, and equestrian clubs. Land uses that are considered relatively insensitive to noise include business, commercial, and professional developments. Land uses that are typically not affected by noise include: industrial, manufacturing, utilities, agriculture, natural open space, undeveloped land, parking lots, warehousing, liquid and solid waste facilities, salvage yards, and transit terminals.

Representative sensitive receivers near the Project site include single-family residential homes at locations R1 to R6, the Redlands East Valley High School at location R7, and multi-family residential homes at location R8. The closest sensitive receiver is represented by location R2 where an existing residential home is located approximately 10 feet from the Project site boundaries on Opal Avenue. Other sensitive land uses in the Project study area that are located at greater distances than those identified in this noise study will experience lower noise levels than those presented in this report due to the additional attenuation from distance and the shielding of intervening structures.

R1: Located approximately 96 feet west of the Project site, R1 represents existing residential home across Opal Avenue, between two industrial land uses.

R2: Location R2 represents an existing residential home surrounded by the Project site boundaries to the north, east, and south on Opal Avenue. A 24-hour noise measurement was taken near this location, L1, to describe the existing ambient noise environment.

R3: Location R3 represents the existing residential homes situated north of the Project site at approximately 85 feet on Nice Avenue. A 24-hour noise measurement was taken near this location, L2, to describe the existing ambient noise environment.

R4: Location R4 represents the existing residential homes located adjacent to the eastern Project site boundary at approximately 16 feet on Beryl Avenue.

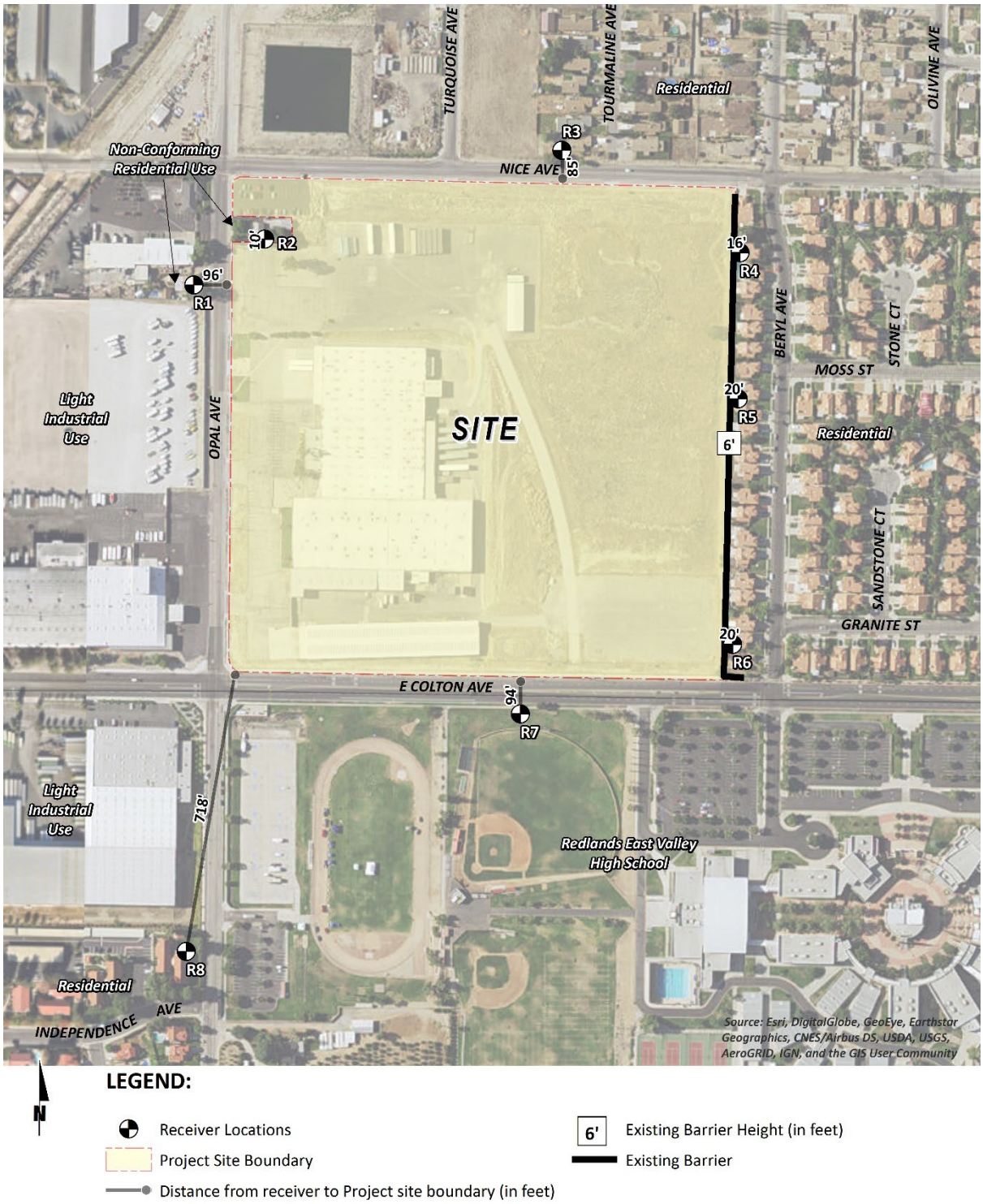
R5: Location R5 represents the existing residential homes located adjacent to the eastern Project site boundary at approximately 20 feet on Beryl Avenue, south of Moss Street.

R6: Location R6 represents the existing residential homes located adjacent to the eastern Project site boundary at approximately 20 feet on Beryl Avenue, south of Granite Street. A 24-hour noise measurement was taken near this location, L3, to describe the existing ambient noise environment.

R7: Location R7 represents the existing Redlands East Valley High School baseball and outdoor fields located south of the Project site at approximately 94 feet on Colton Avenue.

R8: Located approximately 718 feet southwest of the Project site, R8 represents existing residential homes on Opal Avenue. A 24-hour noise measurement was taken near this location, L4, to describe the existing ambient noise environment.

EXHIBIT 8-A: RECEIVER LOCATIONS



9 OPERATIONAL NOISE IMPACTS

This section analyzes the potential stationary-source operational noise impacts at the nearby receiver locations, identified in Section 8, resulting from operation of the proposed 801 Opal Avenue Project. Exhibit 9-A identifies the representative receiver locations and noise source locations used to assess the operational noise levels.

9.1 OPERATIONAL NOISE STANDARDS

To analyze noise impacts originating from a designated fixed location or private property such as the 801 Opal Avenue Project, stationary-source (operational) noise such as the expected idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, parking lot vehicle movements, roof-top air conditioning units, and outdoor storage activities for finished products are typically evaluated against standards established under a jurisdiction's Municipal Code. Therefore, to accurately describe the potential Project-related operational noise levels, this analysis presents the appropriate stationary-source noise level standards from the County of San Bernardino County Code, Title 8 Development Code.

The County of San Bernardino County Code, Title 8 Development Code, Section 83.01.080(c) establishes the noise level standards for stationary noise sources. Since the Project will only operate during the daytime hours of 7:00 a.m. to 7:00 p.m., this analysis only evaluates the Project-related operational noise levels during the daytime hours (7:00 a.m. to 10:00 p.m.) identified in the Development Code. Since the Project's industrial land use will potentially impact adjacent residential homes, located immediately east of the Project site and adjacent to the northwest portion of the Project site, this noise study relies on the residential noise level standards to describe potential operational noise impacts. For residential properties, the exterior noise level shall not exceed 55 dBA Leq during the daytime hours (7:00 a.m. to 10:00 p.m.) for both the whole hour, and for not more than 30 minutes in any hour. (3)

The exterior noise level standards shall apply for a cumulative period of 30 minutes in any hour, as well as plus 5 dBA cannot be exceeded for a cumulative period of more than 15 minutes in any hour, or the standard plus 10 dBA for a cumulative period of more than 5 minutes in any hour, or the standard plus 15 dBA for a cumulative period of more than 1 minute in any hour, or the standard plus 20 dBA for any period of time. The County of San Bernardino operational noise level standards are shown on Table 3-1 and included in Appendix 3.1.

9.2 OPERATIONAL NOISE SOURCES

At the time this noise analysis was prepared, the future tenants of the proposed Project were unknown. Based on information provided by the *Letter of Intent* for the Project, this analysis assumes the Project will be operational during normal weekday business hours from Monday to Friday between 7:00 a.m. to 7:00 p.m. The on-site Project-related noise sources are expected to include: idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, parking lot vehicle movements, roof-top air conditioning units, and outdoor storage activities for finished products. This noise analysis is intended to describe noise level impacts

associated with the expected typical daytime manufacturing and warehouse use activities at the Project site.

9.3 REFERENCE NOISE LEVELS

To estimate the Project operational noise impacts, reference noise level measurements were collected from similar types of activities to represent the noise levels expected with the development of the proposed Project. This section provides a detailed description of the reference noise level measurements shown on Table 9-1 used to estimate the Project operational noise impacts. It is important to note that the following projected noise levels assume the worst-case noise environment with the idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, parking lot vehicle movements, roof-top air conditioning units, and outdoor storage activities for finished products all operating simultaneously. These noise level impacts will likely vary throughout the day.

9.3.1 UNLOADING/DOCKING ACTIVITY

Short-term reference noise level measurements were collected on Wednesday, January 7th, 2015, by Urban Crossroads, Inc. at the Motivational Fulfillment & Logistics Services distribution facility located at 6810 Bickmore Avenue in the City of Chino. The noise level measurements represent the typical weekday dry goods logistics warehouse operation in a single building, of roughly 285,000 square feet, with a loading dock area on the western side of the building façade. Up to ten trucks were observed in the loading dock area including a combination of track trailer semi-trucks, two-axle delivery trucks, and background forklift operations.

The unloading/docking activity noise level measurement was taken over a fifteen-minute period and represents multiple noise sources taken from the center of loading dock activities generating a reference noise level of 62.8 dBA Leq at a uniform reference distance of 50 feet. At this measurement location, the noise sources associated with employees unloading a docked truck container included the squeaking of the truck's shocks when weight was removed from the truck, employees playing music over a radio, as well as a forklift horn and backup alarm. In addition, during the noise level measurement a truck entered the loading dock area and proceeded to reverse and dock in a nearby loading bay, adding truck engine and air brakes noise.

9.3.2 OUTDOOR STORAGE ACTIVITY

To determine the noise level impacts associated with outdoor storage activity for finished products within the Project site, Urban Crossroads collected reference noise level measurements at the at a parcel delivery hub facility in Rialto on March 13th, 2017. The reference noise level measurement indicates that the outdoor storage activity generates noise levels of 64.2 dBA Leq at 50 feet. The outdoor storage activity reference noise level includes a switcher pass-by event with trailer, back-up alarms from a separate switcher dropping off a trailer, air brakes, idling, and background truck movement activity. Noise associated with outdoor storage activity is expected during the typical daytime conditions.

9.3.3 ROOF-TOP AIR CONDITIONING UNITS

To assess the impacts created by the roof-top air conditioning units at the Project buildings, reference noise levels measurements were taken at the Santee Walmart on July 27th, 2015. Located at 170 Town Center Parkway in the City of Santee, the noise level measurements describe a single mechanical roof-top air conditioning unit on the roof of an existing Walmart store. The reference noise level represents a Lennox SCA120 series 10-ton model packaged air conditioning unit. At 5 feet from the roof-top air conditioning unit, the exterior noise levels were measured at 77.2 dBA Leq. Using the uniform reference distance of 50 feet, the noise level is 57.2 dBA Leq. The operating conditions of the reference noise level measurement reflect peak summer cooling requirements with measured temperatures approaching 96 degrees Fahrenheit (°F) with average daytime temperatures of 82°F. The noise attenuation provided by a parapet wall is not reflected in this reference noise level measurement.

9.3.4 PARKING LOT VEHICLE MOVEMENTS (AUTOS)

To determine the noise level impacts associated with automobile parking lot vehicle movements, Urban Crossroads collected reference noise level measurements at the at the Laguna Niguel Walmart located at 27470 Alicia Parkway on May 30th, 2012. The 15-minute noise level measurement indicates that the automobile parking lot vehicle movements generates noise levels of 45.1 dBA Leq at 50 feet. The parking lot noise levels are mainly due to cars pulling in and out of spaces, car alarms sounding, and customers moving shopping carts. Noise associated with automobile parking lot vehicle movements is expected during the typical daytime conditions.

TABLE 9-1: REFERENCE NOISE LEVEL MEASUREMENTS

Noise Source	Duration (hh:mm:ss)	Dist. From Source (Feet)	Noise Source Height (Feet)	Hourly Activity (Mins)[1]	Hourly (dBA Leq)	
					Reference Noise Level	@ 50'
Unloading/Docking Activity[2]	00:15:00	30'	8'	60	67.2	62.8
Outdoor Storage Activity[3]	00:00:40	30'	8'	60	68.6	64.2
Roof-Top Air Conditioning Unit[4]	96:00:00	5'	5'	39	77.2	57.2
Parking Lot Vehicle Movements[5]	00:15:00	5'	5'	60	60.1	45.1

[1] Anticipated duration (minutes within the hour) of noise activity during typical hourly conditions expected at the Project site based on the reference noise level measurement activity.
[2] Reference noise level measurements were collected from the existing operations of the Motivational Fulfillment & Logistics Services distribution facility located at 6810 Bickmore Avenue in the City of Chino on 1/7/2015.
[3] As measured by Urban Crossroads, Inc. on 3/13/2017 at a parcel delivery hub facility in Rialto.
[4] As measured by Urban Crossroads, Inc. on 7/27/2015 at the Santee Walmart located at 170 Town Center Parkway.
[5] As measured by Urban Crossroads, Inc. on 5/30/2012 at the Laguna Niguel Walmart located at 27470 Alicia Parkway.

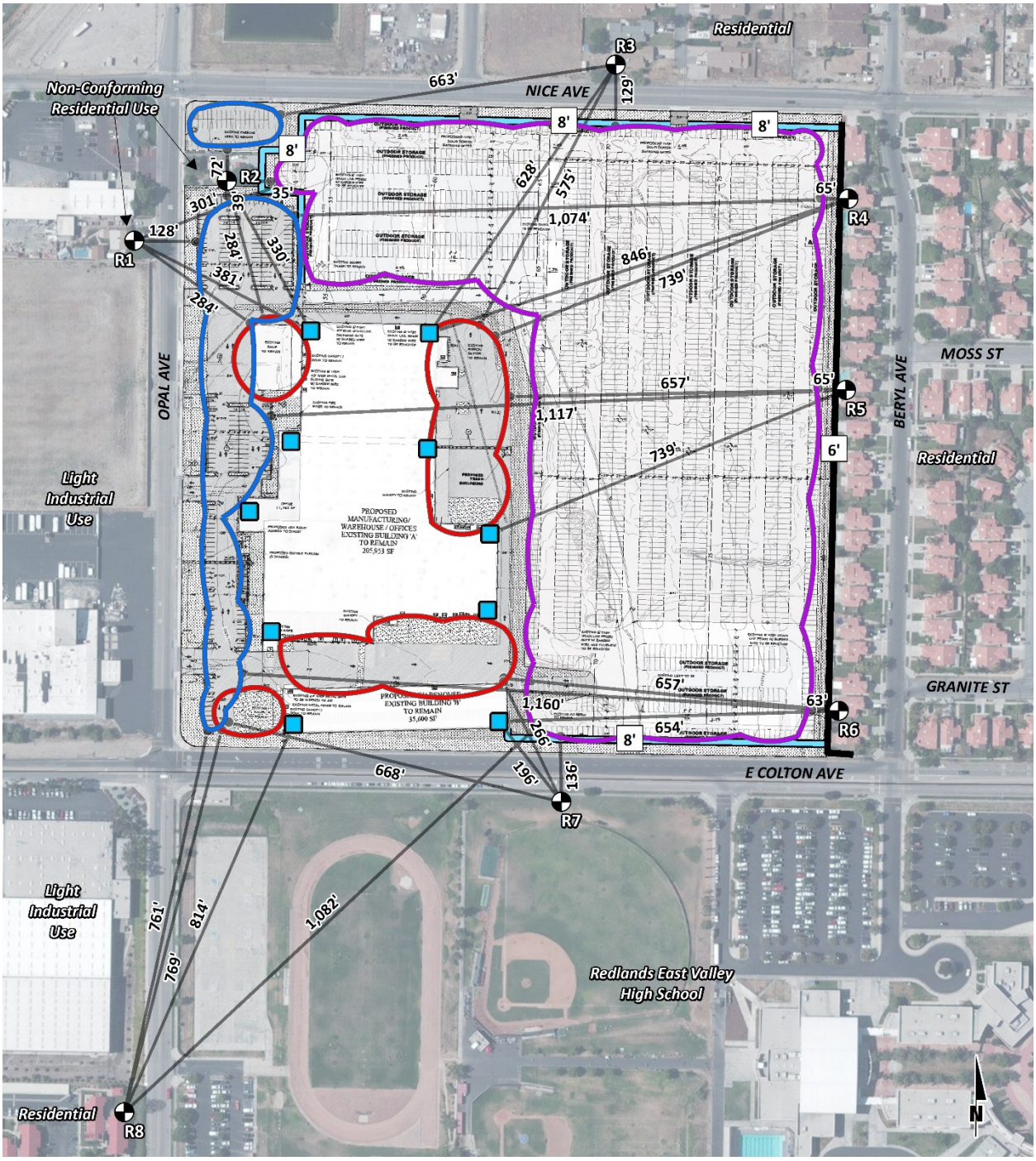
9.4 PROJECT OPERATIONAL NOISE LEVELS

Using the reference noise levels to represent the proposed Project operations that include idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, parking lot vehicle movements, roof-top air conditioning units, and outdoor storage activities for finished products, Urban Crossroads, Inc. calculated the operational source noise levels that are expected to be generated at the Project site and the Project-related noise level increases that would be experienced at each of the sensitive receiver locations. The operational noise level calculations, shown on Table 9-2, account for the distance attenuation provided due to geometric spreading when sound from a localized stationary source (i.e., a point source) propagates uniformly outward in a spherical pattern. Hard site conditions are used in the operational noise analysis which result in noise levels that attenuate (or decrease) at a rate of 6 dBA for each doubling of distance from a point source. The basic noise attenuation equation shown below is used to calculate the distance attenuation based on a reference noise level (SPL_1):

$$SPL_2 = SPL_1 - 20\log(D_2/D_1)$$

Where SPL_2 is the resulting noise level after attenuation, SPL_1 is the source noise level, D_2 is the distance to the reference sound pressure level (SPL_1), and D_1 is the distance to the receiver location. Table 9-2 shows the individual operational noise levels of each noise source at each of the nearby sensitive receiver locations. As indicated on Table 9-, the Project-only operational noise levels will range from 42.1 to 60.3 dBA Leq, 37.9 to 53.0 dBA L_{50}, 42.3 to 61.8 dBA L_{25}, 46.3 to 65.4 dBA L_8, 49.6 to 68.1 dBA L_2, and 53.8 to 70.6 dBA Lmax at the sensitive receiver locations. This analysis includes the barrier attenuation provided by the planned 8-foot high screen wall (noise barrier) as shown on Exhibit 9-A.

EXHIBIT 9-A: OPERATIONAL NOISE SOURCE LOCATIONS



LEGEND:

- Receiver Locations
- 8' Barrier Height (in feet)
- Planned Noise Barrier
- Existing Barrier
- Roof-Top Air Conditioning Unit
- Parking Lot Vehicle Movements
- Outdoor Storage Activity
- Unloading/Docking Activity
- Distance from receiver to center of noise source (in feet)

TABLE 9-2: UNMITIGATED PROJECT-ONLY OPERATIONAL NOISE LEVELS

Receiver Location[1]	Noise Source[2]	Project Operational Noise Levels (dBA)[3]					
		Leq (E. Avg.)	L_{50} (30 mins)	L_{25} (15 mins)	L_8 (5 mins)	L_2 (1 min)	L_{max} (Anytime)
R1	Unloading/Docking Activity	47.7	44.7	47.7	52.3	56.1	60.5
	Outdoor Storage Activity	43.7	35.5	45.4	48.9	51.5	51.8
	Roof-Top Air Conditioning Unit	39.6	36.8	16.1	13.9	12.5	40.6
	Parking Lot Vehicle Movements	39.0	35.6	39.6	42.6	46.0	58.4
	Combined Noise Level:	50.0	46.2	50.1	54.2	57.7	63.0
R2	Unloading/Docking Activity	47.7	44.7	47.7	52.3	56.1	60.5
	Outdoor Storage Activity	59.8	51.6	61.5	65.0	67.6	67.9
	Roof-Top Air Conditioning Unit	40.8	38.0	17.3	15.1	13.7	41.8
	Parking Lot Vehicle Movements	46.7	43.3	47.3	50.3	53.7	66.1
	Combined Noise Level:	60.3	53.0	61.8	65.4	68.1	70.6
R3	Unloading/Docking Activity	36.6	33.6	36.6	41.2	45.0	49.4
	Outdoor Storage Activity	51.0	42.8	52.7	56.2	58.8	59.1
	Roof-Top Air Conditioning Unit	25.9	23.1	2.4	0.2	0.0	26.9
	Parking Lot Vehicle Movements	28.3	24.9	28.9	31.9	35.3	47.7
	Combined Noise Level:	51.2	43.4	52.8	56.4	59.0	59.8
R4	Unloading/Docking Activity	33.4	30.4	33.4	38.0	41.8	46.2
	Outdoor Storage Activity	54.5	46.3	56.2	59.7	62.3	62.6
	Roof-Top Air Conditioning Unit	26.9	24.1	3.4	1.2	0.0	27.9
	Parking Lot Vehicle Movements	19.2	15.8	19.8	22.8	26.2	38.6
	Combined Noise Level:	54.5	46.4	56.2	59.7	62.3	62.7
R5	Unloading/Docking Activity	34.3	31.3	34.3	38.9	42.7	47.1
	Outdoor Storage Activity	54.8	46.6	56.5	60.0	62.6	62.9
	Roof-Top Air Conditioning Unit	28.0	25.2	4.5	2.3	0.9	29.0
	Parking Lot Vehicle Movements	29.6	26.2	30.2	33.2	36.6	49.0
	Combined Noise Level:	54.9	46.8	56.5	60.0	62.7	63.2
R6	Unloading/Docking Activity	34.3	31.3	34.3	38.9	42.7	47.1
	Outdoor Storage Activity	54.8	46.6	56.5	60.0	62.6	62.9
	Roof-Top Air Conditioning Unit	29.1	26.3	5.6	3.4	2.0	30.1
	Parking Lot Vehicle Movements	18.7	15.3	19.3	22.3	25.7	38.1
	Combined Noise Level:	54.9	46.8	56.5	60.0	62.6	63.0
R7	Unloading/Docking Activity	48.2	45.2	48.2	52.8	56.6	61.0
	Outdoor Storage Activity	50.6	42.4	52.3	55.8	58.4	58.7
	Roof-Top Air Conditioning Unit	45.3	42.5	21.8	19.6	18.2	46.3
	Parking Lot Vehicle Movements	28.2	24.8	28.8	31.8	35.2	47.6
	Combined Noise Level:	53.3	48.4	53.7	57.6	60.6	63.2
R8	Unloading/Docking Activity	39.0	36.0	39.0	43.6	47.4	51.8
	Outdoor Storage Activity	37.5	29.3	39.2	42.7	45.3	45.6
	Roof-Top Air Conditioning Unit	33.0	30.2	9.5	7.3	5.9	34.0
	Parking Lot Vehicle Movements	27.4	24.0	28.0	31.0	34.4	46.8
	Combined Noise Level:	42.1	37.9	42.3	46.3	49.6	53.8

[1] See Exhibit 9-A for the receiver and noise source locations.
[2] Reference noise sources as shown on Table 9-1.
[3] Operational noise level calculations are provided in Appendix 9.1.

Table 9-3 presents a summary of the combined total Project-only operational noise level projections at the nearby sensitive receiver locations for a comparison local jurisdiction exterior noise level standards. The Project operational noise levels at the nearby sensitive receiver locations are shown to range from 42.1 to 60.3 dBA Leq, 37.9 to 53.0 dBA L_{50}, 42.3 to 61.8 dBA L_{25}, 46.3 to 65.4 dBA L_8, 49.6 to 68.1 dBA L_2, and 53.8 to 70.6 dBA Lmax. Based on the results of this analysis, the operational noise levels associated with the 801 Opal Avenue will exceed the County of San Bernardino Development Code daytime exterior noise level standards at receiver location R2. The Project operational noise levels at all other receiver locations are shown to satisfy the County of San Bernardino Development Code daytime exterior noise level standards. The operational noise level calculations are included in Appendix 9.2.

TABLE 9-3: UNMITIGATED OPERATIONAL NOISE LEVEL COMPLIANCE

Receiver Location[1]	Noise Level at Receiver Locations (dBA)[2]						Threshold Exceeded?[3]
	Leq (E. Avg.)	L_{50} (30 mins)	L_{25} (15 mins)	L_8 (5 mins)	L_2 (1 min)	L_{max} (Anytime)	
Thresholds:	**55**	**55**	**60**	**65**	**70**	**75**	**-**
R1	50.0	46.2	50.1	54.2	57.7	63.0	No
R2	60.3	53.0	61.8	65.4	68.1	70.6	Yes
R3	51.2	43.4	52.8	56.4	59.0	59.8	No
R4	54.5	46.4	56.2	59.7	62.3	62.7	No
R5	54.9	46.8	56.5	60.0	62.7	63.2	No
R6	54.9	46.8	56.5	60.0	62.6	63.0	No
R7	53.3	48.4	53.7	57.6	60.6	63.2	No
R8	42.1	37.9	42.3	46.3	49.6	53.8	No

[1] See Exhibit 9-A for the receiver and noise source locations.
[2] Estimated Project operational noise levels as shown on Table 9-2.
[3] Do the estimated Project operational noise levels meet the operational noise level standards (Table 3-1)?
"E. Avg." = logarithmic (energy) average

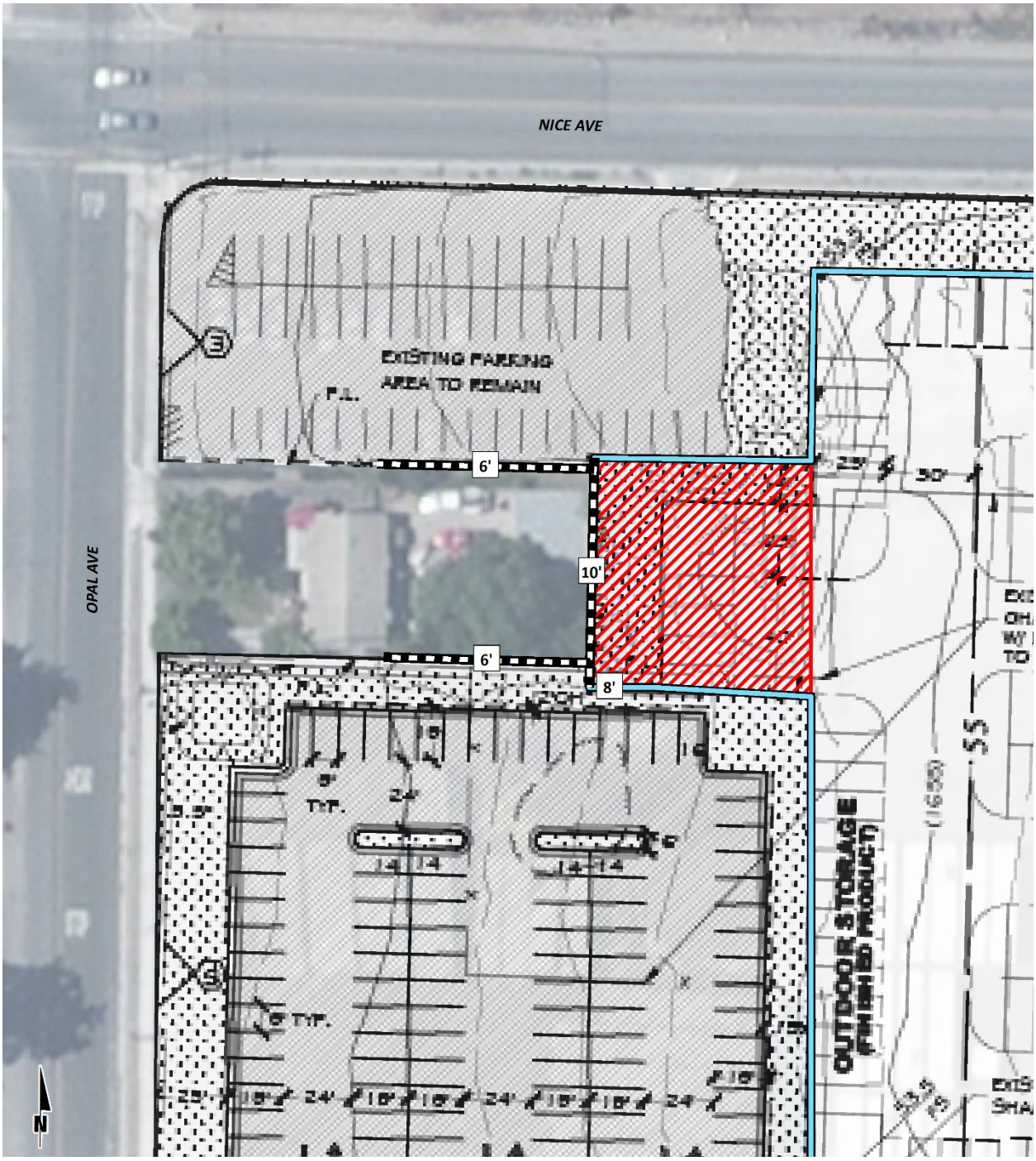
Therefore, mitigation measures are required to reduce these significant noise levels to *less than significant* impacts. Exhibit 9-B shows the mitigation measures required to reduce the Project operational noise levels at receiver location R2 to satisfy the County of San Bernardino Development Code daytime exterior noise level standards. These mitigation measures include a 10-foot high barrier at the eastern residential property line of receiver location R2, 6-foot high noise barriers at the northern and southern property lines, and a 75-foot buffer zone where no truck-related storage activity shall be allowed during Project operation. With the operational noise mitigation measures identified in this noise study, the Project-related operational noise level impacts will be *less than significant*. Table 9-4 shows the Project operational noise levels with the mitigation measures outlined in Section 9.6.

TABLE 9-4: MITIGATED OPERATIONAL NOISE LEVEL COMPLIANCE

Receiver Location[1]	Noise Level at Receiver Locations (dBA)[2]						Threshold Exceeded?[3]
	Leq (E. Avg.)	L_{50} (30 mins)	L_{25} (15 mins)	L_8 (5 mins)	L_2 (1 min)	L_{max} (Anytime)	
Thresholds:	**55**	**55**	**60**	**65**	**70**	**75**	**-**
R1	50.0	46.2	50.1	54.2	57.7	63.0	No
R2	50.5	44.5	51.7	55.3	58.2	62.9	No
R3	51.2	43.4	52.8	56.4	59.0	59.8	No
R4	54.5	46.4	56.2	59.7	62.3	62.7	No
R5	54.9	46.8	56.5	60.0	62.7	63.2	No
R6	54.9	46.8	56.5	60.0	62.6	63.0	No
R7	53.3	48.4	53.7	57.6	60.6	63.2	No
R8	42.1	37.9	42.3	46.3	49.6	53.8	No

[1] See Exhibit 9-A for the receiver and noise source locations.
[2] Mitigated Project operational noise levels (Appendix 9.1).
[3] Do the estimated Project operational noise levels meet the operational noise level standards (Table 3-1)?
"E. Avg." = logarithmic (energy) average

EXHIBIT 3-B: OPERATIONAL NOISE MITIGATION MEASURES AT RECEIVER LOCATION R2



LEGEND:

10' Barrier Height (in feet)
Recommended Noise Barrier
Planned Noise Barrier
75-Foot Buffer for Outdoor Storage Activity*
Existing Barrier

**The following activities shall not be allowed in the buffer zone: the use of trucks to pick up or drop off of finished product; the use of back-up alarms on alternative transport methods (hand lifts, forklifts, switchers, etc.); and the parking or idling of trucks or alternative transport methods.*

9.5 PROJECT OPERATIONAL NOISE CONTRIBUTION

To describe the Project operational noise level contributions, the Project operational noise levels are combined with the existing ambient noise levels measurements for the nearby receiver locations potentially impacted by Project operational noise sources. Since the units used to measure noise, decibels (dB), are logarithmic units, the Project-operational and existing ambient noise levels cannot be combined using standard arithmetic equations. (7) Instead, they must be logarithmically added using the following base equation:

$$SPL_{Total} = 10\log_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$$

Where "SPL1," "SPL2," etc. are equal to the sound pressure levels being combined, or in this case, the Project-operational and existing ambient noise levels. The difference between the combined Project and ambient noise levels describe the Project noise level contributions to the existing ambient noise environment. Noise levels that would be experienced at receiver locations when Project-source noise is added to the daytime ambient conditions are presented on Table 9-5.

As indicated on Table 9-5, the Project will generate a daytime operational noise level increase at the nearby receiver locations of up to 4.9 dBA L_{25} at receiver location R2. Since the Project-related operational noise level contributions will satisfy the significance criteria discussed in Section 4, the increases at the sensitive receiver locations will be *less than significant*. On this basis, Project operational stationary-source noise would not result in a substantial temporary/periodic, or permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project, and impacts in these regards will be *less than significant*.

TABLE 9-5: PROJECT DAYTIME NOISE LEVEL CONTRIBUTIONS

Location		Type of Noise	Noise Levels (dBA)						Threshold Exceeded?[7]
Rec.[1]	Meas.[2]		Leq (E. Avg.)	L_{50} (30 mins)	L_{25} (15 mins)	L_8 (5 mins)	L_2 (1 min)	L_{max} (Anytime)	
R1	L1	Project Noise Level[3]	50.0	46.2	50.1	54.2	57.7	63.0	No
		Ambient Noise Level[4]	53.4	45.4	48.5	54.3	56.2	81.6	
		Combined[5]	55.0	48.8	52.4	57.3	60.0	81.7	
		Project Contribution[6]	1.6	3.4	3.9	3.0	3.8	0.1	
R2	L1	Project Noise Level[3]	50.5	44.5	51.7	55.3	58.2	62.9	No
		Ambient Noise Level[4]	53.4	45.4	48.5	54.3	56.2	81.6	
		Combined[5]	55.2	48.0	53.4	57.9	60.3	81.7	
		Project Contribution[6]	1.8	2.6	4.9	3.6	4.1	0.1	
R3	L2	Project Noise Level[3]	51.2	43.4	52.8	56.4	59.0	59.8	No
		Ambient Noise Level[4]	60.8	46.2	55.2	64.7	69.7	88.5	
		Combined[5]	61.3	48.0	57.2	65.3	70.1	88.5	
		Project Contribution[6]	0.5	1.8	2.0	0.6	0.4	0.0	
R4	L2	Project Noise Level[3]	54.5	46.4	56.2	59.7	62.3	62.7	No
		Ambient Noise Level[4]	60.8	46.2	55.2	64.7	69.7	88.5	
		Combined[5]	61.7	49.3	58.8	65.9	70.4	88.5	
		Project Contribution[6]	0.9	3.1	3.6	1.2	0.7	0.0	
R5	L3	Project Noise Level[3]	54.9	46.8	56.5	60.0	62.7	63.2	No
		Ambient Noise Level[4]	64.0	54.8	60.9	66.4	70.3	98.5	
		Combined[5]	64.5	55.4	62.3	67.3	71.0	98.5	
		Project Contribution[6]	0.5	0.6	1.4	0.9	0.7	0.0	
R6	L3	Project Noise Level[3]	54.9	46.8	56.5	60.0	62.6	63.0	No
		Ambient Noise Level[4]	64.0	54.8	60.9	66.4	70.3	98.5	
		Combined[5]	64.5	55.4	62.3	67.3	71.0	98.5	
		Project Contribution[6]	0.5	0.6	1.4	0.9	0.7	0.0	
R7	L3	Project Noise Level[3]	53.3	48.4	53.7	57.6	60.6	63.2	No
		Ambient Noise Level[4]	64.0	54.8	60.9	66.4	70.3	98.5	
		Combined[5]	64.4	55.7	61.7	66.9	70.7	98.5	
		Project Contribution[6]	0.4	0.9	0.8	0.5	0.4	0.0	
R8	L4	Project Noise Level[3]	42.1	37.9	42.3	46.3	49.6	53.8	No
		Ambient Noise Level[4]	62.4	51.0	56.2	65.2	71.7	88.7	
		Combined[5]	62.4	51.2	56.4	65.3	71.7	88.7	
		Project Contribution[6]	0.0	0.2	0.2	0.1	0.0	0.0	

[1] See Exhibit 9-A for the receiver and noise source locations.
[2] Measurement locations as shown on Exhibit 5-A.
[3] Mitigated operational noise levels as shown on Table 9-4.
[4] Existing ambient noise level measurements provided in Appendix 5.2.
[5] Represents the combined ambient conditions plus the Project activities.
[6] The noise level increase expected with the addition of the proposed Project activities.
[7] Significance of Noise Impacts (Section 4).

9.6 OPERATIONAL NOISE MITIGATION MEASURES

The following operational noise mitigation measures have been identified to reduce potential operational noise levels received at nearby noise-sensitive receiver locations to *less than significant* impacts:

- If at the time a tenant is identified for the Project site, a tenant-specific noise study shall be required for any special noise generators or equipment which are not already included in this analysis: idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, parking lot vehicle movements, roof-top air conditioning units, and outdoor storage activities for finished products.
- Construct the following noise barriers, as shown on Exhibit 9-B, which shall provide a weight of at least 4 pounds per square foot of face area or provide a minimum transmission loss of 20 dBA. (5) The barriers shall consist of a solid face from top to bottom. Unnecessary openings or decorative cutouts shall not be made. All gaps (except for weep holes) should be filled with grout or caulking.
    - A 10-foot high noise barrier at the eastern property line of the residential home in the northwestern portion of the Project site (receiver location R2);
    - 6-foot high noise barriers at the northern and southern property lines of the residential home in the northwestern portion of the Project site (receiver location R2). A 6 to 8-foot high transition to the 10-foot high eastern property line barrier is recommended.
    - The noise barriers may be constructed using the following materials capable of providing a minimum transmission loss of 20 dBA.:
        - Masonry block;
        - Stucco veneer over wood framing (or foam core), or 1-inch-thick tongue and groove wood of sufficient weight per square foot
        - Glass (1/4-inch-thick), or other transparent material with sufficient weight per square foot
        - Earthen berm
        - Any combination of these construction materials
- A 75-foot buffer zone shall be enforced at the Project site, as shown on Exhibit 9-B, in which the following activities shall not be allowed within 75 feet of the eastern property line of the residential home in the northwestern portion of the Project site (receiver location R2):
    - Truck activity of any kind, including the pick-up or drop-off of finished products or storage materials, the use of back-up alarms, idling, and parking
    - Back-up alarms for any alternative transport methods used to store finished products or materials within the buffer zone.
- All on-site operating equipment under the control of the building user that is used in outdoor areas (including but not limited to trucks, tractors, forklifts, and hostlers), shall be operated with properly functioning and well-maintained mufflers.
- The truck access gates and loading docks within the truck court on the Project site shall be posted with signs which state:

- Truck drivers shall turn off engines when not in use;
- Diesel trucks servicing the Project shall not idle for more than five (5) minutes; and
- Telephone numbers of the building facilities manager and the California Air Resources Board (CARB) to report violations.

9.7 OPERATIONAL VIBRATION IMPACTS

To assess the potential vibration impacts from truck haul trips associated with operational activities the threshold for vibration of 0.2 in/sec PPV is used, as previously shown on Table 3-3. Truck vibration levels are dependent on vehicle characteristics, load, speed, and pavement conditions. Typical vibration levels for the 801 Opal Avenue heavy truck activity at normal traffic speeds will approach 0.001 in/sec PPV, based on the FTA *Transit Noise Impact and Vibration Assessment*. (4) Trucks transiting on site will be travelling at very low speeds so it is expected that delivery truck vibration impacts at nearby homes will satisfy the vibration threshold of 0.2 in/sec PPV, and therefore, will be *less than significant*.

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10 CONSTRUCTION IMPACTS

This section analyzes potential impacts resulting from the short-term construction activities associated with the development of the Project. Exhibit 10-A shows the construction noise source locations in relation to the nearby sensitive receiver locations previously described in Section 8.

10.1 CONSTRUCTION NOISE STANDARDS

To analyze noise impacts originating from the construction of the 801 Opal Avenue Project, noise from construction activities are typically limited to the hours of operation established under a jurisdiction's Municipal Code. Section 83.01.080(g)(3) of the County of San Bernardino Development Code, provided in Appendix 3.1, indicates that construction activity is considered exempt from the noise level standards between the hours of 7:00a.m. to 7:00 p.m. except on Sundays and Federal holidays, as shown on Table 3-1. (3) However, neither the County of San Bernardino General Plan or County Code establish numeric maximum acceptable construction source noise levels at potentially affected receivers, which would allow for a quantified determination of what CEQA constitutes a *substantial temporary or periodic noise increase*. Therefore, the following construction noise level threshold is used in this noise study.

To evaluate whether the Project will generate potentially significant construction noise levels at off-site sensitive receiver locations, a construction-related noise level threshold is adopted from the *Criteria for Recommended Standard: Occupational Noise Exposure* prepared by the National Institute for Occupational Safety and Health (NIOSH). (17) A division of the U.S. Department of Health and Human Services, NIOSH identifies a noise level threshold based on the duration of exposure to the source. The construction related noise level threshold starts at 85 dBA for more than eight hours per day, and for every 3 dBA increase, the exposure time is cut in half. This results in noise level thresholds of 88 dBA for more than four hours per day, 92 dBA for more than one hour per day, 96 dBA for more than 30 minutes per day, and up to 100 dBA for more than 15 minutes per day. (17) For the purposes of this analysis, the lowest, more conservative construction noise level threshold of 85 dBA Leq is used as an acceptable threshold for construction noise at the nearby sensitive receiver locations. Since this construction-related noise level threshold represents the energy average of the noise source over a given time, they are expressed as Leq noise levels. Therefore, the noise level threshold of 85 dBA Leq over a period of eight hours or more is used to evaluate the potential Project-related construction noise level impacts at the nearby sensitive receiver locations.

10.2 CONSTRUCTION NOISE LEVELS

Noise generated by the Project construction equipment will include a combination of trucks, power tools, concrete mixers, and portable generators that when combined can reach high levels. The number and mix of construction equipment is expected to occur in the following stages:

- Demolition
- Building Construction
- Paving
- Architectural Coating

This construction noise analysis was prepared using reference noise level measurements taken by Urban Crossroads, Inc. to describe the typical construction activity noise levels for each stage of Project construction. The construction reference noise level measurements represent a list of typical construction activity noise levels. Noise levels generated by heavy construction equipment can range from approximately 68 dBA to more than 80 dBA when measured at 50 feet. However, these noise levels diminish with distance from the construction site at a rate of 6 dBA per doubling of distance. For example, a noise level of 80 dBA measured at 50 feet from the noise source to the receiver would be reduced to 74 dBA at 100 feet from the source to the receiver, and would be further reduced to 68 dBA at 200 feet from the source to the receiver. The construction stages used in this analysis are consistent with the *801 Opal Avenue Air Quality Impact Analysis* prepared by Urban Crossroads, Inc. (25)

10.3 CONSTRUCTION REFERENCE NOISE LEVELS

To describe the Project construction noise levels, measurements were collected for similar activities at several construction sites. Table 10-1 provides a summary of the 17-construction reference noise level measurements. Since the reference noise levels were collected at varying distances of 30 feet and 50 feet, all construction noise level measurements presented on Table 10-1 have been adjusted for consistency to describe a uniform reference distance of 50 feet.

EXHIBIT 10-A: CONSTRUCTION NOISE SOURCE LOCATIONS AND MITIGATION MEASURES

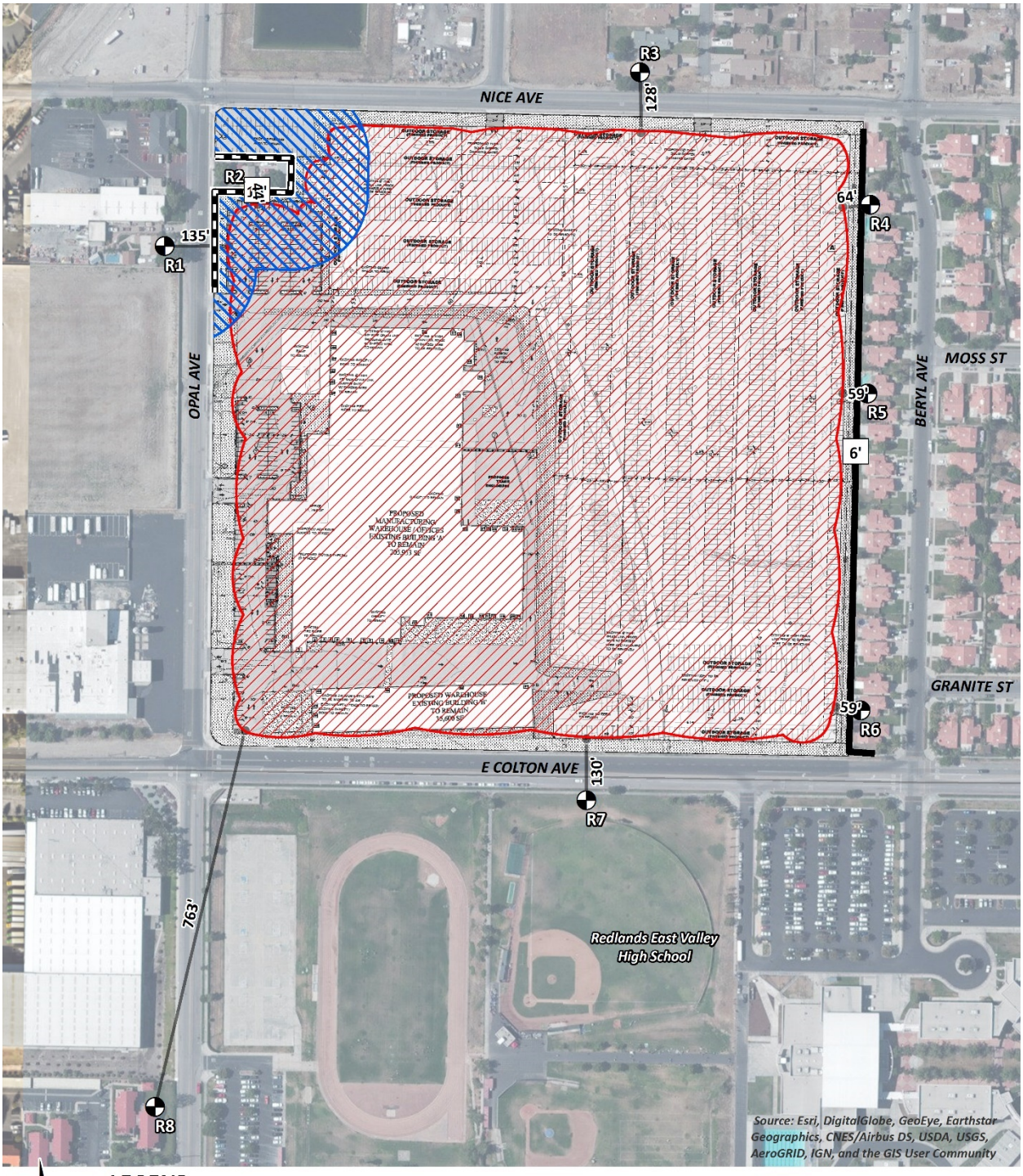

TABLE 10-1: CONSTRUCTION REFERENCE NOISE LEVELS

ID	Noise Source	Reference Distance From Source (Feet)	Reference Noise Levels @ Reference Distance (dBA Leq)	Reference Noise Levels @ 50 Feet (dBA Leq)[7]
1	Truck Pass-Bys & Dozer Activity[1]	30'	63.6	59.2
2	Dozer Activity[1]	30'	68.6	64.2
3	Construction Vehicle Maintenance Activities[2]	30'	71.9	67.5
4	Foundation Trenching[2]	30'	72.6	68.2
5	Rough Grading Activities[2]	30'	77.9	73.5
6	Framing[3]	30'	66.7	62.3
7	Water Truck Pass-By & Backup Alarm[4]	30'	76.3	71.9
8	Dozer Pass-By[4]	30'	84.0	79.6
9	Two Scrapers & Water Truck Pass-By[4]	30'	83.4	79.0
10	Two Scrapers Pass-By[4]	30'	83.7	79.3
11	Scraper, Water Truck, & Dozer Activity[4]	30'	79.7	75.3
12	Concrete Mixer Truck Movements[5]	50'	71.2	71.2
13	Concrete Paver Activities[5]	30'	70.0	65.6
14	Concrete Mixer Pour & Paving Activities[5]	30'	70.3	65.9
15	Concrete Mixer Backup Alarms & Air Brakes[5]	50'	71.6	71.6
16	Concrete Mixer Pour Activities[5]	50'	67.7	67.7
17	Forklift, Jackhammer, & Metal Truck Bed Loading	50'	67.9	67.9

[1] As measured by Urban Crossroads, Inc. on 10/14/15 at a business park construction site located at the northwest corner of Barranca Parkway and Alton Parkway in the City of Irvine.
[2] As measured by Urban Crossroads, Inc. on 10/20/15 at a construction site located in Rancho Mission Viejo.
[3] As measured by Urban Crossroads, Inc. on 10/20/15 at a residential construction site located in Rancho Mission Viejo.
[4] As measured by Urban Crossroads, Inc. on 10/30/15 during grading operations within an industrial construction site located in the City of Ontario.
[5] Reference noise level measurements were collected from a nighttime concrete pour at an industrial construction site, located at 27334 San Bernardino Avenue in the City of Redlands, between 1:00 a.m. to 2:00 a.m. on 7/1/15.
[6] As measured by Urban Crossroads, Inc. on 9/9/16 during the demolition of an existing paved parking lot at 41 Corporate Park in Irvine.
[7] Reference noise levels are calculated at 50 feet using a drop off rate of 6 dBA per doubling of distance (point source).

10.4 CONSTRUCTION NOISE ANALYSIS

Using the reference construction equipment noise levels, calculations of the Project construction noise level impacts at the nearby sensitive receiver locations were completed. Tables 10-2 to 10-5 present the short-term construction noise levels for each stage of construction. Table 10-6 provides a summary of the construction noise levels by stage at the nearby noise-sensitive receiver locations. Based on the stages of construction, the noise impacts associated with the proposed Project are expected to create temporarily high noise levels at the nearby receiver locations. To assess the peak construction noise levels, this analysis shows the highest noise impacts when the equipment with the highest reference noise level is operating at the closest point from the center of primary construction activity to each receiver location.

TABLE 10-2: DEMOLITION EQUIPMENT NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA Leq)
Truck Pass-Bys & Dozer Activity	59.2
Dozer Activity	64.2
Dozer Pass-By	79.6
Peak Reference Noise Level at 50 Feet (dBA Leq):	79.6

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Calculated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	135'	-8.6	0.0	70.9
R2	44'	1.1	0.0	80.7
R3	128'	-8.2	0.0	71.4
R4	64'	-2.1	-5.7	71.7
R5	59'	-1.4	-5.8	72.3
R6	59'	-1.4	-5.8	72.3
R7	130'	-8.3	0.0	71.3
R8	763'	-23.7	0.0	55.9

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Calculated barrier attenuation from existing barriers in the Project study area (Appendix 9.1).

TABLE 10-3: BUILDING CONSTRUCTION EQUIPMENT NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA Leq)
Construction Vehicle Maintenance Activities	67.5
Foundation Trenching	68.2
Framing	62.3
Peak Reference Noise Level at 50 Feet (dBA Leq):	68.2

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Calculated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	135'	-8.6	0.0	59.5
R2	44'	1.1	0.0	69.3
R3	128'	-8.2	0.0	60.0
R4	64'	-2.1	-5.7	60.3
R5	59'	-1.4	-5.8	60.9
R6	59'	-1.4	-5.8	60.9
R7	130'	-8.3	0.0	59.9
R8	763'	-23.7	0.0	44.5

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Calculated barrier attenuation from existing barriers in the Project study area (Appendix 9.1).

TABLE 10-4: PAVING EQUIPMENT NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA Leq)
Concrete Mixer Truck Movements	71.2
Concrete Paver Activities	65.6
Concrete Mixer Pour & Paving Activities	65.9
Concrete Mixer Backup Alarms & Air Brakes	71.6
Concrete Mixer Pour Activities	67.7
Peak Reference Noise Level at 50 Feet (dBA Leq):	71.6

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Calculated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	135'	-8.6	0.0	63.0
R2	44'	1.1	0.0	72.7
R3	128'	-8.2	0.0	63.4
R4	64'	-2.1	-5.7	63.8
R5	59'	-1.4	-5.8	64.4
R6	59'	-1.4	-5.8	64.4
R7	130'	-8.3	0.0	63.3
R8	763'	-23.7	0.0	47.9

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Calculated barrier attenuation from existing barriers in the Project study area (Appendix 9.1).

TABLE 10-5: ARCHITECTURAL COATING EQUIPMENT NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA Leq)
Construction Vehicle Maintenance Activities	67.5
Peak Reference Noise Level at 50 Feet (dBA Leq):	67.5

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Calculated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	135'	-8.6	0.0	58.8
R2	44'	1.1	0.0	68.6
R3	128'	-8.2	0.0	59.3
R4	64'	-2.1	-5.7	59.6
R5	59'	-1.4	-5.8	60.2
R6	59'	-1.4	-5.8	60.2
R7	130'	-8.3	0.0	59.2
R8	763'	-23.7	0.0	43.8

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Calculated barrier attenuation from existing barriers in the Project study area (Appendix 9.1).

10.5 CONSTRUCTION NOISE THRESHOLDS OF SIGNIFICANCE

The construction noise analysis shows that the highest construction noise levels will occur when construction activities take place at the closest point from the center of Project construction activity to each of the nearby receiver locations. As shown on Table 10-6, the unmitigated construction noise levels are expected to range from 55.9 to 80.7 dBA Leq at the nearby receiver locations. To evaluate whether the Project will generate potentially significant short-term noise levels at off-site sensitive receiver locations a construction-related the NIOSH noise level threshold of 85 dBA Leq is used as acceptable thresholds for construction noise at the nearby sensitive receiver locations.

TABLE 10-6: UNMITIGATED CONSTRUCTION EQUIPMENT NOISE LEVEL SUMMARY (DBA LEQ)

Receiver Location[1]	Construction Phase Hourly Noise Level (dBA Leq)				
	Demolition	Building Construction	Paving	Architectural Coating	Peak Activity[2]
R1	70.9	59.5	63.0	58.8	70.9
R2	80.7	69.3	72.7	68.6	80.7
R3	71.4	60.0	63.4	59.3	71.4
R4	71.7	60.3	63.8	59.6	71.7
R5	72.3	60.9	64.4	60.2	72.3
R6	72.3	60.9	64.4	60.2	72.3
R7	71.3	59.9	63.3	59.2	71.3
R8	55.9	44.5	47.9	43.8	55.9

[1] Noise receiver locations are shown on Exhibit 10-A.
[2] Estimated construction noise levels during peak operating conditions.

Table 10-7 shows the peak construction noise levels at the potentially impacted receiver locations are expected to approach 80.7 dBA Leq and will satisfy the NIOSH 85 dBA Leq significance threshold during temporary Project construction activities. The noise impact due to unmitigated Project construction noise levels is, therefore, considered a *less than significant* impact at all nearby sensitive receiver locations.

TABLE 10-7: CONSTRUCTION EQUIPMENT NOISE LEVEL COMPLIANCE (DBA LEQ)

Receiver Location[1]	Construction Noise Levels (dBA Leq)		
	Peak Activity[2]	Threshold[3]	Threshold Exceeded?[4]
R1	70.9	85	No
R2	80.7	85	No
R3	71.4	85	No
R4	71.7	85	No
R5	72.3	85	No
R6	72.3	85	No
R7	71.3	85	No
R8	55.9	85	No

[1] Noise receiver locations are shown on Exhibit 10-A.
[2] Estimated construction noise levels during peak operating conditions, as shown on Table 10-7.
[3] Construction noise level threshold as shown on Table 4-2.
[4] Do the estimated Project construction noise levels exceed the construction noise level threshold?

10.6 CONSTRUCTION NOISE LEVEL INCREASES

To describe the temporary Project construction noise level contributions to the existing ambient noise environment, the Project construction noise levels were combined with the existing ambient noise levels measurements at the off-site receiver locations. The difference between the combined Project-construction and ambient noise levels are used to describe the construction noise level contributions. Temporary noise level increases that would be experienced at sensitive receiver locations when Project construction-source noise is added to the ambient daytime conditions are presented on Table 10-8. A temporary noise level increase of 12 dBA is considered a potentially significant impact based on the Caltrans substantial noise level increase criteria which is used to assess the Project-construction noise level increases. (6) No nighttime construction activity is permitted in the County of San Bernardino Development Code, and therefore, nighttime noise level increases are not analyzed in this noise study.

As indicated in Table 10-8, the Project will contribute unmitigated, worst-case construction noise level increases approaching 27.3 dBA Leq during the daytime hours at the closest sensitive receiver location, R2, and up to 17.6 dBA Leq at receiver location R1. Since the worst-case temporary noise level increases at receiver locations R1 and R2 during Project construction will exceed the 12 dBA Leq significance threshold, the unmitigated construction noise level increases are considered *potentially significant* temporary noise impacts at receiver locations R1 and R2.

TABLE 10-8: UNMITIGATED CONSTRUCTION-RELATED TEMPORARY NOISE LEVEL INCREASES

Receiver Location[1]	Peak Project Construction Noise Level[2]	Measurement Location[3]	Reference Ambient Noise Levels[4]	Combined Project and Ambient[5]	Temporary Worst-Case Project Contribution[6]	Threshold Exceeded?[7]
R1	70.9	L1	53.4	71.0	17.6	Yes
R2	80.7	L1	53.4	80.7	27.3	Yes
R3	71.4	L2	60.8	71.8	11.0	No
R4	71.7	L2	60.8	72.1	11.3	No
R5	72.3	L3	64.0	72.9	8.9	No
R6	72.3	L3	64.0	72.9	8.9	No
R7	71.3	L3	64.0	72.0	8.0	No
R8	55.9	L4	62.4	63.3	0.9	No

[1] Noise receiver locations are shown on Exhibit 10-A.
[2] Peak unmitigated Project construction noise levels as shown on Table 10-8.
[3] Ambient noise level measurement locations as shown on Exhibit 5-A.
[4] Observed daytime ambient noise levels as shown on Table 5-1.
[5] Represents the combined ambient conditions plus the Project construction activities.
[6] The temporary noise level increase expected with the addition of the proposed Project activities.
[7] Based on the 12 dBA temporary increase significance criteria as defined in Section 4.

Therefore, temporary construction noise mitigation measures are required to reduce these impacts at receiver locations R1 and R2. This includes the use of temporary construction noise mitigation barriers at the construction boundaries near the impacted receiver locations where Project construction noise levels could potentially exceed the noise level thresholds, as previously shown on Exhibit 10-A. In addition, a 150-foot buffer zone from the property lines of R1 and R2 is shown on Exhibit 10-A in which the use of dozers shall not be allowed. The construction noise analysis presents a conservative approach with the highest noise-level-producing equipment for each stage of Project construction operating at the closest point from construction activity to the nearby sensitive receiver locations. This scenario is unlikely to occur during typical construction activities and likely overstates the construction noise levels which will be experienced at each receiver location. With the construction noise mitigation measures identified in this noise study, shown on Exhibit 10-A, the worst-case construction noise level increases at the nearby residential receivers would be reduced.

The noise attenuation provided through temporary noise barriers depends on many factors including cost, wind loading, the location of the receiver, and the ability to place barriers such that the line-of-sight of the receiver is blocked to the noise source, among others. This analysis assumes a temporary noise barrier constructed using frame-mounted materials such as vinyl acoustic curtains or quilted blankets attached to the construction site perimeter fence.

Table 10-9 shows the peak construction noise level increases at the potentially impacted receiver locations will be reduced to range from 9.3 to 9.9 dBA Leq with the attenuation provided by the temporary construction noise barriers and the 150-foot buffer zone. As shown on Table 10-9, the temporary construction noise mitigation measures will reduce the construction noise levels

at the impacted receiver locations to satisfy the 12 dBA Leq significant increase threshold during temporary Project construction activities. Therefore, the noise impact due to Project construction is considered a *less than significant* impact after mitigation. The temporary construction noise barrier attenuation calculations are provided in Appendix 10.1. Appendix 10.2 includes example photographs of temporary noise barrier installations for reference.

TABLE 10-10: MITIGATED CONSTRUCTION-RELATED TEMPORARY NOISE LEVEL INCREASES

Receiver Location[1]	Mitigated Peak Project Construction Noise Level[2]	Measurement Location[3]	Reference Ambient Noise Levels[4]	Combined Project and Ambient[5]	Temporary Worst-Case Project Contribution[6]	Threshold Exceeded?[7]
R1	62.8	L1	53.4	63.3	9.9	No
R2	62.2	L1	53.4	62.7	9.3	No

[1] Noise receiver locations are shown on Exhibit 10-A.
[2] Peak mitigated Project construction noise levels as shown on Table 10-8.
[3] Ambient noise level measurement locations as shown on Exhibit 5-A.
[4] Observed daytime ambient noise levels as shown on Table 5-1.
[5] Represents the combined ambient conditions plus the Project construction activities.
[6] The temporary noise level increase expected with the addition of the proposed Project activities.
[7] Based on the 12 dBA temporary increase significance criteria as defined in Section 4.

10.7 CONSTRUCTION VIBRATION IMPACTS

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods used, distance to the affected structures and soil type. It is expected that ground-borne vibration from Project construction activities would cause only intermittent, localized intrusion. The proposed Project's construction activities most likely to cause vibration impacts are:

- Heavy Construction Equipment: Although all heavy mobile construction equipment has the potential of causing at least some perceptible vibration while operating close to building, the vibration is usually short-term and is not of sufficient magnitude to cause building damage. It is not expected that heavy equipment such as large bulldozers would operate close enough to any residences to cause a vibration impact.
- Trucks: Trucks hauling building materials to construction sites can be sources of vibration intrusion if the haul routes pass through residential neighborhoods on streets with bumps or potholes. Repairing the bumps and potholes generally eliminates the problem.

Ground-borne vibration levels resulting from construction activities occurring within the Project site were estimated by data published by the Federal Transit Administration. Construction activities that would have the potential to generate low levels of ground-borne vibration within the Project site include grading. Using the vibration source level of construction equipment provided on Table 6-8 and the construction vibration assessment methodology published by the FTA, it is possible to estimate the Project vibration impacts. Table 10-10 presents the expected Project related vibration levels at the nearby receiver locations.

Based on the reference vibration levels provided by the FTA, a large bulldozer represents the peak source of vibration with a reference velocity of 0.089 in/sec PPV at 25 feet. At distances ranging from 44 to 763 feet from Project construction activities, construction vibration velocity levels are expected to approach 0.04 in/sec PPV, which is below the vibration standard of 0.2 in/sec PPV at all receiver locations during Project construction. Therefore, the Project-related vibration impacts are considered *less than significant* during the construction activities at the Project site.

Further, the Project-related construction vibration levels do not represent levels capable of causing building damage to nearby residential homes. The FTA identifies construction vibration levels capable of building damage ranging from 0.12 to 0.5 in/sec PPV. (4) The peak Project-construction vibration levels shown on Table 10-10, approaching 0.04 in/sec PPV, are below the FTA vibration levels for building damage at the residential homes near the Project site. Further, the impacts at the site of the closest sensitive receivers are unlikely to be sustained during the entire construction period, but will occur rather only during the times that heavy construction equipment is operating adjacent to the Project site perimeter. Construction at the Project site will be restricted to daytime hours consistent with City requirements thereby eliminating potential vibration impact during the sensitive nighttime hours.

TABLE 10-10: CONSTRUCTION EQUIPMENT VIBRATION LEVELS

Receiver[1]	Distance to Const. Activity (Feet)	Receiver PPV Levels (in/sec)[2]					Threshold Exceeded?[4]
		Small Bulldozer	Jack-hammer	Loaded Trucks	Large Bulldozer	Peak Vibration	
R1	135'	0.00	0.00	0.01	0.01	0.01	No
R2	44'	0.00	0.01	0.03	0.04	0.04	No
R3	128'	0.00	0.00	0.01	0.01	0.01	No
R4	64'	0.00	0.01	0.02	0.02	0.02	No
R5	59'	0.00	0.01	0.02	0.02	0.02	No
R6	59'	0.00	0.01	0.02	0.02	0.02	No
R7	130'	0.00	0.00	0.01	0.01	0.01	No
R8	763'	0.00	0.00	0.00	0.00	0.00	No

[1] Receiver locations are shown on Exhibit 10-A.
[2] Based on the Vibration Source Levels of Construction Equipment included on Table 6-8.
[3] Vibration levels in PPV are converted to RMS velocity using a 0.71 conversion factor identified in the Caltrans Transportation and Construction Vibration Guidance Manual, September 2013.
[4] Does the peak vibration exceed the County of San Bernardino maximum acceptable vibration threshold shown on Table 3-3?

10.8 CONSTRUCTION NOISE MITIGATION MEASURES

Though construction noise is temporary, intermittent and of short duration, and will not present any long-term impacts, the following mitigation measures would reduce noise level increases produced by the construction equipment to the nearby noise-sensitive residential land uses:

- Install minimum 10-foot high temporary construction noise barriers at the Project's western site boundaries adjacent to sensitive receivers on Opal Avenue, as shown on Exhibit 10-A, for the duration of Project construction. The noise control barriers must have a solid face from top to bottom. The noise control barriers must meet the minimum height and be constructed as follows:
    - The temporary noise barriers shall provide a minimum transmission loss of 20 dBA (Federal Highway Administration, Noise Barrier Design Handbook). The noise barrier shall be constructed using an acoustical blanket (e.g. vinyl acoustic curtains or quilted blankets) attached to the construction site perimeter fence or equivalent temporary fence posts;
    - The noise barrier must be maintained and any damage promptly repaired. Gaps, holes, or weaknesses in the barrier or openings between the barrier and the ground shall be promptly repaired;
    - The noise control barrier and associated elements shall be completely removed and the site appropriately restored upon the conclusion of the construction activity.
- The use of dozers shall be prohibited within 150 feet of nearby occupied sensitive residential homes (receiver locations R1 and R2) to reduce the noise levels during Project construction.
- Prior to approval of grading plans and/or issuance of building permits, plans shall include a note indicating that noise-generating Project construction activities shall only occur between the hours of 7:00 a.m. to 7:00 p.m.; with no activity on Sundays and Federal holidays (Section 83.01.080(g)(3) of the County of San Bernardino Development Code).
- During all Project site construction, the construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturers' standards. The construction contractor shall place all stationary construction equipment so that emitted noise is directed away from the noise sensitive receptors nearest the Project site.
- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receivers nearest the Project site (i.e., to the center) during all Project construction.
- The construction contractor shall limit haul truck deliveries to the same hours specified for construction equipment (between the hours of 7:00 a.m. to 7:00 p.m.; with no activity on Sundays and Federal holidays). The contractor shall design delivery routes to minimize the exposure of sensitive land uses or residential dwellings to delivery truck-related noise, consistent with County of San Bernardino General Plan Noise Element, Policy N 1.5.

11 REFERENCES

1. **State of California.** *California Environmental Quality Act, Appendix G.* 2016.
2. **Urban Crossroads, Inc.** *801 Opal Avenue Traffic Impact Analysis .* May 2017.
3. **County of San Bernardino.** *Code of Ordinances, Title 8 Development Code, Chapter 83.01 General Performance Standards.*
4. **U.S. Department of Transportation, Federal Transit Administration.** *Transit Noise and Vibration Impact Assessment.* May 2006. FTA-VA-90-1003-06.
5. **U.S. Department of Transportation Federal Highway Administration.** Acoustical Consideration. *Noise Barrier Design Handbook.* [Online] [Cited: November 28, 2016.] https://www.fhwa.dot.gov/environment/noise/noise_barriers/design_construction/design/design03.cfm.
6. **California Department of Transportation.** *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects.* May 2011.
7. **California Department of Transportation Environmental Program.** *Technical Noise Supplement - A Technical Supplement to the Traffic Noise Analysis Protocol.* Sacramento, CA : s.n., September 2013.
8. **Environmental Protection Agency Office of Noise Abatement and Control.** *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* March 1974. EPA/ONAC 550/9/74-004.
9. **U.S. Department of Transportation, Federal Highway Administration, Office of Environment and Planning, Noise and Air Quality Branch.** *Highway Traffic Noise Analysis and Abatement Policy and Guidance.* June, 1995.
10. **U.S. Department of Transportation, Federal Highway Administration.** *Highway Traffic Noise in the United States, Problem and Response.* April 2000. p. 3.
11. **U.S. Environmental Protection Agency Office of Noise Abatement and Control.** *Noise Effects Handbook-A Desk Reference to Health and Welfare Effects of Noise.* October 1979 (revised July 1981). EPA 550/9/82/106.
12. **Occupational Safety and Health Administration.** *Standard 29 CRF, Part 1910.*
13. **Center for Disease Control and Prevention.** About Hearing Loss. [Online] [Cited: 04 15, 2016.] http://www.cdc.gov/healthyschools/noise/signs.htm.
14. **Office of Planning and Research.** *State of California General Plan Guidelines.* October 2003.
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16. **County of San Bernardino.** *General Plan Noise Element.* April 2007.
17. **National Institute for Occupational Safety and Health.** *Criteria for Recommended Standard: Occupational Noise Exposure.* June 1998.
18. **City of Redlands.** *Final Airport Master Plan for Redland Municipal Airport.* November 2008.
19. **California Court of Appeal.** *Gray v. County of Madera, F053661.* 167 Cal.App.4th 1099; - Cal.Rptr.3d, October 2008.
20. **Federal Interagency Committee on Noise.** *Federal Agency Review of Selected Airport Noise Analysis Issues.* August 1992.

21. **American National Standards Institute (ANSI).** *Specification for Sound Level Meters ANSI S1.4-2014/IEC 61672-1:2013.*

22. **U.S. Department of Transportation, Federal Highway Administration.** *FHWA Highway Traffic Noise Prediction Model.* December 1978. FHWA-RD-77-108.

23. **California Department of Transportation Environmental Program, Office of Environmental Engineering.** *Use of California Vehicle Noise Reference Energy Mean Emission Levels (Calveno REMELs) in FHWA Highway Traffic Noise Prediction.* September 1995. TAN 95-03.

24. **California Department of Transportation.** *Traffic Noise Attenuation as a Function of Ground and Vegetation Final Report.* June 1995. FHWA/CA/TL-95/23.

25. **Urban Crossroads, Inc.** *801 Opal Avenue Air Quality Impact Analysis.* May 2017.

12 CERTIFICATION

The contents of this noise study report represent an accurate depiction of the noise environment and impacts associated with the proposed 801 Opal Avenue Project. The information contained in this noise study report is based on the best available data at the time of preparation. If you have any questions, please contact me directly at (949) 336-5979.

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EDUCATION

Master of Science in Civil and Environmental Engineering
California Polytechnic State University, San Luis Obispo • December, 1993

Bachelor of Science in City and Regional Planning
California Polytechnic State University, San Luis Obispo • June, 1992

PROFESSIONAL REGISTRATIONS

PE – Registered Professional Traffic Engineer – TR 2537 • January, 2009
AICP – American Institute of Certified Planners – 013011 • June, 1997–January 1, 2012
PTP – Professional Transportation Planner • May, 2007 – May, 2013
INCE – Institute of Noise Control Engineering • March, 2004

PROFESSIONAL AFFILIATIONS

ASA – Acoustical Society of America
ITE – Institute of Transportation Engineers

PROFESSIONAL CERTIFICATIONS

Certified Acoustical Consultant – County of Orange • February, 2011
FHWA-NHI-142051 Highway Traffic Noise Certificate of Training • February, 2013

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APPENDIX 3.1:

COUNTY OF SAN BERNARDINO DEVELOPMENT CODE

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Print

San Bernardino County, CA Code of Ordinances

DIVISION 3: COUNTYWIDE DEVELOPMENT STANDARDS

CHAPTER 83.01: GENERAL PERFORMANCE STANDARDS

Section

§ 83.01.010 Purpose.

The purpose of this Chapter is to establish uniform performance standards for development within the County that promotes compatibility with surrounding areas and land uses.

Performance standards are designed to mitigate the environmental impacts of existing and proposed land uses within a community. Environmental impacts include air quality, glare, heat, noise, runoff control, and waste disposal. These general performance standards are intended to protect the health and safety of businesses, nearby residents, and workers and to prevent damaging effects to surrounding properties.

(Ord. 4011, passed - -2007)

§ 83.01.020 Applicability.

(a) *New and Existing Uses in All Land Use Zoning Districts.* The provisions of this Chapter apply to all new and existing uses in all land use zoning districts. The standards of this Chapter elaborate upon and otherwise augment the development standards specified for individual land use zoning districts in Division 2 (Land Use Zoning Districts and Allowed Land Uses) and in Division 4 (Standards for Specific Land Uses and Activities).

(b) *Compliance of Alterations or Modifications.* Uses of the land that existed on the effective date of this Division shall not be altered or modified so as to conflict with, or further conflict with, these standards.

(c) *Evidence of Compliance with Standards.* If requested by the Director or the Review Authority, applicants shall provide evidence to the Director that the proposed development is in compliance with the standards in this Division and other applicable standards in this Development Code before the issuance of a Building Permit or business license.

(Ord. 4011, passed - -2007)

§ 83.01.030 Modification of Standards.

(a) *Modification by Specific Reference.* The provisions of this Division shall prevail should they conflict with the provisions of a land use zoning district or specific plan, unless the land use zoning district or plan standard specifically overrides or modifies the provisions of this Division by specific reference.

(b) *Modification by Establishment of Overlay or Approval of Planned Development or Variance.* An overlay, approved Planned Development, or approved Variance may modify the provisions of this Division.

(Ord. 4011, passed - -2007)

§ 83.01.040 Air Quality.

(a) *Equipment Permit and Inspection Requirements.* Required permits shall be obtained from either the Mojave Air Pollution Management District or the South Coast Air Quality Management District depending on the location of the subject property and equipment for equipment that may cause air pollution. Before the equipment may be constructed, plans and specifications shall be submitted to the appropriate District for approval

(b) *Permits from Air Quality Management Districts.* Permits shall be obtained from either the Mojave Air Pollution Management District or the South Coast Air Quality Management District depending on the location of the subject property and equipment. If requested by the Director, uses, activities, or processes that require Air Quality Management District approval to operate shall file a copy of the permit with the Department within 30 days of its approval.

(c) *Diesel Exhaust Emissions Control Measures.* The following emissions control measures shall apply to all discretionary land use projects approved by the County on or after January 15, 2009:

(1) *On-Road Diesel Vehicles.* On-road diesel vehicles are regulated by the State of California Air Resources Board.

(2) *Off-Road Diesel Vehicle/Equipment Operations.* All business establishments and contractors that use off-road diesel vehicle/equipment as part of their normal business operations shall adhere to the following measures during their operations in order to reduce diesel particulate matter emissions from diesel-fueled engines:

(A) Off-road vehicles/equipment shall not be left idling on site for periods in excess of five minutes. The idling limit does not apply to:

(I) Idling when queuing;

(II) Idling to verify that the vehicle is in safe operating condition;

(III) Idling for testing, servicing, repairing or diagnostic purposes;

(IV) Idling necessary to accomplish work for which the vehicle was designed (such as operating a crane);

(V) Idling required to bring the machine system to operating temperature; and

(VI) Idling necessary to ensure safe operation of the vehicle.

(B) Use reformulated ultra low-sulfur diesel fuel in equipment and use equipment certified by the U.S. Environmental Protection Agency (EPA) or that pre-dates EPA regulations.

(C) Maintain engines in good working order to reduce emissions.

(D) Signs shall be posted requiring vehicle drivers to turn off engines when parked.

(E) Any requirements or standards subsequently adopted by the South Coast Air Quality Management District, the Mojave Desert Air Quality Management District or the California Air Resources Board.

(F) Provide temporary traffic control during all phases of construction.

(G) On-site electrical power connections shall be provided for electric construction tools to eliminate the need for diesel-powered electric generators, where feasible.

(H) Maintain construction equipment engines in good working order to reduce emissions. The developer shall have each contractor certify that all construction equipment is properly serviced and maintained in good operating condition.

(I) Contractors shall use ultra low sulfur diesel fuel for stationary construction equipment as required by Air Quality Management District (AQMD) Rules 431.1 and 431.2 to reduce the release of undesirable emissions.

(J) Substitute electric and gasoline-powered equipment for diesel-powered equipment, where feasible.

(3) *Project Design.* Distribution centers, warehouses, truck stops and other facilities with loading docks where diesel trucks may reside overnight or for periods in excess of three hours shall be designed to enable any vehicle using these facilities to utilize on-site electrical connections to power the heating and air conditioning of the cabs of such trucks, and any refrigeration unit(s) of any trailer being pulled by the trucks, instead of operating the diesel engines and diesel refrigeration units of such trucks and trailers for these purposes. This requirement shall also apply to Recreational Vehicle Parks (as defined in § 810.01.200(k) of this title) and other development projects where diesel engines may reasonably be expected to operate on other than an occasional basis.

(Ord. 4011, passed - -2007; Am. Ord. 4065, passed - -2008)

§ 83.01.050 Electrical Disturbances.

No activity, land use, or process shall cause electrical disturbance that adversely affects persons or the operation of equipment across lot lines and that does not conform to the regulations of the Federal Communications Commission. Existing or proposed uses that generate electrical disturbances that are be considered hazardous or a public nuisance shall be contained, modified, or shielded to prevent disturbances.

(Ord. 4011, passed - -2007)

§ 83.01.060 Fire Hazards.

This Section establishes standards for storage of solid materials susceptible to fire hazards and flammable liquids and gases where allowed in compliance with Division 2 (Land Use Zoning Districts and Allowed

Land Uses).

(a) *Combustible Solids.* Land uses that include the storage of solid materials susceptible to fire hazards shall be subject to the following storage standards in the indicated land use zoning districts.

(1) *Regional Industrial (IR) Land Use Zoning District.*

(A) *Inside Storage.* A structure utilized for the storage, manufacture, or use of flammable solid materials shall be located no less than 40 feet from any lot line and any other on-site structures or shall adhere to standards specified in Subdivision (2) below.

(B) *Outdoor Storage.* Outdoor storage of flammable solid materials shall be no less than 50 feet from any lot line and any other on-site structures.

(2) *All Other Manufacturing or Industrial Uses Legally Established Within Any Other Land Use Zoning District.* The storage, manufacture, or use of highly flammable solid materials shall take place in enclosed spaces having fire resistance of no less than two hours and protected with an automatic fire extinguishing system.

(b) *Flammable Liquids and Gases.* Land uses that involve the storage of flammable liquids and gases shall be subject to the following standards when established within the land use zoning districts indicated.

(1) *Setbacks.* County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials) shall establish setback requirements for flammable liquids and gases.

(2) *Storage capacity.* The total storage capacity of flammable liquids and gases on a parcel shall not exceed the quantities indicated in Table 83-1 (Storage Standards for Flammable Liquids and Gases).

Table 83-1		
Storage Standards for Flammable Liquids and Gases		
Stored Substance	***Land Use Zoning District***	***Maximum Capacity***
SCF = Standard cubic feet at 60ºF and 29.92" Hg (i.e., mercury)		
Liquids	Regional Industrial District (IR)	120,000 gallons
	All other manufacturing or industrial uses legally established within any other land use zoning district	60,000 gallons
Liquefied Petroleum Gas (LPG)	All manufacturing or industrial uses established in any land zoning use district	Per County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials)
	All commercial uses legally established in any land use zoning district	15,000 gal./tank 20,000 gallons maximum aggregate total
	All agricultural uses legally established in any land use zoning district and aggregate total	15,000 gal./tank and aggregate total
Gases other than liquefied petroleum gas	Regional Industrial District (IR)	300,000 SCF above ground 600,000 SCF below ground
	All other manufacturing or industrial uses legally	150,000 SCF above ground 300,000 SCF below ground

	established within any other land use zoning district	

(c) *Liquefied Petroleum Gas (LPG).*

(1) *General Requirements.*

(A) *Agricultural, Commercial, Industrial, or Manufacturing Uses and Land Use Zoning Districts.* Liquefied petroleum gas (LPG) storage and distribution facilities for agricultural, commercial, industrial, or manufacturing uses shall be allowed subject to a Use Permit in compliance with Division 2 (Land Use Zoning Districts and Allowed Land Uses). The location, installation, operation, and maintenance of LPG storage and distribution facilities shall be subject to:

(I) The standards in this Subdivision.

(II) The conditions, requirements, and standards imposed by the Review Authority in compliance with this Chapter.

(B) *Residential Uses and Land Use Zoning Districts.* County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials) shall establish standards for residential uses and residential land use zoning districts for LPG storage.

(C) *Conflict Between Land Use District and Use Permit Requirements.* In the event of a conflict between the provisions of this § 83.01.060(c) (Liquefied Petroleum Gas [LPG]) and the provisions of a land use zoning district, including the requirement for Use Permit, the provisions of this Section shall prevail and control.

(2) *Fire Protection Requirements for All Parcels.*

(A) Setbacks for LPG storage and distribution facilities from structures and property lines shall be those specified by County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(B) LPG storage tanks shall be centrally located on the parcel to the satisfaction of the Fire Department.

(3) *Additional Fire Protection Requirements for Specific Types of Parcels.* For parcels that have no more than one occupied structure less than 5,000 square feet in size and where the water system provides substandard flows per International Standards Organization (ISO) standards for structure protection, additional fire protection requirements shall be as follows:

(A) *Where Parcel Size Is Ten Acres or More.* Fire flow shall be calculated for exposures only in compliance with County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(B) *Where Parcel Size Is at Least Five Acres but less than Ten Acres.*

(I) A one hour approved protective coating shall be applied to the LPG storage tank.

(II) Fire flow shall be calculated for exposures only, in compliance with County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(C) *Where Parcel Size Is at Least Two and One-half Acres, but less than Five Acres.*

(I) A two hour approved protective coating shall be applied to the tank.

(II) Fire flow shall be calculated for exposures only, in compliance with County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(4) *Additional Fire Protection Requirements for Any Parcel with Adequate Fire Flow Available per ISO Standards.*

(A) Fire hydrant(s) shall serve the parcel in compliance with County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(B) Fire flow shall provide for exposure protection (ISO Calculation) and LPG storage tank protection/suppression.

(I) Sprinklers shall use calculations, as adopted by County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(II) Hose lines shall use the formula: GPM = five times the square root of the tank capacity.

(C) Additional protection.

(I) Where the Fire Chief determines that water can be applied to the tank or exposures by the Fire Department in required amounts in eight minutes or less, no additional protection shall be required.

(II) Where the Fire Chief determines that water cannot be applied to the tank or exposures by the Fire Department in required amounts in eight minutes or less, one of the following protection measures shall be required:

(i) One hour approved protective coating shall be applied to the LPG storage tank; or

(ii) A fixed spray water system shall be installed as approved by the Fire Department.

(5) Additional fire protection requirements for any parcel not included in either Subdivisions (C)(III) or (C)(IV), above:

(A) Either a one-hour or more protective coating shall be applied to the LPG storage tank, as required by the Fire Department, or a fixed spray water system shall be installed instead of coating the tank.

(B) Fire flow shall be calculated for exposure only, in compliance with the San Bernardino Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(Ord. 4011, passed - -2007)

§ 83.01.070 Heat.

Land uses in industrial districts shall not emit heat that would cause a temperature increase on any adjacent property in excess of ten degrees Fahrenheit, whether the change is in the air, on the ground, or in a structure.

(Ord. 4011, passed - -2007)

§ 83.01.080 Noise.

This Section establishes standards concerning acceptable noise levels for both noise-sensitive land uses and for noise-generating land uses.

(a) *Noise Measurement.* Noise shall be measured:

(1) At the property line of the nearest site that is occupied by, and/or zoned or designated to allow the development of noise-sensitive land uses;

(2) With a sound level meter that meets the standards of the American National Standards Institute (ANSI § SI4 1979, Type 1 or Type 2);

(3) Using the "A" weighted sound pressure level scale in decibels (ref. pressure = 20 micronewtons per meter squared). The unit of measure shall be designated as dB(A).

(b) *Noise Impacted Areas.* Areas within the County shall be designated as "noise-impacted" if exposed to existing or projected future exterior noise levels from mobile or stationary sources exceeding the standards listed in Subdivision (d) (Noise Standards for Stationary Noise Sources) and Subdivision (e) (Noise Standards for Adjacent Mobile Noise Sources), below. New development of residential or other noise-sensitive land uses shall not be allowed in noise-impacted areas unless effective mitigation measures are incorporated into the project design to reduce noise levels to these standards. Noise-sensitive land uses shall include residential uses, schools, hospitals, nursing homes, religious institutions, libraries, and similar uses.

(c) *Noise Standards for Stationary Noise Sources.*

(1) *Noise Standards.* Table 83-2 (Noise Standards for Stationary Noise Sources) describes the noise standard for emanations from a stationary noise source, as it affects adjacent properties:

Table 83-2

Noise Standards for Stationary Noise Sources

Affected Land Uses (Receiving Noise)	***7:00 a.m. - 10:00 p.m. Leq***	***10:00 p.m. - 7:00 a.m. Leq***
Residential	55 dB(A)	45 dB(A)
Professional Services	55 dB(A)	55 dB(A)
Other Commercial	60 dB(A)	60 dB(A)
Industrial	70 dB(A)	70 dB(A)
Leq = (Equivalent Energy Level). The sound level corresponding to a steady-state sound level containing the same total energy as a time-varying signal over a given sample period, typically one, eight or 24 hours.		
dB(A) = (A-weighted Sound Pressure Level). The sound pressure level, in decibels, as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound, placing greater emphasis on those frequencies within the sensitivity range of the human ear.		
Ldn = (Day-Night Noise Level). The average equivalent A-weighted sound level during a 24-hour day obtained by adding 10 decibels to the hourly noise levels measured during the night (from 10:00 p.m. to 7:00 a.m.). In this way Ldn takes into account the lower tolerance of people for noise during nighttime periods.		

(2) *Noise Limit Categories.* No person shall operate or cause to be operated a source of sound at a location or allow the creation of noise on property owned, leased, occupied, or otherwise controlled by the person, which causes the noise level, when measured on another property, either incorporated or unincorporated, to exceed any one of the following:

(A) The noise standard for the receiving land use as specified in Subdivision (b) (Noise-Impacted Areas), above, for a cumulative period of more than 30 minutes in any hour.

(B) The noise standard plus five dB(A) for a cumulative period of more than 15 minutes in any hour.

(C) The noise standard plus ten dB(A) for a cumulative period of more than five minutes in any hour.

(D) The noise standard plus 15 dB(A) for a cumulative period of more than one minute in any hour.

(E) The noise standard plus 20 dB(A) for any period of time.

(d) *Noise Standards for Adjacent Mobile Noise Sources.* Noise from mobile sources may affect adjacent properties adversely. When it does, the noise shall be mitigated for any new development to a level that shall not exceed the standards described in the following Table 83-3 (Noise Standards for Adjacent Mobile Noise Sources).

Table 83-3

Noise Standards for Adjacent Mobile Noise Sources

Land Use		***Ldn (or CNEL) dB(A)***	
Categories	***Uses***	***Interior*** (1)	***Exterior*** (2)
Residential	Single and multi-family, duplex, mobile homes	45	60(3)
Commercial	Hotel, motel, transient housing	45	60(3)
	Commercial retail, bank, restaurant	50	N/A
	Office building, research and development, professional offices	45	65
	Amphitheater, concert hall, auditorium, movie theater	45	N/A
Institutional/Public	Hospital, nursing home, school classroom, religious institution, library	45	65
Open Space	Park	N/A	65

Notes:

(1) The indoor environment shall exclude bathrooms, kitchens, toilets, closets and corridors.

(2) The outdoor environment shall be limited to:

- Hospital/office building patios
- Hotel and motel recreation areas
- Mobile home parks
- Multi-family private patios or balconies
- Park picnic areas
- Private yard of single-family dwellings
- School playgrounds

(3) An exterior noise level of up to 65 dB(A) (or CNEL) shall be allowed provided exterior noise levels have been substantially mitigated through a reasonable application of the best available noise reduction technology, and interior noise exposure does not exceed 45 dB(A) (or CNEL) with windows and doors closed. Requiring that windows and doors remain closed to achieve an acceptable interior noise level shall necessitate the use of air conditioning or mechanical ventilation.

CNEL = (Community Noise Equivalent Level). The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of approximately five decibels to sound

levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night from 10:00 p.m. to 7:00 a.m.

(e) *Increases in Allowable Noise Levels.* If the measured ambient level exceeds any of the first four noise limit categories in Subdivision (d)(2), above, the allowable noise exposure standard shall be increased to reflect the ambient noise level. If the ambient noise level exceeds the fifth noise limit category in Subdivision (d)(2), above, the maximum allowable noise level under this category shall be increased to reflect the maximum ambient noise level.

(f) *Reductions in Allowable Noise Levels.* If the alleged offense consists entirely of impact noise or simple tone noise, each of the noise levels in Table 83-2 (Noise Standards for Stationary Noise Sources) shall be reduced by five dB(A).

(g) *Exempt Noise.* The following sources of noise shall be exempt from the regulations of this Section:

(1) Motor vehicles not under the control of the commercial or industrial use.

(2) Emergency equipment, vehicles, and devices.

(3) Temporary construction, maintenance, repair, or demolition activities between 7:00 a.m. and 7:00 p.m., except Sundays and Federal holidays.

(h) *Noise Standards for Other Structures.* All other structures shall be sound attenuated against the combined input of all present and projected exterior noise to not exceed the criteria.

Table 83-4

Noise Standards for Other Structures

Typical Uses	***12-Hour Equivalent Sound Level (Interior) in dBA Ldn***
Educational, institutions, libraries, meeting facilities, etc.	45
General office, reception, etc.	50
Retail stores, restaurants, etc.	55
Other areas for manufacturing, assembly, testing, warehousing, etc.	65

In addition, the average of the maximum levels on the loudest of intrusive sounds occurring during a 24-hour period shall not exceed 65 dBA interior.

(Ord. 4011, passed - -2007; Am. Ord. 4245, passed - -2014)

§ 83.01.090 Vibration.

(a) *Vibration Standard.* No ground vibration shall be allowed that can be felt without the aid of instruments at or beyond the lot line, nor shall any vibration be allowed which produces a particle velocity greater than or equal to two-tenths inches per second measured at or beyond the lot line.

(b) *Vibration Measurement.* Vibration velocity shall be measured with a seismograph or other instrument capable of measuring and recording displacement and frequency, particle velocity, or acceleration. Readings shall be made at points of maximum vibration along any lot line next to a parcel within a residential, commercial and industrial land use zoning district.

(c) *Exempt Vibrations.* The following sources of vibration shall be exempt from the regulations of this Section.

(1) Motor vehicles not under the control of the subject use.

(2) Temporary construction, maintenance, repair, or demolition activities between 7:00 a.m. and 7:00 p.m., except Sundays and Federal holidays.

(Ord. 4011, passed - -2007)

§ 83.01.100 Waste Disposal.

(a) *Liquid Waste Disposal and Runoff Control.* No liquids of any kind shall be discharged into a public or private sewage or drainage system, watercourse, body of water, or into the ground, except in compliance with applicable regulations of the County Code, Title 23 (Waters) of the California Code of Regulations, the California Water Code, and related Federal regulations.

(b) *Hazardous Waste.* Refer to Chapter 84.11 (Hazardous Waste Facilities) for regulations relative to hazardous waste facilities.

(c) *Solid Waste Disposal.* Refer to Chapter 84.24 (Solid Waste/Recyclable Materials Storage) for regulations relative to solid waste disposal.

(Ord. 4011, passed - -2007)

§ 83.01.110 External Commercial or Industrial Activity on Private Property.

There shall be no unpermitted external or industrial activity on properties subject to the County's jurisdiction between the hours of 9:00 p.m. and 7:00 a.m. that shall at any time impair the quiet enjoyment of neighboring property owners or residents or in any manner disturb the public peace.

(Ord. 4245, passed - -2014)

APPENDIX 5.1:

STUDY AREA PHOTOS

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L1_E
34, 3' 57.260000", 117, 8' 4.060000"

L1_N
34, 3' 57.240000", 117, 8' 4.090000"

L1_S
34, 3' 57.190000", 117, 8' 4.220000"

L1_W
34, 3' 57.210000", 117, 8' 4.110000"

L2_N
34, 3' 59.530000", 117, 7' 57.520000"

L2_SE
,

L2_SE2
34, 3' 59.760000", 117, 7' 57.410000"

L2_SW
34, 3' 59.760000", 117, 7' 57.410000"

L3
34, 3' 46.550000", 117, 7' 49.090000"

L3_N
34, 3' 46.700000", 117, 7' 48.950000"

L3_S
34, 3' 46.680000", 117, 7' 48.810000"

L4_E
34, 3' 39.970000", 117, 8' 4.690000"

L4_N
34, 3' 40.030000", 117, 8' 4.660000"

L4_W
34, 3' 39.970000", 117, 8' 4.690000"

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APPENDIX 5.2:

NOISE LEVEL MEASUREMENT WORKSHEETS

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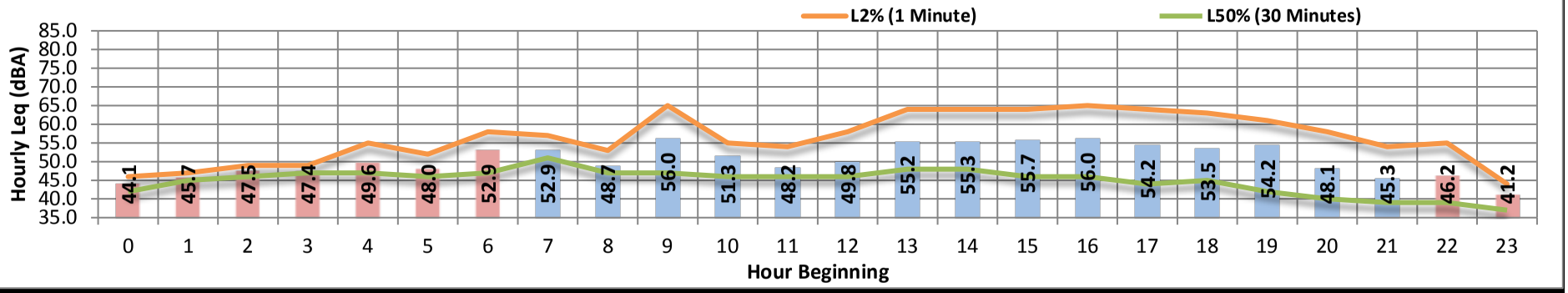
24-Hour Noise Level Measurement Summary

			Energy Average Leq		24-Hour
Project Name: Opal	*JN:* 10958		*Day*	*Night*	*CNEL*
Location: L1 - Located on Opal Avenue adjacent to an existing residential home bounded by the Project site boundaries.	*Analyst:* A. Wolfe		53.4	48.1	56.1
	Date: 5/10/2017				

Hourly Leq dBA Readings (unadjusted)



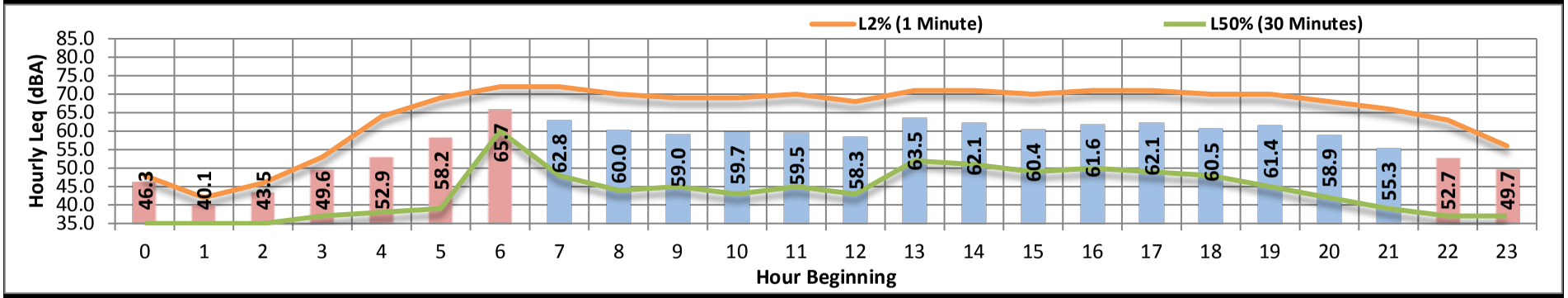
Time Period	*Hour*	*Leq*	*Lmax*	*Lmin*	*L1%*	*L2%*	*L5%*	*L8%*	*L25%*	*L50%*	*L90%*	*L95%*	*L99%*
Day	Min	45.3	62.7	37.6	55.0	53.0	46.0	44.0	41.0	39.0	37.0	37.0	37.0
	Max	56.0	81.6	46.8	67.0	65.0	64.0	64.0	54.0	51.0	47.0	46.0	46.0
Energy Average:		53.4	Average:		62.1	59.9	56.2	54.3	48.5	45.4	42.9	42.4	41.7
Night	Min	41.2	58.0	37.5	47.0	44.0	42.0	41.0	39.0	37.0	37.0	37.0	37.0
	Max	52.9	82.0	46.8	61.0	58.0	55.0	54.0	50.0	47.0	47.0	47.0	46.0
Energy Average:		48.1	Average:		53.3	50.6	47.3	46.3	45.1	44.0	43.2	42.9	42.8
Hourly Summary													
Night	0	44.1	70.4	39.3	49.0	46.0	43.0	42.0	42.0	42.0	40.0	39.0	39.0
	1	45.7	63.8	42.3	50.0	47.0	46.0	46.0	46.0	45.0	42.0	42.0	42.0
	2	47.5	67.1	46.5	52.0	49.0	47.0	47.0	46.0	46.0	46.0	46.0	46.0
	3	47.4	58.0	46.8	51.0	49.0	47.0	47.0	47.0	47.0	47.0	46.0	46.0
	4	49.6	74.4	46.8	57.0	55.0	51.0	50.0	48.0	47.0	47.0	47.0	46.0
	5	48.0	67.9	46.6	54.0	52.0	48.0	47.0	47.0	46.0	46.0	46.0	46.0
	6	52.9	82.0	46.6	61.0	58.0	55.0	54.0	50.0	47.0	47.0	46.0	46.0
Day	7	52.9	66.7	46.7	59.0	57.0	56.0	55.0	54.0	51.0	47.0	46.0	46.0
	8	48.7	67.7	46.8	55.0	53.0	50.0	49.0	48.0	47.0	47.0	46.0	46.0
	9	56.0	65.7	46.4	65.0	65.0	64.0	64.0	50.0	47.0	46.0	46.0	46.0
	10	51.3	76.9	46.3	58.0	55.0	51.0	49.0	47.0	46.0	46.0	46.0	46.0
	11	48.2	62.7	46.0	56.0	54.0	51.0	50.0	47.0	46.0	46.0	46.0	46.0
	12	49.8	68.2	43.5	60.0	58.0	54.0	52.0	47.0	46.0	44.0	44.0	43.0
	13	55.2	75.0	42.4	65.0	64.0	61.0	59.0	53.0	48.0	44.0	43.0	43.0
	14	55.3	76.8	40.4	66.0	64.0	61.0	60.0	53.0	48.0	44.0	43.0	41.0
	15	55.7	77.5	39.4	67.0	64.0	60.0	58.0	51.0	46.0	42.0	41.0	40.0
	16	56.0	77.0	38.6	67.0	65.0	62.0	60.0	51.0	46.0	40.0	40.0	39.0
	17	54.2	74.0	38.8	66.0	64.0	60.0	58.0	50.0	44.0	41.0	40.0	39.0
	18	53.5	71.8	38.9	65.0	63.0	59.0	57.0	49.0	45.0	41.0	40.0	40.0
	19	54.2	81.6	37.6	64.0	61.0	56.0	52.0	45.0	42.0	39.0	39.0	37.0
	20	48.1	70.1	37.6	61.0	58.0	52.0	48.0	41.0	40.0	37.0	37.0	37.0
	21	45.3	65.7	37.6	58.0	54.0	46.0	44.0	41.0	39.0	39.0	39.0	37.0
Night	22	46.2	68.5	37.5	59.0	55.0	47.0	43.0	39.0	39.0	37.0	37.0	37.0
	23	41.2	64.7	37.5	47.0	44.0	42.0	41.0	41.0	37.0	37.0	37.0	37.0

URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

			Energy Average Leq		24-Hour
Project Name: Opal	*JN:* 10958		*Day*	*Night*	*CNEL*
Location: L2 - Located north of the Project site at the intersection of Turquoise Avenue and Nice Avenue near existing residential homes.	*Analyst:* A. Wolfe		60.8	57.5	64.9
	Date: 5/10/2017				

Hourly Leq dBA Readings (unadjusted)



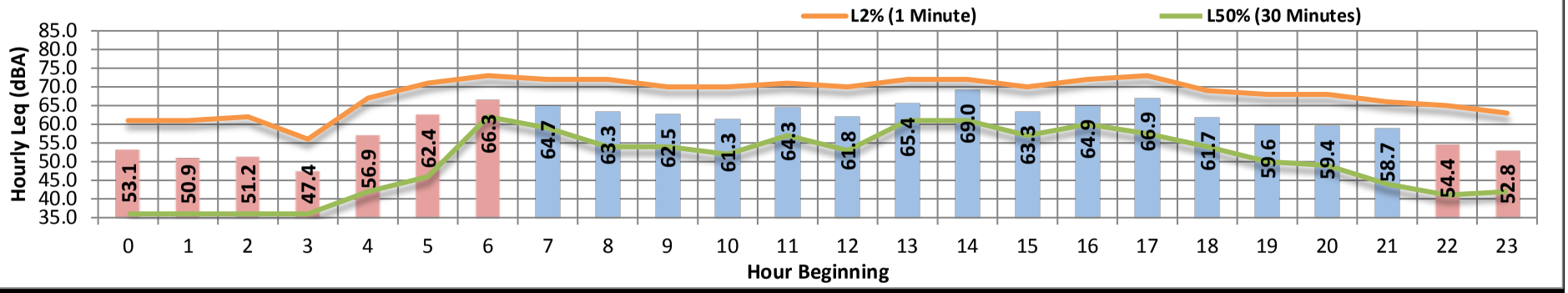
Time Period	Hour	Leq	Lmax	Lmin	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	55.3	75.6	35.1	69.0	66.0	61.0	57.0	43.0	39.0	37.0	37.0	37.0
	Max	63.5	88.5	39.2	74.0	72.0	70.0	68.0	62.0	52.0	42.0	41.0	40.0
Energy Average:		60.8	Average:		71.3	69.7	66.9	64.7	55.2	46.2	39.3	38.6	37.7
Night	Min	40.1	64.9	34.6	49.0	42.0	38.0	37.0	35.0	35.0	35.0	35.0	35.0
	Max	65.7	82.2	37.6	73.0	72.0	71.0	70.0	67.0	60.0	45.0	40.0	38.0
Energy Average:		57.5	Average:		62.2	57.0	49.7	46.4	41.0	39.2	36.6	35.8	35.6
Hourly Summary													
Night	0	46.3	73.0	34.6	56.0	48.0	39.0	37.0	35.0	35.0	35.0	35.0	35.0
	1	40.1	64.9	34.6	49.0	42.0	38.0	37.0	35.0	35.0	35.0	35.0	35.0
	2	43.5	69.6	34.6	52.0	46.0	39.0	37.0	35.0	35.0	35.0	35.0	35.0
	3	49.6	73.9	34.6	61.0	53.0	43.0	41.0	38.0	37.0	35.0	35.0	35.0
	4	52.9	76.3	34.6	68.0	64.0	53.0	48.0	41.0	38.0	37.0	35.0	35.0
	5	58.2	82.2	35.0	71.0	69.0	62.0	57.0	42.0	39.0	37.0	37.0	37.0
	6	65.7	76.6	37.6	73.0	72.0	71.0	70.0	67.0	60.0	45.0	40.0	38.0
Day	7	62.8	79.6	37.5	74.0	72.0	70.0	68.0	59.0	48.0	39.0	39.0	37.0
	8	60.0	78.2	37.5	72.0	70.0	67.0	65.0	54.0	44.0	39.0	38.0	37.0
	9	59.0	76.4	37.5	71.0	69.0	66.0	63.0	55.0	45.0	39.0	38.0	37.0
	10	59.7	83.9	37.5	71.0	69.0	66.0	63.0	52.0	43.0	38.0	37.0	37.0
	11	59.5	75.6	37.5	71.0	70.0	67.0	65.0	54.0	45.0	38.0	37.0	37.0
	12	58.3	76.2	37.5	70.0	68.0	65.0	63.0	53.0	43.0	38.0	37.0	37.0
	13	63.5	85.5	37.5	72.0	71.0	69.0	68.0	62.0	52.0	40.0	39.0	37.0
	14	62.1	79.0	38.3	72.0	71.0	69.0	68.0	61.0	51.0	41.0	40.0	39.0
	15	60.4	77.6	39.2	71.0	70.0	67.0	65.0	57.0	49.0	42.0	41.0	40.0
	16	61.6	79.0	37.6	72.0	71.0	69.0	67.0	58.0	50.0	41.0	40.0	39.0
	17	62.1	82.5	37.6	72.0	71.0	69.0	67.0	59.0	49.0	41.0	40.0	39.0
	18	60.5	79.3	37.9	71.0	70.0	67.0	66.0	57.0	48.0	40.0	40.0	39.0
	19	61.4	88.5	37.5	71.0	70.0	67.0	65.0	54.0	45.0	39.0	39.0	37.0
	20	58.9	87.6	37.2	70.0	68.0	64.0	60.0	50.0	42.0	37.0	37.0	37.0
	21	55.3	76.2	35.1	69.0	66.0	61.0	57.0	43.0	39.0	37.0	37.0	37.0
Night	22	52.7	75.3	34.6	67.0	63.0	55.0	49.0	39.0	37.0	35.0	35.0	35.0
	23	49.7	73.3	34.6	63.0	56.0	47.0	42.0	37.0	37.0	35.0	35.0	35.0

URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

Project Name:	Opal	*JN:*	10958	*Energy Average Leq*	*24-Hour*
Location:	L3 - Located at the southeast corner of the Project site adjacent to an existing barrier for residential homes, and north of the Redlands East Valley High School.	*Analyst:*	A. Wolfe	*Day* / *Night*	*CNEL*
		Date:	5/10/2017	64.0 / 59.2	66.9

Hourly Leq dBA Readings (unadjusted)



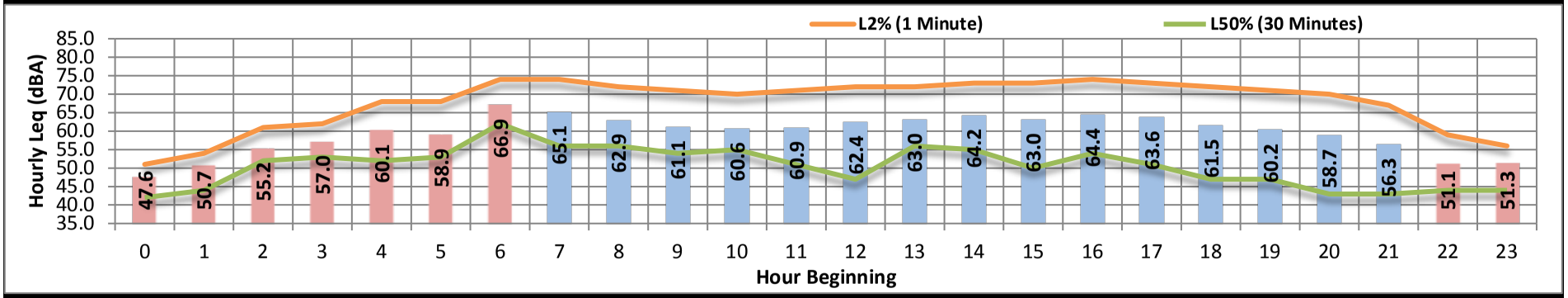
Time Period	*Hour*	*Leq*	*Lmax*	*Lmin*	*L1%*	*L2%*	*L5%*	*L8%*	*L25%*	*L50%*	*L90%*	*L95%*	*L99%*
Day	Min	58.7	79.3	36.5	69.0	66.0	63.0	61.0	52.0	44.0	39.0	39.0	37.0
	Max	69.0	98.5	43.4	77.0	73.0	70.0	69.0	65.0	61.0	50.0	49.0	46.0
Energy Average:		64.0	Average:		72.7	70.3	67.8	66.4	60.9	54.8	44.9	43.1	40.8
Night	Min	47.4	70.5	36.5	61.0	56.0	47.0	43.0	36.0	36.0	36.0	36.0	36.0
	Max	66.3	86.7	39.5	75.0	73.0	71.0	70.0	66.0	62.0	53.0	48.0	41.0
Energy Average:		59.2	Average:		67.3	64.3	58.3	54.2	45.0	41.9	38.6	37.8	36.9
Hourly Summary													
Night	0	53.1	81.8	36.5	65.0	61.0	53.0	49.0	36.0	36.0	36.0	36.0	36.0
	1	50.9	73.5	36.5	64.0	61.0	53.0	47.0	36.0	36.0	36.0	36.0	36.0
	2	51.2	73.7	36.5	66.0	62.0	53.0	46.0	36.0	36.0	36.0	36.0	36.0
	3	47.4	70.5	36.5	61.0	56.0	47.0	43.0	37.0	36.0	36.0	36.0	36.0
	4	56.9	81.4	36.5	70.0	67.0	60.0	54.0	47.0	42.0	36.0	36.0	36.0
	5	62.4	86.7	38.0	73.0	71.0	68.0	66.0	55.0	46.0	39.0	39.0	39.0
	6	66.3	85.3	39.5	75.0	73.0	71.0	70.0	66.0	62.0	53.0	48.0	41.0
Day	7	64.7	83.0	39.5	73.0	72.0	70.0	69.0	65.0	59.0	47.0	44.0	41.0
	8	63.3	81.7	39.4	73.0	72.0	69.0	67.0	61.0	54.0	44.0	42.0	39.0
	9	62.5	84.1	39.5	72.0	70.0	68.0	66.0	61.0	54.0	43.0	41.0	39.0
	10	61.3	83.3	39.5	72.0	70.0	67.0	65.0	60.0	52.0	42.0	41.0	40.0
	11	64.3	87.6	39.5	74.0	71.0	68.0	67.0	62.0	57.0	45.0	43.0	41.0
	12	61.8	79.9	39.3	72.0	70.0	68.0	66.0	60.0	53.0	43.0	41.0	39.0
	13	65.4	86.1	40.5	74.0	72.0	70.0	69.0	64.0	61.0	48.0	44.0	41.0
	14	69.0	98.5	43.4	76.0	72.0	70.0	69.0	65.0	61.0	50.0	48.0	45.0
	15	63.3	83.6	42.4	72.0	70.0	69.0	67.0	63.0	57.0	48.0	46.0	43.0
	16	64.9	85.0	43.2	75.0	72.0	69.0	68.0	64.0	60.0	50.0	49.0	46.0
	17	66.9	92.5	43.4	77.0	73.0	69.0	68.0	63.0	57.5	48.0	46.0	44.0
	18	61.7	83.6	39.5	71.0	69.0	67.0	66.0	61.0	54.0	45.0	43.0	39.0
	19	59.6	79.3	39.5	70.0	68.0	65.0	64.0	57.0	50.0	41.0	41.0	39.0
	20	59.4	79.9	37.9	70.0	68.0	65.0	64.0	56.0	49.0	40.0	39.0	39.0
	21	58.7	82.7	36.5	69.0	66.0	63.0	61.0	52.0	44.0	39.0	39.0	37.0
Night	22	54.4	78.3	36.5	67.0	65.0	61.0	58.0	46.0	41.0	36.0	36.0	36.0
	23	52.8	72.9	36.5	65.0	63.0	59.0	55.0	46.0	42.0	39.0	37.0	36.0

URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

				Energy Average Leq		24-Hour
Project Name:	Opal	*JN:*	10958	*Day*	*Night*	*CNEL*
Location:	L4 - Located south of the Project site on Opal Avenue near existing residential homes and the Redlands East Valley High School.	*Analyst:*	A. Wolfe	62.4	59.5	66.6
		Date:	5/10/2017			

Hourly Leq dBA Readings (unadjusted)



Time Period	*Hour*	*Leq*	*Lmax*	*Lmin*	*L1%*	*L2%*	*L5%*	*L8%*	*L25%*	*L50%*	*L90%*	*L95%*	*L99%*
Day	Min	56.3	77.8	39.0	70.0	67.0	61.0	55.0	44.0	43.0	40.0	40.0	39.0
	Max	65.1	88.7	51.4	76.0	74.0	71.0	69.0	62.0	56.0	53.0	53.0	52.0
Energy Average:		62.4	Average:		73.5	71.7	68.2	65.2	56.2	51.0	46.4	45.8	44.7
Night	Min	47.6	73.4	36.0	55.0	51.0	47.0	45.0	43.0	42.0	40.0	39.0	36.0
	Max	66.9	83.5	49.7	75.0	74.0	73.0	72.0	67.0	62.0	53.0	52.0	50.0
Energy Average:		59.5	Average:		65.6	61.4	55.7	54.3	51.4	49.6	45.8	45.3	44.0
Hourly Summary													
Night	0	47.6	74.0	36.0	55.0	51.0	47.0	45.0	43.0	42.0	40.0	39.0	36.0
	1	50.7	77.5	41.5	58.0	54.0	49.0	48.0	45.0	44.0	42.0	42.0	42.0
	2	55.2	75.6	41.9	65.0	61.0	57.0	57.0	54.0	52.0	43.0	43.0	42.0
	3	57.0	80.1	47.7	66.0	62.0	58.0	57.0	54.0	53.0	51.0	50.0	50.0
	4	60.1	83.5	48.8	72.0	68.0	61.0	58.0	54.0	52.0	50.0	50.0	49.0
	5	58.9	79.5	48.7	72.0	68.0	60.0	58.0	55.0	53.0	50.0	50.0	49.0
	6	66.9	81.4	49.7	75.0	74.0	73.0	72.0	67.0	62.0	53.0	52.0	50.0
Day	7	65.1	88.7	49.7	76.0	74.0	71.0	69.0	61.0	56.0	53.0	53.0	51.0
	8	62.9	82.9	51.4	74.0	72.0	69.0	66.0	58.0	56.0	53.0	53.0	52.0
	9	61.1	77.8	49.7	73.0	71.0	67.0	64.0	57.0	54.0	52.0	51.0	50.0
	10	60.6	79.1	49.8	72.0	70.0	66.0	63.0	57.0	55.0	52.0	52.0	50.0
	11	60.9	81.1	46.4	73.0	71.0	68.0	64.0	55.0	51.0	49.0	48.0	47.0
	12	62.4	83.9	40.8	74.0	72.0	69.0	66.0	54.0	47.0	43.0	43.0	42.0
	13	63.0	79.1	41.9	73.0	72.0	69.0	68.0	62.0	56.0	47.0	46.0	44.0
	14	64.2	82.0	43.0	75.0	73.0	71.0	69.0	62.0	55.0	47.0	45.0	44.0
	15	63.0	84.8	42.0	74.0	73.0	70.0	67.0	59.0	50.0	44.0	44.0	43.0
	16	64.4	83.8	42.5	75.0	74.0	71.0	69.0	62.0	54.0	46.0	45.0	44.0
	17	63.6	81.6	40.8	75.0	73.0	71.0	69.0	60.0	51.0	44.0	43.0	42.0
	18	61.5	80.5	40.6	74.0	72.0	69.0	66.0	55.0	47.0	42.0	42.0	40.0
	19	60.2	83.4	40.7	73.0	71.0	66.0	62.0	50.0	47.0	43.0	42.0	42.0
	20	58.7	78.0	39.0	72.0	70.0	65.0	61.0	47.0	43.0	41.0	40.0	40.0
	21	56.3	78.3	39.0	70.0	67.0	61.0	55.0	44.0	43.0	40.0	40.0	39.0
Night	22	51.1	73.4	39.0	64.0	59.0	49.0	48.0	46.0	44.0	42.0	42.0	39.0
	23	51.3	76.0	38.2	63.0	56.0	47.0	46.0	45.0	44.0	41.0	40.0	39.0

URBAN CROSSROADS

APPENDIX 7.1:

OFF-SITE TRAFFIC NOISE CONTOURS

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing Without Project
Road Name: Judson St.
Road Segment: s/o Colton Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	6,669	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	667	vehicles
Vehicle Speed:	40	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	66.51	-3.53	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	77.72	-13.53	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-24.52	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	63.1	61.1	59.1	54.1	62.3	62.8
Medium Trucks:	64.3	62.4	59.9	55.6	63.7	64.2
Heavy Trucks:	58.6	57.5	46.3	44.6	56.0	56.1
Vehicle Noise:	67.3	65.5	62.7	58.1	66.5	66.9

Centerline Distance to Noise Contour (in feet)

	70 dBA	*65 dBA*	*60 dBA*	*55 dBA*
Ldn:	26	55	119	256
CNEL:	27	59	128	275

Tuesday, May 30, 2017

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing Without Project
Road Name: Wabash Av.
Road Segment: s/o Colton Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	6,439	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	644	vehicles
Vehicle Speed:	40	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	66.51	-3.68	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	77.72	-13.68	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-24.68	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	62.9	60.9	59.0	53.9	62.2	62.7
Medium Trucks:	64.1	62.2	59.8	55.4	63.5	64.0
Heavy Trucks:	58.4	57.4	46.2	44.4	55.8	56.0
Vehicle Noise:	67.2	65.4	62.5	57.9	66.3	66.8

Centerline Distance to Noise Contour (in feet)

	70 dBA	*65 dBA*	*60 dBA*	*55 dBA*
Ldn:	25	54	116	250
CNEL:	27	58	125	269

Tuesday, May 30, 2017

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing Without Project
Road Name: Opal Av.
Road Segment: n/o Dwy. 1
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	1,243	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	124	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	24	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	25.0	feet
Centerline Dist. to Observer:	25.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	22.494
Medium Trucks:	22.098
Heavy Trucks:	22.136

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	64.30	-10.25	5.10	-1.20	*-4.41*	0.000	0.000
Medium Trucks:	75.75	-20.25	5.22	-1.20	*-4.85*	0.000	0.000
Heavy Trucks:	81.57	-31.24	5.20	-1.20	*-5.94*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	58.0	56.0	54.0	49.0	57.2	57.7
Medium Trucks:	59.5	57.6	55.1	50.8	58.9	59.4
Heavy Trucks:	54.3	53.3	42.1	40.3	51.7	51.9
Vehicle Noise:	62.5	60.7	57.7	53.2	61.6	62.1

Centerline Distance to Noise Contour (in feet)

	70 dBA	*65 dBA*	*60 dBA*	*55 dBA*
Ldn:	7	15	32	69
CNEL:	7	16	34	74

Tuesday, May 30, 2017

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing Without Project
Road Name: Mentone Bl.
Road Segment: w/o Opal Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	18,449	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	1,845	vehicles
Vehicle Speed:	40	mph
Near/Far Lane Distance:	48	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	52.0	feet
Centerline Dist. to Observer:	52.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	46.400
Medium Trucks:	46.209
Heavy Trucks:	46.228

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	66.51	0.89	0.38	-1.20	*-4.66*	0.000	0.000
Medium Trucks:	77.72	-9.11	0.41	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-20.11	0.41	-1.20	*-5.41*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	66.6	64.6	62.7	57.6	65.8	66.4
Medium Trucks:	67.8	65.9	63.4	59.1	67.2	67.7
Heavy Trucks:	62.1	61.1	49.8	48.1	59.5	59.6
Vehicle Noise:	70.9	69.1	66.2	61.6	70.0	70.5

Centerline Distance to Noise Contour (in feet)

	70 dBA	*65 dBA*	*60 dBA*	*55 dBA*
Ldn:	52	112	241	520
CNEL:	56	120	259	558

Tuesday, May 30, 2017

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing Without Project
Road Name: Colton Av.
Road Segment: w/o Judson St.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	8,200 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	820 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-2.05	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	75.75	-12.05	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	81.57	-23.05	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.3	60.4	58.4	53.3	61.6	62.1
Medium Trucks:	63.8	61.9	59.4	55.1	63.2	63.7
Heavy Trucks:	58.6	57.6	46.4	44.6	56.0	56.2
Vehicle Noise:	66.8	65.1	62.1	57.5	65.9	66.4

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	24	51	110	236
CNEL:	25	55	118	253

Tuesday, May 30, 2017

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing Without Project
Road Name: Colton Av.
Road Segment: e/o Judson St.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	8,233 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	823 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-2.04	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	75.75	-12.04	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	81.57	-23.03	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.3	60.4	58.4	53.4	61.6	62.1
Medium Trucks:	63.8	61.9	59.4	55.1	63.2	63.7
Heavy Trucks:	58.6	57.6	46.4	44.6	56.1	56.2
Vehicle Noise:	66.9	65.1	62.1	57.6	66.0	66.4

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	24	51	110	237
CNEL:	25	55	118	254

Tuesday, May 30, 2017

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing Without Project
Road Name: Colton Av.
Road Segment: e/o Dearborn St.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	6,791 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	679 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-3.45	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-13.45	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-24.45	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	63.1	61.2	59.2	54.2	62.4	62.9
Medium Trucks:	64.4	62.4	60.0	55.7	63.8	64.2
Heavy Trucks:	58.7	57.6	46.4	44.6	56.1	56.2
Vehicle Noise:	67.4	65.6	62.7	58.2	66.6	67.0

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	26	56	120	259
CNEL:	28	60	129	278

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing Without Project
Road Name: Colton Av.
Road Segment: e/o Wabash Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	6,904 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	690 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-2.80	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	75.75	-12.80	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	81.57	-23.79	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	61.6	59.6	57.7	52.6	60.8	61.4
Medium Trucks:	63.1	61.1	58.7	54.3	62.5	62.9
Heavy Trucks:	57.9	56.9	45.6	43.9	55.3	55.4
Vehicle Noise:	66.1	64.3	61.3	56.8	65.2	65.7

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	21	45	98	211
CNEL:	23	49	105	226

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing Without Project | Project Name: Opal
Road Name: Colton Av. | Job Number: 10958
Road Segment: e/o Opal Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	6,552	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	655	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-3.03	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	75.75	-13.03	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	81.57	-24.02	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	61.4	59.4	57.4	52.4	60.6	61.1
Medium Trucks:	62.8	60.9	58.5	54.1	62.2	62.7
Heavy Trucks:	57.7	56.6	45.4	43.6	55.1	55.2
Vehicle Noise:	65.9	64.1	61.1	56.6	65.0	65.4

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	20	44	94	203
CNEL:	22	47	101	218

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing With Project | Project Name: Opal
Road Name: Judson St. | Job Number: 10958
Road Segment: s/o Colton Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	6,810	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	681	vehicles
Vehicle Speed:	40	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.46%
Medium Trucks:	77.0%	10.9%	12.1%	8.84%
Heavy Trucks:	94.6%	1.8%	3.6%	0.70%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-3.43	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	77.72	-13.53	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-24.52	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	63.2	61.2	59.2	54.2	62.4	62.9
Medium Trucks:	64.3	62.4	59.9	55.6	63.7	64.2
Heavy Trucks:	58.6	57.5	46.3	44.6	56.0	56.1
Vehicle Noise:	67.4	65.6	62.7	58.1	66.5	67.0

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	26	56	120	258
CNEL:	28	60	128	277

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing With Project | Project Name: Opal
Road Name: Wabash Av. | Job Number: 10958
Road Segment: s/o Colton Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	6,549	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	655	vehicles
Vehicle Speed:	40	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	89.27%
Medium Trucks:	77.0%	10.9%	12.1%	9.19%
Heavy Trucks:	94.6%	1.8%	3.6%	1.53%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-3.66	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	77.72	-13.53	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-21.32	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.9	61.0	59.0	54.0	62.2	62.7
Medium Trucks:	64.3	62.4	59.9	55.6	63.7	64.2
Heavy Trucks:	61.8	60.8	49.5	47.8	59.2	59.3
Vehicle Noise:	67.9	66.2	62.7	58.3	66.8	67.3

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	27	58	126	271
CNEL:	29	62	134	289

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing With Project | Project Name: Opal
Road Name: Opal Av. | Job Number: 10958
Road Segment: n/o Dwy. 1

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	1,371	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	137	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	24	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	25.0	feet
Centerline Dist. to Observer:	25.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	87.00%
Medium Trucks:	77.0%	10.9%	12.1%	9.35%
Heavy Trucks:	94.6%	1.8%	3.6%	3.64%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	22.494
Medium Trucks:	22.098
Heavy Trucks:	22.136

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-9.98	5.10	-1.20	*-4.41*	0.000	0.000
Medium Trucks:	75.75	-19.67	5.22	-1.20	*-4.85*	0.000	0.000
Heavy Trucks:	81.57	-23.76	5.20	-1.20	*-5.94*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	58.2	56.3	54.3	49.2	57.5	58.0
Medium Trucks:	60.1	58.2	55.7	51.4	59.5	60.0
Heavy Trucks:	61.8	60.8	49.6	47.8	59.2	59.3
Vehicle Noise:	65.1	63.6	58.6	54.5	63.6	63.9

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	9	20	43	93
CNEL:	10	21	46	99

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing With Project
Road Name: Mentone Bl.
Road Segment: w/o Opal Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	18,604 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,860 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	48 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	52.0 feet
Centerline Dist. to Observer:	52.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	89.73%
Medium Trucks:	77.0%	10.9%	12.1%	9.12%
Heavy Trucks:	94.6%	1.8%	3.6%	1.15%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	46.400
Medium Trucks:	46.209
Heavy Trucks:	46.228

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	0.90	0.38	-1.20	-4.66	0.000	0.000
Medium Trucks:	77.72	-9.03	0.41	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-18.03	0.41	-1.20	-5.41	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	66.6	64.6	62.7	57.6	65.9	66.4
Medium Trucks:	67.9	66.0	63.5	59.2	67.3	67.8
Heavy Trucks:	64.2	63.1	51.9	50.2	61.6	61.7
Vehicle Noise:	71.3	69.5	66.3	61.8	70.3	70.7

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	54	117	252	542
CNEL:	58	125	269	581

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing With Project
Road Name: Colton Av.
Road Segment: w/o Judson St.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	8,518 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	852 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.62%
Medium Trucks:	77.0%	10.9%	12.1%	8.69%
Heavy Trucks:	94.6%	1.8%	3.6%	0.69%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-1.87	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	75.75	-12.05	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	81.57	-23.05	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.5	60.6	58.6	53.5	61.8	62.3
Medium Trucks:	63.8	61.9	59.4	55.1	63.2	63.7
Heavy Trucks:	58.6	57.6	46.4	44.6	56.0	56.2
Vehicle Noise:	66.9	65.1	62.2	57.6	66.0	66.5

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	24	51	111	239
CNEL:	26	55	119	256

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing With Project
Road Name: Colton Av.
Road Segment: e/o Judson St.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	8,727 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	873 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.81%
Medium Trucks:	77.0%	10.9%	12.1%	8.51%
Heavy Trucks:	94.6%	1.8%	3.6%	0.68%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-1.76	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	75.75	-12.04	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	81.57	-23.03	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.6	60.7	58.7	53.6	61.9	62.4
Medium Trucks:	63.8	61.9	59.4	55.1	63.2	63.7
Heavy Trucks:	58.6	57.6	46.4	44.6	56.1	56.2
Vehicle Noise:	67.0	65.2	62.2	57.7	66.1	66.5

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	24	52	112	241
CNEL:	26	56	120	258

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing With Project
Road Name: Colton Av.
Road Segment: e/o Dearborn St.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	7,321 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	732 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.96%
Medium Trucks:	77.0%	10.9%	12.1%	8.37%
Heavy Trucks:	94.6%	1.8%	3.6%	0.67%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-3.09	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-13.45	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-24.45	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	63.5	61.5	59.6	54.5	62.8	63.3
Medium Trucks:	64.4	62.4	60.0	55.7	63.8	64.2
Heavy Trucks:	58.7	57.6	46.4	44.6	56.1	56.2
Vehicle Noise:	67.6	65.8	62.9	58.3	66.7	67.2

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	26	57	123	265
CNEL:	28	61	132	284

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing With Project | Project Name: Opal
Road Name: Colton Av. | Job Number: 10958
Road Segment: e/o Wabash Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	7,544 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	754 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.09%
Medium Trucks:	77.0%	10.9%	12.1%	8.54%
Heavy Trucks:	94.6%	1.8%	3.6%	1.37%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-2.42	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	75.75	-12.66	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	81.57	-20.59	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.0	60.0	58.0	53.0	61.2	61.7
Medium Trucks:	63.2	61.3	58.8	54.5	62.6	63.1
Heavy Trucks:	61.1	60.1	48.8	47.1	58.5	58.6
Vehicle Noise:	66.9	65.3	61.7	57.2	65.9	66.3

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	23	50	108	233
CNEL:	25	54	115	249

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing With Project | Project Name: Opal
Road Name: Colton Av. | Job Number: 10958
Road Segment: e/o Opal Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	6,623 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	662 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.36%
Medium Trucks:	77.0%	10.9%	12.1%	8.93%
Heavy Trucks:	94.6%	1.8%	3.6%	0.71%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-2.98	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	75.75	-13.03	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	81.57	-24.02	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	61.4	59.4	57.5	52.4	60.7	61.2
Medium Trucks:	62.8	60.9	58.5	54.1	62.2	62.7
Heavy Trucks:	57.7	56.6	45.4	43.6	55.1	55.2
Vehicle Noise:	65.9	64.1	61.1	56.6	65.0	65.4

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	20	44	95	204
CNEL:	22	47	102	219

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 Without Project | Project Name: Opal
Road Name: Judson St. | Job Number: 10958
Road Segment: s/o Colton Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	7,628 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	763 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-2.95	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-12.95	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-23.94	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	63.6	61.7	59.7	54.7	62.9	63.4
Medium Trucks:	64.9	63.0	60.5	56.2	64.3	64.7
Heavy Trucks:	59.2	58.1	46.9	45.1	56.6	56.7
Vehicle Noise:	67.9	66.1	63.2	58.7	67.1	67.5

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	28	60	130	280
CNEL:	30	65	140	301

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 Without Project | Project Name: Opal
Road Name: Wabash Av. | Job Number: 10958
Road Segment: s/o Colton Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	6,832 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	683 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-3.43	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-13.43	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-24.42	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	63.2	61.2	59.2	54.2	62.4	63.0
Medium Trucks:	64.4	62.5	60.0	55.7	63.8	64.3
Heavy Trucks:	58.7	57.7	46.4	44.7	56.1	56.2
Vehicle Noise:	67.5	65.6	62.8	58.2	66.6	67.0

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	26	56	121	260
CNEL:	28	60	130	279

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 Without Project | Project Name: Opal
Road Name: Opal Av. | Job Number: 10958
Road Segment: n/o Dwy. 1

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	1,418	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	142	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	24	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	25.0	feet
Centerline Dist. to Observer:	25.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	22.494
Medium Trucks:	22.098
Heavy Trucks:	22.136

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-9.67	5.10	-1.20	*-4.41*	0.000	0.000
Medium Trucks:	75.75	-19.67	5.22	-1.20	*-4.85*	0.000	0.000
Heavy Trucks:	81.57	-30.67	5.20	-1.20	*-5.94*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	58.5	56.6	54.6	49.6	57.8	58.3
Medium Trucks:	60.1	58.2	55.7	51.4	59.5	59.9
Heavy Trucks:	54.9	53.9	42.7	40.9	52.3	52.4
Vehicle Noise:	63.1	61.3	58.3	53.8	62.2	62.7

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	8	16	35	75
CNEL:	8	17	38	81

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 Without Project | Project Name: Opal
Road Name: Mentone Bl. | Job Number: 10958
Road Segment: w/o Opal Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	19,238	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	1,924	vehicles
Vehicle Speed:	40	mph
Near/Far Lane Distance:	48	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	52.0	feet
Centerline Dist. to Observer:	52.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	46.400
Medium Trucks:	46.209
Heavy Trucks:	46.228

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	1.07	0.38	-1.20	*-4.66*	0.000	0.000
Medium Trucks:	77.72	-8.93	0.41	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-19.92	0.41	-1.20	*-5.41*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	66.8	64.8	62.8	57.8	66.0	66.6
Medium Trucks:	68.0	66.1	63.6	59.3	67.4	67.9
Heavy Trucks:	62.3	61.2	50.0	48.3	59.7	59.8
Vehicle Noise:	71.1	69.2	66.4	61.8	70.2	70.6

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	53	115	248	534
CNEL:	57	124	266	574

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 Without Project | Project Name: Opal
Road Name: Colton Av. | Job Number: 10958
Road Segment: w/o Judson St.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	8,917	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	892	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-1.69	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	75.75	-11.69	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	81.57	-22.68	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.7	60.7	58.8	53.7	62.0	62.5
Medium Trucks:	64.2	62.2	59.8	55.4	63.6	64.0
Heavy Trucks:	59.0	58.0	46.7	45.0	56.4	56.5
Vehicle Noise:	67.2	65.4	62.4	57.9	66.3	66.8

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	25	54	116	250
CNEL:	27	58	124	268

Tuesday, May 30, 2017

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 Without Project | Project Name: Opal
Road Name: Colton Av. | Job Number: 10958
Road Segment: e/o Judson St.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	8,979	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	898	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-1.66	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	75.75	-11.66	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	81.57	-22.65	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.7	60.8	58.8	53.7	62.0	62.5
Medium Trucks:	64.2	62.3	59.8	55.5	63.6	64.1
Heavy Trucks:	59.0	58.0	46.8	45.0	56.4	56.6
Vehicle Noise:	67.2	65.5	62.5	57.9	66.3	66.8

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	25	54	116	251
CNEL:	27	58	125	269

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 Without Project
Road Name: Colton Av.
Road Segment: e/o Dearborn St.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		***Site Conditions (Hard = 10, Soft = 15)***	
Average Daily Traffic (Adt):	7,508 vehicles	*Autos:*	15
Peak Hour Percentage:	10%	*Medium Trucks (2 Axles):*	15
Peak Hour Volume:	751 vehicles	*Heavy Trucks (3+ Axles):*	15
Vehicle Speed:	40 mph		
Near/Far Lane Distance:	36 feet		
Site Data			
Barrier Height:	**0.0 feet**		
Barrier Type (0-Wall, 1-Berm):	0.0		
Centerline Dist. to Barrier:	44.0 feet		
Centerline Dist. to Observer:	44.0 feet		
Barrier Distance to Observer:	0.0 feet		
Observer Height (Above Pad):	5.0 feet		
Pad Elevation:	0.0 feet		
Road Elevation:	0.0 feet		
Road Grade:	0.0%		
Left View:	-90.0 degrees		
Right View:	90.0 degrees		

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos: 0.000
Medium Trucks: 2.297
Heavy Trucks: 8.004 *Grade Adjustment:* 0.0

Lane Equivalent Distance (in feet)

Autos: 40.460
Medium Trucks: 40.241
Heavy Trucks: 40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-3.02	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	77.72	-13.02	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-24.01	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	63.6	61.6	59.6	54.6	62.8	63.4
Medium Trucks:	64.8	62.9	60.4	56.1	64.2	64.7
Heavy Trucks:	59.1	58.1	46.8	45.1	56.5	56.6
Vehicle Noise:	67.9	66.1	63.2	58.6	67.0	67.5

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	28	60	129	277
CNEL:	30	64	138	298

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 Without Project
Road Name: Colton Av.
Road Segment: e/o Wabash Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		***Site Conditions (Hard = 10, Soft = 15)***	
Average Daily Traffic (Adt):	7,382 vehicles	*Autos:*	15
Peak Hour Percentage:	10%	*Medium Trucks (2 Axles):*	15
Peak Hour Volume:	738 vehicles	*Heavy Trucks (3+ Axles):*	15
Vehicle Speed:	35 mph		
Near/Far Lane Distance:	36 feet		
Site Data			
Barrier Height:	**0.0 feet**		
Barrier Type (0-Wall, 1-Berm):	0.0		
Centerline Dist. to Barrier:	44.0 feet		
Centerline Dist. to Observer:	44.0 feet		
Barrier Distance to Observer:	0.0 feet		
Observer Height (Above Pad):	5.0 feet		
Pad Elevation:	0.0 feet		
Road Elevation:	0.0 feet		
Road Grade:	0.0%		
Left View:	-90.0 degrees		
Right View:	90.0 degrees		

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos: 0.000
Medium Trucks: 2.297
Heavy Trucks: 8.004 *Grade Adjustment:* 0.0

Lane Equivalent Distance (in feet)

Autos: 40.460
Medium Trucks: 40.241
Heavy Trucks: 40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-2.51	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	75.75	-12.51	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	81.57	-23.50	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	61.9	59.9	57.9	52.9	61.1	61.7
Medium Trucks:	63.4	61.4	59.0	54.6	62.7	63.2
Heavy Trucks:	58.2	57.1	45.9	44.2	55.6	55.7
Vehicle Noise:	66.4	64.6	61.6	57.1	65.5	65.9

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	22	47	102	220
CNEL:	24	51	110	236

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 Without Project
Road Name: Colton Av.
Road Segment: e/o Opal Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		***Site Conditions (Hard = 10, Soft = 15)***	
Average Daily Traffic (Adt):	7,173 vehicles	*Autos:*	15
Peak Hour Percentage:	10%	*Medium Trucks (2 Axles):*	15
Peak Hour Volume:	717 vehicles	*Heavy Trucks (3+ Axles):*	15
Vehicle Speed:	35 mph		
Near/Far Lane Distance:	36 feet		
Site Data			
Barrier Height:	**0.0 feet**		
Barrier Type (0-Wall, 1-Berm):	0.0		
Centerline Dist. to Barrier:	44.0 feet		
Centerline Dist. to Observer:	44.0 feet		
Barrier Distance to Observer:	0.0 feet		
Observer Height (Above Pad):	5.0 feet		
Pad Elevation:	0.0 feet		
Road Elevation:	0.0 feet		
Road Grade:	0.0%		
Left View:	-90.0 degrees		
Right View:	90.0 degrees		

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos: 0.000
Medium Trucks: 2.297
Heavy Trucks: 8.004 *Grade Adjustment:* 0.0

Lane Equivalent Distance (in feet)

Autos: 40.460
Medium Trucks: 40.241
Heavy Trucks: 40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-2.63	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	75.75	-12.63	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	81.57	-23.63	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	61.7	59.8	57.8	52.8	61.0	61.5
Medium Trucks:	63.2	61.3	58.8	54.5	62.6	63.1
Heavy Trucks:	58.0	57.0	45.8	44.0	55.5	55.6
Vehicle Noise:	66.3	64.5	61.5	57.0	65.4	65.8

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	22	47	100	216
CNEL:	23	50	108	232

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 With Project
Road Name: Judson St.
Road Segment: s/o Colton Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		***Site Conditions (Hard = 10, Soft = 15)***	
Average Daily Traffic (Adt):	7,769 vehicles	*Autos:*	15
Peak Hour Percentage:	10%	*Medium Trucks (2 Axles):*	15
Peak Hour Volume:	777 vehicles	*Heavy Trucks (3+ Axles):*	15
Vehicle Speed:	40 mph		
Near/Far Lane Distance:	36 feet		
Site Data			
Barrier Height:	**0.0 feet**		
Barrier Type (0-Wall, 1-Berm):	0.0		
Centerline Dist. to Barrier:	44.0 feet		
Centerline Dist. to Observer:	44.0 feet		
Barrier Distance to Observer:	0.0 feet		
Observer Height (Above Pad):	5.0 feet		
Pad Elevation:	0.0 feet		
Road Elevation:	0.0 feet		
Road Grade:	0.0%		
Left View:	-90.0 degrees		
Right View:	90.0 degrees		

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.43%
Medium Trucks:	77.0%	10.9%	12.1%	8.86%
Heavy Trucks:	94.6%	1.8%	3.6%	0.70%

Noise Source Elevations (in feet)

Autos: 0.000
Medium Trucks: 2.297
Heavy Trucks: 8.004 *Grade Adjustment:* 0.0

Lane Equivalent Distance (in feet)

Autos: 40.460
Medium Trucks: 40.241
Heavy Trucks: 40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-2.86	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	77.72	-12.95	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-23.94	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	63.7	61.8	59.8	54.8	63.0	63.5
Medium Trucks:	64.9	63.0	60.5	56.2	64.3	64.7
Heavy Trucks:	59.2	58.1	46.9	45.1	56.6	56.7
Vehicle Noise:	68.0	66.2	63.3	58.7	67.1	67.6

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	28	61	131	282
CNEL:	30	65	140	302

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 With Project | Project Name: Opal
Road Name: Wabash Av. | Job Number: 10958
Road Segment: s/o Colton Av.

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		**Site Conditions (Hard = 10, Soft = 15)**	
Average Daily Traffic (Adt):	6,942 vehicles	Autos:	15
Peak Hour Percentage:	10%	Medium Trucks (2 Axles):	15
Peak Hour Volume:	694 vehicles	Heavy Trucks (3+ Axles):	15
Vehicle Speed:	40 mph		
Near/Far Lane Distance:	36 feet		
Site Data		**Vehicle Mix**	
Barrier Height:	**0.0 feet**	VehicleType	Day / Evening / Night / Daily
Barrier Type (0-Wall, 1-Berm):	0.0	Autos:	76.5% / 12.1% / 11.4% / 89.33%
Centerline Dist. to Barrier:	44.0 feet	Medium Trucks:	77.0% / 10.9% / 12.1% / 9.19%
Centerline Dist. to Observer:	44.0 feet	Heavy Trucks:	94.6% / 1.8% / 3.6% / 1.48%
Barrier Distance to Observer:	0.0 feet	**Noise Source Elevations (in feet)**	
Observer Height (Above Pad):	5.0 feet	Autos:	0.000
Pad Elevation:	0.0 feet	Medium Trucks:	2.297
Road Elevation:	0.0 feet	Heavy Trucks:	8.004 Grade Adjustment: 0.0
Road Grade:	0.0%	**Lane Equivalent Distance (in feet)**	
Left View:	-90.0 degrees	Autos:	40.460
Right View:	90.0 degrees	Medium Trucks:	40.241
		Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-3.40	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-13.28	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.20	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	63.2	61.2	59.3	54.2	62.4	63.0
Medium Trucks:	64.5	62.6	60.2	55.8	63.9	64.4
Heavy Trucks:	61.9	60.9	49.7	47.9	59.3	59.4
Vehicle Noise:	68.1	66.4	63.0	58.5	67.1	67.5

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	28	60	130	280
CNEL:	30	65	139	300

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 With Project | Project Name: Opal
Road Name: Opal Av. | Job Number: 10958
Road Segment: n/o Dwy. 1

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		**Site Conditions (Hard = 10, Soft = 15)**	
Average Daily Traffic (Adt):	1,546 vehicles	Autos:	15
Peak Hour Percentage:	10%	Medium Trucks (2 Axles):	15
Peak Hour Volume:	155 vehicles	Heavy Trucks (3+ Axles):	15
Vehicle Speed:	35 mph		
Near/Far Lane Distance:	24 feet		
Site Data		**Vehicle Mix**	
Barrier Height:	**0.0 feet**	VehicleType	Day / Evening / Night / Daily
Barrier Type (0-Wall, 1-Berm):	0.0	Autos:	76.5% / 12.1% / 11.4% / 87.37%
Centerline Dist. to Barrier:	25.0 feet	Medium Trucks:	77.0% / 10.9% / 12.1% / 9.32%
Centerline Dist. to Observer:	25.0 feet	Heavy Trucks:	94.6% / 1.8% / 3.6% / 3.31%
Barrier Distance to Observer:	0.0 feet	**Noise Source Elevations (in feet)**	
Observer Height (Above Pad):	5.0 feet	Autos:	0.000
Pad Elevation:	0.0 feet	Medium Trucks:	2.297
Road Elevation:	0.0 feet	Heavy Trucks:	8.004 Grade Adjustment: 0.0
Road Grade:	0.0%	**Lane Equivalent Distance (in feet)**	
Left View:	-90.0 degrees	Autos:	22.494
Right View:	90.0 degrees	Medium Trucks:	22.098
		Heavy Trucks:	22.136

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-9.44	5.10	-1.20	-4.41	0.000	0.000
Medium Trucks:	75.75	-19.16	5.22	-1.20	-4.85	0.000	0.000
Heavy Trucks:	81.57	-23.65	5.20	-1.20	-5.94	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	58.8	56.8	54.8	49.8	58.0	58.6
Medium Trucks:	60.6	58.7	56.2	51.9	60.0	60.5
Heavy Trucks:	61.9	60.9	49.7	47.9	59.3	59.5
Vehicle Noise:	65.4	63.9	59.1	54.9	64.0	64.3

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	10	21	46	99
CNEL:	10	23	49	105

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 With Project | Project Name: Opal
Road Name: Mentone Bl. | Job Number: 10958
Road Segment: w/o Opal Av.

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		**Site Conditions (Hard = 10, Soft = 15)**	
Average Daily Traffic (Adt):	19,393 vehicles	Autos:	15
Peak Hour Percentage:	10%	Medium Trucks (2 Axles):	15
Peak Hour Volume:	1,939 vehicles	Heavy Trucks (3+ Axles):	15
Vehicle Speed:	40 mph		
Near/Far Lane Distance:	48 feet		
Site Data		**Vehicle Mix**	
Barrier Height:	**0.0 feet**	VehicleType	Day / Evening / Night / Daily
Barrier Type (0-Wall, 1-Berm):	0.0	Autos:	76.5% / 12.1% / 11.4% / 89.75%
Centerline Dist. to Barrier:	52.0 feet	Medium Trucks:	77.0% / 10.9% / 12.1% / 9.12%
Centerline Dist. to Observer:	52.0 feet	Heavy Trucks:	94.6% / 1.8% / 3.6% / 1.13%
Barrier Distance to Observer:	0.0 feet	**Noise Source Elevations (in feet)**	
Observer Height (Above Pad):	5.0 feet	Autos:	0.000
Pad Elevation:	0.0 feet	Medium Trucks:	2.297
Road Elevation:	0.0 feet	Heavy Trucks:	8.004 Grade Adjustment: 0.0
Road Grade:	0.0%	**Lane Equivalent Distance (in feet)**	
Left View:	-90.0 degrees	Autos:	46.400
Right View:	90.0 degrees	Medium Trucks:	46.209
		Heavy Trucks:	46.228

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	1.08	0.38	-1.20	-4.66	0.000	0.000
Medium Trucks:	77.72	-8.85	0.41	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-17.92	0.41	-1.20	-5.41	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	66.8	64.8	62.8	57.8	66.0	66.6
Medium Trucks:	68.1	66.1	63.7	59.4	67.5	67.9
Heavy Trucks:	64.3	63.3	52.0	50.3	61.7	61.8
Vehicle Noise:	71.4	69.7	66.5	62.0	70.4	70.9

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	56	120	258	557
CNEL:	60	128	277	596

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 With Project | Project Name: Opal
Road Name: Colton Av. | Job Number: 10958
Road Segment: w/o Judson St.

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		**Site Conditions (Hard = 10, Soft = 15)**	
Average Daily Traffic (Adt):	9,235 vehicles	Autos:	15
Peak Hour Percentage:	10%	Medium Trucks (2 Axles):	15
Peak Hour Volume:	923 vehicles	Heavy Trucks (3+ Axles):	15
Vehicle Speed:	35 mph		
Near/Far Lane Distance:	36 feet		
Site Data		**Vehicle Mix**	
Barrier Height:	**0.0 feet**	VehicleType	Day / Evening / Night / Daily
Barrier Type (0-Wall, 1-Berm):	0.0	Autos:	76.5% / 12.1% / 11.4% / 90.59%
Centerline Dist. to Barrier:	44.0 feet	Medium Trucks:	77.0% / 10.9% / 12.1% / 8.72%
Centerline Dist. to Observer:	44.0 feet	Heavy Trucks:	94.6% / 1.8% / 3.6% / 0.69%
Barrier Distance to Observer:	0.0 feet	**Noise Source Elevations (in feet)**	
Observer Height (Above Pad):	5.0 feet	Autos:	0.000
Pad Elevation:	0.0 feet	Medium Trucks:	2.297
Road Elevation:	0.0 feet	Heavy Trucks:	8.004 Grade Adjustment: 0.0
Road Grade:	0.0%	**Lane Equivalent Distance (in feet)**	
Left View:	-90.0 degrees	Autos:	40.460
Right View:	90.0 degrees	Medium Trucks:	40.241
		Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-1.52	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	75.75	-11.69	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	81.57	-22.68	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.9	60.9	58.9	53.9	62.1	62.6
Medium Trucks:	64.2	62.2	59.8	55.4	63.6	64.0
Heavy Trucks:	59.0	58.0	46.7	45.0	56.4	56.5
Vehicle Noise:	67.3	65.5	62.5	58.0	66.4	66.8

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	25	54	117	252
CNEL:	27	58	126	270

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 With Project
Road Name: Colton Av.
Road Segment: e/o Judson St.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		***Site Conditions (Hard = 10, Soft = 15)***	
Average Daily Traffic (Adt):	9,473 vehicles	*Autos:*	15
Peak Hour Percentage:	10%	*Medium Trucks (2 Axles):*	15
Peak Hour Volume:	947 vehicles	*Heavy Trucks (3+ Axles):*	15
Vehicle Speed:	35 mph		
Near/Far Lane Distance:	36 feet		
Site Data			
Barrier Height:	**0.0 feet**		
Barrier Type (0-Wall, 1-Berm):	0.0		
Centerline Dist. to Barrier:	44.0 feet		
Centerline Dist. to Observer:	44.0 feet		
Barrier Distance to Observer:	0.0 feet		
Observer Height (Above Pad):	5.0 feet		
Pad Elevation:	0.0 feet		
Road Elevation:	0.0 feet		
Road Grade:	0.0%		
Left View:	-90.0 degrees		
Right View:	90.0 degrees		

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.76%
Medium Trucks:	77.0%	10.9%	12.1%	8.56%
Heavy Trucks:	94.6%	1.8%	3.6%	0.68%

Noise Source Elevations (in feet)

Autos: 0.000
Medium Trucks: 2.297
Heavy Trucks: 8.004 *Grade Adjustment:* 0.0

Lane Equivalent Distance (in feet)

Autos: 40.460
Medium Trucks: 40.241
Heavy Trucks: 40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-1.40	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	75.75	-11.66	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	81.57	-22.65	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	63.0	61.0	59.0	54.0	62.2	62.8
Medium Trucks:	64.2	62.3	59.8	55.5	63.6	64.1
Heavy Trucks:	59.0	58.0	46.8	45.0	56.4	56.6
Vehicle Noise:	67.3	65.5	62.6	58.0	66.4	66.9

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	25	55	118	255
CNEL:	27	59	127	273

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 With Project
Road Name: Colton Av.
Road Segment: e/o Dearborn St.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		***Site Conditions (Hard = 10, Soft = 15)***	
Average Daily Traffic (Adt):	8,038 vehicles	*Autos:*	15
Peak Hour Percentage:	10%	*Medium Trucks (2 Axles):*	15
Peak Hour Volume:	804 vehicles	*Heavy Trucks (3+ Axles):*	15
Vehicle Speed:	40 mph		
Near/Far Lane Distance:	36 feet		
Site Data			
Barrier Height:	**0.0 feet**		
Barrier Type (0-Wall, 1-Berm):	0.0		
Centerline Dist. to Barrier:	44.0 feet		
Centerline Dist. to Observer:	44.0 feet		
Barrier Distance to Observer:	0.0 feet		
Observer Height (Above Pad):	5.0 feet		
Pad Elevation:	0.0 feet		
Road Elevation:	0.0 feet		
Road Grade:	0.0%		
Left View:	-90.0 degrees		
Right View:	90.0 degrees		

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.90%
Medium Trucks:	77.0%	10.9%	12.1%	8.43%
Heavy Trucks:	94.6%	1.8%	3.6%	0.67%

Noise Source Elevations (in feet)

Autos: 0.000
Medium Trucks: 2.297
Heavy Trucks: 8.004 *Grade Adjustment:* 0.0

Lane Equivalent Distance (in feet)

Autos: 40.460
Medium Trucks: 40.241
Heavy Trucks: 40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-2.69	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	77.72	-13.02	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-24.01	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	63.9	61.9	60.0	54.9	63.2	63.7
Medium Trucks:	64.8	62.9	60.4	56.1	64.2	64.7
Heavy Trucks:	59.1	58.1	46.8	45.1	56.5	56.6
Vehicle Noise:	68.0	66.2	63.3	58.7	67.1	67.6

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	28	61	131	283
CNEL:	30	65	141	304

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 With Project
Road Name: Colton Av.
Road Segment: e/o Wabash Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		***Site Conditions (Hard = 10, Soft = 15)***	
Average Daily Traffic (Adt):	8,022 vehicles	*Autos:*	15
Peak Hour Percentage:	10%	*Medium Trucks (2 Axles):*	15
Peak Hour Volume:	802 vehicles	*Heavy Trucks (3+ Axles):*	15
Vehicle Speed:	35 mph		
Near/Far Lane Distance:	36 feet		
Site Data			
Barrier Height:	**0.0 feet**		
Barrier Type (0-Wall, 1-Berm):	0.0		
Centerline Dist. to Barrier:	44.0 feet		
Centerline Dist. to Observer:	44.0 feet		
Barrier Distance to Observer:	0.0 feet		
Observer Height (Above Pad):	5.0 feet		
Pad Elevation:	0.0 feet		
Road Elevation:	0.0 feet		
Road Grade:	0.0%		
Left View:	-90.0 degrees		
Right View:	90.0 degrees		

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.10%
Medium Trucks:	77.0%	10.9%	12.1%	8.57%
Heavy Trucks:	94.6%	1.8%	3.6%	1.33%

Noise Source Elevations (in feet)

Autos: 0.000
Medium Trucks: 2.297
Heavy Trucks: 8.004 *Grade Adjustment:* 0.0

Lane Equivalent Distance (in feet)

Autos: 40.460
Medium Trucks: 40.241
Heavy Trucks: 40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-2.16	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	75.75	-12.37	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	81.57	-20.45	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.2	60.3	58.3	53.2	61.5	62.0
Medium Trucks:	63.5	61.6	59.1	54.8	62.9	63.3
Heavy Trucks:	61.2	60.2	49.0	47.2	58.6	58.8
Vehicle Noise:	67.2	65.5	62.0	57.5	66.1	66.5

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	24	52	112	242
CNEL:	26	56	120	258

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2018 With Project
Road Name: Colton Av.
Road Segment: e/o Opal Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		***Site Conditions (Hard = 10, Soft = 15)***	
Average Daily Traffic (Adt):	7,244 vehicles	*Autos:*	15
Peak Hour Percentage:	10%	*Medium Trucks (2 Axles):*	15
Peak Hour Volume:	724 vehicles	*Heavy Trucks (3+ Axles):*	15
Vehicle Speed:	35 mph		
Near/Far Lane Distance:	36 feet		
Site Data			
Barrier Height:	**0.0 feet**		
Barrier Type (0-Wall, 1-Berm):	0.0		
Centerline Dist. to Barrier:	44.0 feet		
Centerline Dist. to Observer:	44.0 feet		
Barrier Distance to Observer:	0.0 feet		
Observer Height (Above Pad):	5.0 feet		
Pad Elevation:	0.0 feet		
Road Elevation:	0.0 feet		
Road Grade:	0.0%		
Left View:	-90.0 degrees		
Right View:	90.0 degrees		

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.35%
Medium Trucks:	77.0%	10.9%	12.1%	8.94%
Heavy Trucks:	94.6%	1.8%	3.6%	0.71%

Noise Source Elevations (in feet)

Autos: 0.000
Medium Trucks: 2.297
Heavy Trucks: 8.004 *Grade Adjustment:* 0.0

Lane Equivalent Distance (in feet)

Autos: 40.460
Medium Trucks: 40.241
Heavy Trucks: 40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-2.59	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	75.75	-12.63	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	81.57	-23.63	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	61.8	59.8	57.9	52.8	61.1	61.6
Medium Trucks:	63.2	61.3	58.8	54.5	62.6	63.1
Heavy Trucks:	58.0	57.0	45.8	44.0	55.5	55.6
Vehicle Noise:	66.3	64.5	61.5	57.0	65.4	65.8

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	22	47	101	217
CNEL:	23	50	108	232

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 Without Project
Road Name: Judson St.
Road Segment: s/o Colton Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		***Site Conditions (Hard = 10, Soft = 15)***	
Average Daily Traffic (Adt):	9,087 vehicles	*Autos:*	15
Peak Hour Percentage:	10%	*Medium Trucks (2 Axles):*	15
Peak Hour Volume:	909 vehicles	*Heavy Trucks (3+ Axles):*	15
Vehicle Speed:	40 mph		
Near/Far Lane Distance:	36 feet		
Site Data			
Barrier Height:	**0.0 feet**		
Barrier Type (0-Wall, 1-Berm):	0.0		
Centerline Dist. to Barrier:	44.0 feet		
Centerline Dist. to Observer:	44.0 feet		
Barrier Distance to Observer:	0.0 feet		
Observer Height (Above Pad):	5.0 feet		
Pad Elevation:	0.0 feet		
Road Elevation:	0.0 feet		
Road Grade:	0.0%		
Left View:	-90.0 degrees		
Right View:	90.0 degrees		

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos: 0.000
Medium Trucks: 2.297
Heavy Trucks: 8.004 *Grade Adjustment:* 0.0

Lane Equivalent Distance (in feet)

Autos: 40.460
Medium Trucks: 40.241
Heavy Trucks: 40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-2.19	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	77.72	-12.19	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-23.18	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	64.4	62.4	60.5	55.4	63.7	64.2
Medium Trucks:	65.6	63.7	61.3	56.9	65.0	65.5
Heavy Trucks:	59.9	58.9	47.7	45.9	57.3	57.5
Vehicle Noise:	68.7	66.9	64.0	59.4	67.8	68.3

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	31	68	146	315
CNEL:	34	73	157	338

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 Without Project
Road Name: Wabash Av.
Road Segment: s/o Colton Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		***Site Conditions (Hard = 10, Soft = 15)***	
Average Daily Traffic (Adt):	10,118 vehicles	*Autos:*	15
Peak Hour Percentage:	10%	*Medium Trucks (2 Axles):*	15
Peak Hour Volume:	1,012 vehicles	*Heavy Trucks (3+ Axles):*	15
Vehicle Speed:	40 mph		
Near/Far Lane Distance:	36 feet		
Site Data			
Barrier Height:	**0.0 feet**		
Barrier Type (0-Wall, 1-Berm):	0.0		
Centerline Dist. to Barrier:	44.0 feet		
Centerline Dist. to Observer:	44.0 feet		
Barrier Distance to Observer:	0.0 feet		
Observer Height (Above Pad):	5.0 feet		
Pad Elevation:	0.0 feet		
Road Elevation:	0.0 feet		
Road Grade:	0.0%		
Left View:	-90.0 degrees		
Right View:	90.0 degrees		

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos: 0.000
Medium Trucks: 2.297
Heavy Trucks: 8.004 *Grade Adjustment:* 0.0

Lane Equivalent Distance (in feet)

Autos: 40.460
Medium Trucks: 40.241
Heavy Trucks: 40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-1.72	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	77.72	-11.72	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-22.71	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	64.9	62.9	60.9	55.9	64.1	64.7
Medium Trucks:	66.1	64.2	61.7	57.4	65.5	66.0
Heavy Trucks:	60.4	59.4	48.1	46.4	57.8	57.9
Vehicle Noise:	69.2	67.4	64.5	59.9	68.3	68.7

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	34	73	157	338
CNEL:	36	78	168	363

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 Without Project
Road Name: Opal Av.
Road Segment: n/o Dwy. 1
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		***Site Conditions (Hard = 10, Soft = 15)***	
Average Daily Traffic (Adt):	1,690 vehicles	*Autos:*	15
Peak Hour Percentage:	10%	*Medium Trucks (2 Axles):*	15
Peak Hour Volume:	169 vehicles	*Heavy Trucks (3+ Axles):*	15
Vehicle Speed:	35 mph		
Near/Far Lane Distance:	24 feet		
Site Data			
Barrier Height:	**0.0 feet**		
Barrier Type (0-Wall, 1-Berm):	0.0		
Centerline Dist. to Barrier:	25.0 feet		
Centerline Dist. to Observer:	25.0 feet		
Barrier Distance to Observer:	0.0 feet		
Observer Height (Above Pad):	5.0 feet		
Pad Elevation:	0.0 feet		
Road Elevation:	0.0 feet		
Road Grade:	0.0%		
Left View:	-90.0 degrees		
Right View:	90.0 degrees		

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos: 0.000
Medium Trucks: 2.297
Heavy Trucks: 8.004 *Grade Adjustment:* 0.0

Lane Equivalent Distance (in feet)

Autos: 22.494
Medium Trucks: 22.098
Heavy Trucks: 22.136

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-8.91	5.10	-1.20	*-4.41*	0.000	0.000
Medium Trucks:	75.75	-18.91	5.22	-1.20	*-4.85*	0.000	0.000
Heavy Trucks:	81.57	-29.91	5.20	-1.20	*-5.94*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	59.3	57.3	55.4	50.3	58.6	59.1
Medium Trucks:	60.9	58.9	56.5	52.1	60.2	60.7
Heavy Trucks:	55.7	54.6	43.4	41.7	53.1	53.2
Vehicle Noise:	63.9	62.1	59.1	54.6	63.0	63.4

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	8	18	39	85
CNEL:	9	20	42	91

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 Without Project
Road Name: Mentone Bl.
Road Segment: w/o Opal Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA		NOISE MODEL INPUTS	
Highway Data		***Site Conditions (Hard = 10, Soft = 15)***	
Average Daily Traffic (Adt):	23,273 vehicles	*Autos:*	15
Peak Hour Percentage:	10%	*Medium Trucks (2 Axles):*	15
Peak Hour Volume:	2,327 vehicles	*Heavy Trucks (3+ Axles):*	15
Vehicle Speed:	40 mph		
Near/Far Lane Distance:	48 feet		
Site Data			
Barrier Height:	**0.0 feet**		
Barrier Type (0-Wall, 1-Berm):	0.0		
Centerline Dist. to Barrier:	52.0 feet		
Centerline Dist. to Observer:	52.0 feet		
Barrier Distance to Observer:	0.0 feet		
Observer Height (Above Pad):	5.0 feet		
Pad Elevation:	0.0 feet		
Road Elevation:	0.0 feet		
Road Grade:	0.0%		
Left View:	-90.0 degrees		
Right View:	90.0 degrees		

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos: 0.000
Medium Trucks: 2.297
Heavy Trucks: 8.004 *Grade Adjustment:* 0.0

Lane Equivalent Distance (in feet)

Autos: 46.400
Medium Trucks: 46.209
Heavy Trucks: 46.228

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	1.90	0.38	-1.20	*-4.66*	0.000	0.000
Medium Trucks:	77.72	-8.10	0.41	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-19.10	0.41	-1.20	*-5.41*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	67.6	65.6	63.7	58.6	66.9	67.4
Medium Trucks:	68.8	66.9	64.4	60.1	68.2	68.7
Heavy Trucks:	63.1	62.1	50.9	49.1	60.5	60.6
Vehicle Noise:	71.9	70.1	67.2	62.6	71.0	71.5

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	61	131	282	607
CNEL:	65	140	302	651

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 Without Project | Project Name: Opal
Road Name: Colton Av. | Job Number: 10958
Road Segment: w/o Judson St.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,710 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,071 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-0.89	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	75.75	-10.89	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	81.57	-21.89	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	63.5	61.5	59.6	54.5	62.7	63.3
Medium Trucks:	65.0	63.0	60.6	56.2	64.4	64.8
Heavy Trucks:	59.8	58.8	47.5	45.8	57.2	57.3
Vehicle Noise:	68.0	66.2	63.2	58.7	67.1	67.6

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	28	61	131	282
CNEL:	30	65	140	303

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 Without Project | Project Name: Opal
Road Name: Colton Av. | Job Number: 10958
Road Segment: e/o Judson St.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,779 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,078 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-0.87	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	75.75	-10.87	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	81.57	-21.86	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	63.5	61.6	59.6	54.5	62.8	63.3
Medium Trucks:	65.0	63.1	60.6	56.3	64.4	64.9
Heavy Trucks:	59.8	58.8	47.6	45.8	57.2	57.3
Vehicle Noise:	68.0	66.2	63.3	58.7	67.1	67.6

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	28	61	132	283
CNEL:	30	65	141	304

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 Without Project | Project Name: Opal
Road Name: Colton Av. | Job Number: 10958
Road Segment: e/o Dearborn St.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	8,993 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	899 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-2.23	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-12.23	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-23.23	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	64.4	62.4	60.4	55.4	63.6	64.1
Medium Trucks:	65.6	63.7	61.2	56.9	65.0	65.5
Heavy Trucks:	59.9	58.8	47.6	45.9	57.3	57.4
Vehicle Noise:	68.6	66.8	64.0	59.4	67.8	68.2

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	31	67	145	313
CNEL:	34	72	156	336

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 Without Project | Project Name: Opal
Road Name: Colton Av. | Job Number: 10958
Road Segment: e/o Wabash Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	8,892 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	889 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-1.70	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	75.75	-11.70	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	81.57	-22.69	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.7	60.7	58.7	53.7	61.9	62.5
Medium Trucks:	64.2	62.2	59.8	55.4	63.6	64.0
Heavy Trucks:	59.0	57.9	46.7	45.0	56.4	56.5
Vehicle Noise:	67.2	65.4	62.4	57.9	66.3	66.8

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	25	54	116	249
CNEL:	27	58	124	267

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 Without Project | Project Name: Opal
Road Name: Colton Av. | Job Number: 10958
Road Segment: e/o Opal Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	8,606	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	861	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.26%
Medium Trucks:	77.0%	10.9%	12.1%	9.03%
Heavy Trucks:	94.6%	1.8%	3.6%	0.72%

Noise Source Elevations (in feet)

Autos:	0.000	
Medium Trucks:	2.297	
Heavy Trucks:	8.004	Grade Adjustment: 0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-1.84	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	75.75	-11.84	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	81.57	-22.84	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.5	60.6	58.6	53.6	61.8	62.3
Medium Trucks:	64.0	62.1	59.6	55.3	63.4	63.9
Heavy Trucks:	58.8	57.8	46.6	44.8	56.2	56.4
Vehicle Noise:	67.1	65.3	62.3	57.7	66.2	66.6

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	24	53	113	244
CNEL:	26	56	121	262

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 With Project | Project Name: Opal
Road Name: Judson St. | Job Number: 10958
Road Segment: s/o Colton Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	9,228	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	923	vehicles
Vehicle Speed:	40	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.41%
Medium Trucks:	77.0%	10.9%	12.1%	8.89%
Heavy Trucks:	94.6%	1.8%	3.6%	0.71%

Noise Source Elevations (in feet)

Autos:	0.000	
Medium Trucks:	2.297	
Heavy Trucks:	8.004	Grade Adjustment: 0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-2.11	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	77.72	-12.19	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-23.18	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	64.5	62.5	60.5	55.5	63.7	64.3
Medium Trucks:	65.6	63.7	61.3	56.9	65.0	65.5
Heavy Trucks:	59.9	58.9	47.7	45.9	57.3	57.5
Vehicle Noise:	68.7	66.9	64.0	59.5	67.8	68.3

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	32	68	147	316
CNEL:	34	73	158	339

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 With Project | Project Name: Opal
Road Name: Wabash Av. | Job Number: 10958
Road Segment: s/o Colton Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,228	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	1,023	vehicles
Vehicle Speed:	40	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	89.63%
Medium Trucks:	77.0%	10.9%	12.1%	9.13%
Heavy Trucks:	94.6%	1.8%	3.6%	1.24%

Noise Source Elevations (in feet)

Autos:	0.000	
Medium Trucks:	2.297	
Heavy Trucks:	8.004	Grade Adjustment: 0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-1.70	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	77.72	-11.62	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-20.30	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	64.9	62.9	61.0	55.9	64.1	64.7
Medium Trucks:	66.2	64.3	61.8	57.5	65.6	66.1
Heavy Trucks:	62.8	61.8	50.5	48.8	60.2	60.3
Vehicle Noise:	69.6	67.9	64.6	60.1	68.6	69.1

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	36	77	165	356
CNEL:	38	82	177	381

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 With Project | Project Name: Opal
Road Name: Opal Av. | Job Number: 10958
Road Segment: n/o Dwy. 1

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	1,818	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	182	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	24	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	25.0	feet
Centerline Dist. to Observer:	25.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	87.80%
Medium Trucks:	77.0%	10.9%	12.1%	9.27%
Heavy Trucks:	94.6%	1.8%	3.6%	2.92%

Noise Source Elevations (in feet)

Autos:	0.000	
Medium Trucks:	2.297	
Heavy Trucks:	8.004	Grade Adjustment: 0.0

Lane Equivalent Distance (in feet)

Autos:	22.494
Medium Trucks:	22.098
Heavy Trucks:	22.136

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-8.72	5.10	-1.20	*-4.41*	0.000	0.000
Medium Trucks:	75.75	-18.48	5.22	-1.20	*-4.85*	0.000	0.000
Heavy Trucks:	81.57	-23.49	5.20	-1.20	*-5.94*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	59.5	57.5	55.6	50.5	58.7	59.3
Medium Trucks:	61.3	59.4	56.9	52.6	60.7	61.1
Heavy Trucks:	62.1	61.0	49.8	48.1	59.5	59.6
Vehicle Noise:	65.9	64.3	59.8	55.5	64.5	64.9

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	11	23	50	107
CNEL:	11	24	53	114

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 With Project
Road Name: Mentone Bl.
Road Segment: w/o Opal Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	23,428	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	2,343	vehicles
Vehicle Speed:	40	mph
Near/Far Lane Distance:	48	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	52.0	feet
Centerline Dist. to Observer:	52.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	76.5%	12.1%	11.4%	89.84%
Medium Trucks:	77.0%	10.9%	12.1%	9.10%
Heavy Trucks:	94.6%	1.8%	3.6%	1.06%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	46.400
Medium Trucks:	46.209
Heavy Trucks:	46.228

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	66.51	1.91	0.38	-1.20	*-4.66*	0.000	0.000
Medium Trucks:	77.72	-8.04	0.41	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-17.38	0.41	-1.20	*-5.41*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	67.6	65.6	63.7	58.6	66.9	67.4
Medium Trucks:	68.9	67.0	64.5	60.2	68.3	68.7
Heavy Trucks:	64.8	63.8	52.6	50.8	62.2	62.4
Vehicle Noise:	72.2	70.4	67.3	62.8	71.2	71.7

Centerline Distance to Noise Contour (in feet)

	70 dBA	*65 dBA*	*60 dBA*	*55 dBA*
Ldn:	63	135	291	628
CNEL:	67	145	312	672

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 With Project
Road Name: Colton Av.
Road Segment: w/o Judson St.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	11,028	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	1,103	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	76.5%	12.1%	11.4%	90.54%
Medium Trucks:	77.0%	10.9%	12.1%	8.77%
Heavy Trucks:	94.6%	1.8%	3.6%	0.70%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	64.30	-0.75	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	75.75	-10.89	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	81.57	-21.89	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	63.6	61.7	59.7	54.6	62.9	63.4
Medium Trucks:	65.0	63.0	60.6	56.2	64.4	64.8
Heavy Trucks:	59.8	58.8	47.5	45.8	57.2	57.3
Vehicle Noise:	68.1	66.3	63.3	58.8	67.2	67.6

Centerline Distance to Noise Contour (in feet)

	70 dBA	*65 dBA*	*60 dBA*	*55 dBA*
Ldn:	28	61	132	284
CNEL:	31	66	142	305

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 With Project
Road Name: Colton Av.
Road Segment: e/o Judson St.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	11,273	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	1,127	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	76.5%	12.1%	11.4%	90.68%
Medium Trucks:	77.0%	10.9%	12.1%	8.63%
Heavy Trucks:	94.6%	1.8%	3.6%	0.69%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	64.30	-0.65	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	75.75	-10.87	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	81.57	-21.86	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	63.7	61.8	59.8	54.8	63.0	63.5
Medium Trucks:	65.0	63.1	60.6	56.3	64.4	64.9
Heavy Trucks:	59.8	58.8	47.6	45.8	57.2	57.3
Vehicle Noise:	68.1	66.3	63.4	58.8	67.2	67.7

Centerline Distance to Noise Contour (in feet)

	70 dBA	*65 dBA*	*60 dBA*	*55 dBA*
Ldn:	29	62	133	287
CNEL:	31	66	143	308

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 With Project
Road Name: Colton Av.
Road Segment: e/o Dearborn St.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	9,523	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	952	vehicles
Vehicle Speed:	40	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	76.5%	12.1%	11.4%	90.80%
Medium Trucks:	77.0%	10.9%	12.1%	8.52%
Heavy Trucks:	94.6%	1.8%	3.6%	0.68%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	66.51	-1.96	1.28	-1.20	*-4.61*	0.000	0.000
Medium Trucks:	77.72	-12.23	1.31	-1.20	*-4.87*	0.000	0.000
Heavy Trucks:	82.99	-23.23	1.31	-1.20	*-5.50*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	64.6	62.7	60.7	55.7	63.9	64.4
Medium Trucks:	65.6	63.7	61.2	56.9	65.0	65.5
Heavy Trucks:	59.9	58.8	47.6	45.9	57.3	57.4
Vehicle Noise:	68.8	66.9	64.1	59.5	67.9	68.3

Centerline Distance to Noise Contour (in feet)

	70 dBA	*65 dBA*	*60 dBA*	*55 dBA*
Ldn:	32	68	148	318
CNEL:	34	74	158	341

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 With Project
Road Name: Colton Av.
Road Segment: e/o Wabash Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	9,532	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	953	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.12%
Medium Trucks:	77.0%	10.9%	12.1%	8.64%
Heavy Trucks:	94.6%	1.8%	3.6%	1.24%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-1.41	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	75.75	-11.59	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	81.57	-20.03	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	63.0	61.0	59.0	54.0	62.2	62.8
Medium Trucks:	64.3	62.3	59.9	55.5	63.7	64.1
Heavy Trucks:	61.6	60.6	49.4	47.6	59.1	59.2
Vehicle Noise:	67.9	66.2	62.7	58.2	66.8	67.2

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	27	58	125	270
CNEL:	29	62	134	288

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: 2040 With Project
Road Name: Colton Av.
Road Segment: e/o Opal Av.
Project Name: Opal
Job Number: 10958

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	8,677	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	868	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	36	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	44.0	feet
Centerline Dist. to Observer:	44.0	feet
Barrier Distance to Observer:	0.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Road Grade:	0.0%	
Left View:	-90.0	degrees
Right View:	90.0	degrees

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	Day	Evening	Night	Daily
Autos:	76.5%	12.1%	11.4%	90.34%
Medium Trucks:	77.0%	10.9%	12.1%	8.95%
Heavy Trucks:	94.6%	1.8%	3.6%	0.71%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.004	Grade Adjustment:	0.0

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	64.30	-1.80	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	75.75	-11.84	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	81.57	-22.84	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.6	60.6	58.6	53.6	61.8	62.4
Medium Trucks:	64.0	62.1	59.6	55.3	63.4	63.9
Heavy Trucks:	58.8	57.8	46.6	44.8	56.2	56.4
Vehicle Noise:	67.1	65.3	62.3	57.8	66.2	66.6

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	24	53	113	244
CNEL:	26	56	122	262

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APPENDIX 9.1:

OPERATIONAL STATIONARY-SOURCE NOISE CALCULATIONS

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STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R1**
Source: Unloading/Docking Activity
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	284.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	284.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	284.0	-19.5	-19.5	-19.5	-19.5	-19.5	-19.5
Shielding (Barrier Attenuation)	284.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		47.7	44.7	47.7	52.3	56.1	60.5
60 Minute Hourly Adjustment		**47.7**	**44.7**	**47.7**	**52.3**	**56.1**	**60.5**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R1**
Source: Outdoor Storage Movements
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	301.0 feet	***Barrier Height:***	**8.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	291.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	301.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0
Shielding (Barrier Attenuation)	10.0	-4.9	-4.9	-4.9	-4.9	-4.9	-4.9
Raw (Distance + Barrier)		43.7	35.5	45.4	48.9	51.5	51.8
60 Minute Hourly Adjustment		**43.7**	**35.5**	**45.4**	**48.9**	**51.5**	**51.8**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R1**
Source: Roof-Top Air Conditioning
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	381.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	381.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	20.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	381.0	-37.6	-37.6	-37.6	-37.6	-37.6	-37.6
Shielding (Barrier Attenuation)	381.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		39.6	36.8	16.1	13.9	12.5	40.6
60 Minute Hourly Adjustment		**39.6**	**36.8**	**16.1**	**13.9**	**12.5**	**40.6**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R1**
Source: Parking Lot Vehicle Movements
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	128.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	128.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	128.0	-21.1	-21.1	-21.1	-21.1	-21.1	-21.1
Shielding (Barrier Attenuation)	128.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		39.0	35.6	39.6	42.6	46.0	58.4
60 Minute Hourly Adjustment		**39.0**	**35.6**	**39.6**	**42.6**	**46.0**	**58.4**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R2** *Project Name:* Opal
Source: Unloading/Docking Activity *Job Number:* 10958
Condition: Operational *Analyst:* A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	284.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	284.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	284.0	-19.5	-19.5	-19.5	-19.5	-19.5	-19.5
Shielding (Barrier Attenuation)	284.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		47.7	44.7	47.7	52.3	56.1	60.5
60 Minute Hourly Adjustment		**47.7**	**44.7**	**47.7**	**52.3**	**56.1**	**60.5**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R2** *Project Name:* Opal
Source: Outdoor Storage Movements *Job Number:* 10958
Condition: Operational *Analyst:* A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	35.0 feet	***Barrier Height:***	**8.0 feet**
Noise Distance to Barrier:	25.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	35.0	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3
Shielding (Barrier Attenuation)	25.0	-7.5	-7.5	-7.5	-7.5	-7.5	-7.5
Raw (Distance + Barrier)		59.8	51.6	61.5	65.0	67.6	67.9
60 Minute Hourly Adjustment		**59.8**	**51.6**	**61.5**	**65.0**	**67.6**	**67.9**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R2**
Source: Roof-Top Air Conditioning
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	330.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	330.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	20.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	330.0	-36.4	-36.4	-36.4	-36.4	-36.4	-36.4
Shielding (Barrier Attenuation)	330.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		40.8	38.0	17.3	15.1	13.7	41.8
60 Minute Hourly Adjustment		**40.8**	**38.0**	**17.3**	**15.1**	**13.7**	**41.8**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R2**
Source: Parking Lot Vehicle Movements
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	39.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	39.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	39.0	-13.4	-13.4	-13.4	-13.4	-13.4	-13.4
Shielding (Barrier Attenuation)	39.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		46.7	43.3	47.3	50.3	53.7	66.1
60 Minute Hourly Adjustment		**46.7**	**43.3**	**47.3**	**50.3**	**53.7**	**66.1**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R3**
Source: Unloading/Docking Activity
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	575.0 feet	***Barrier Height:***	**8.0 feet**
Noise Distance to Barrier:	135.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	440.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	575.0	-25.7	-25.7	-25.7	-25.7	-25.7	-25.7
Shielding (Barrier Attenuation)	135.0	-4.9	-4.9	-4.9	-4.9	-4.9	-4.9
Raw (Distance + Barrier)		36.6	33.6	36.6	41.2	45.0	49.4
60 Minute Hourly Adjustment		**36.6**	**33.6**	**36.6**	**41.2**	**45.0**	**49.4**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R3**
Source: Outdoor Storage Movements
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	129.0 feet	***Barrier Height:***	**8.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	119.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	129.0	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7
Shielding (Barrier Attenuation)	10.0	-4.9	-4.9	-4.9	-4.9	-4.9	-4.9
Raw (Distance + Barrier)		51.0	42.8	52.7	56.2	58.8	59.1
60 Minute Hourly Adjustment		**51.0**	**42.8**	**52.7**	**56.2**	**58.8**	**59.1**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R3**
Source: Roof-Top Air Conditioning
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	628.0 feet	***Barrier Height:***	**8.0 feet**
Noise Distance to Barrier:	140.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	488.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	20.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	628.0	-42.0	-42.0	-42.0	-42.0	-42.0	-42.0
Shielding (Barrier Attenuation)	140.0	-9.3	-9.3	-9.3	-9.3	-9.3	-9.3
Raw (Distance + Barrier)		25.9	23.1	2.4	0.2	-1.2	26.9
60 Minute Hourly Adjustment		**25.9**	**23.1**	**2.4**	**0.2**	**-1.2**	**26.9**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R3**
Source: Parking Lot Vehicle Movements
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	663.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	663.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	663.0	-31.8	-31.8	-31.8	-31.8	-31.8	-31.8
Shielding (Barrier Attenuation)	663.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		28.3	24.9	28.9	31.9	35.3	47.7
60 Minute Hourly Adjustment		**28.3**	**24.9**	**28.9**	**31.9**	**35.3**	**47.7**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R4**
Source: Unloading/Docking Activity
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	739.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	729.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	91.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	56.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	91.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	739.0	-27.8	-27.8	-27.8	-27.8	-27.8	-27.8
Shielding (Barrier Attenuation)	729.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Raw (Distance + Barrier)		33.4	30.4	33.4	38.0	41.8	46.2
60 Minute Hourly Adjustment		**33.4**	**30.4**	**33.4**	**38.0**	**41.8**	**46.2**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R4**
Source: Outdoor Storage Movements
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	65.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	55.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	91.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	80.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	91.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	65.0	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7
Shielding (Barrier Attenuation)	55.0	-7.4	-7.4	-7.4	-7.4	-7.4	-7.4
Raw (Distance + Barrier)		54.5	46.3	56.2	59.7	62.3	62.6
60 Minute Hourly Adjustment		**54.5**	**46.3**	**56.2**	**59.7**	**62.3**	**62.6**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R4**
Source: Roof-Top Air Conditioning
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	846.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	836.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	91.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	75.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	91.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	846.0	-44.6	-44.6	-44.6	-44.6	-44.6	-44.6
Shielding (Barrier Attenuation)	836.0	-5.7	-5.7	-5.7	-5.7	-5.7	-5.7
Raw (Distance + Barrier)		26.9	24.1	3.4	1.2	-0.2	27.9
60 Minute Hourly Adjustment		**26.9**	**24.1**	**3.4**	**1.2**	**-0.2**	**27.9**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R4**
Source: Parking Lot Vehicle Movements
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	1,074.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	1,064.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	91.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	55.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	91.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	1,074.0	-35.0	-35.0	-35.0	-35.0	-35.0	-35.0
Shielding (Barrier Attenuation)	1,064.0	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9
Raw (Distance + Barrier)		19.2	15.8	19.8	22.8	26.2	38.6
60 Minute Hourly Adjustment		**19.2**	**15.8**	**19.8**	**22.8**	**26.2**	**38.6**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R5** *Project Name:* Opal
Source: Unloading/Docking Activity *Job Number:* 10958
Condition: Operational *Analyst:* A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	657.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	647.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	93.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	56.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	93.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	657.0	-26.8	-26.8	-26.8	-26.8	-26.8	-26.8
Shielding (Barrier Attenuation)	647.0	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1
Raw (Distance + Barrier)		34.3	31.3	34.3	38.9	42.7	47.1
60 Minute Hourly Adjustment		**34.3**	**31.3**	**34.3**	**38.9**	**42.7**	**47.1**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R5** *Project Name:* Opal
Source: Outdoor Storage Movements *Job Number:* 10958
Condition: Operational *Analyst:* A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	62.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	52.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	93.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	82.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	93.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	62.0	-6.3	-6.3	-6.3	-6.3	-6.3	-6.3
Shielding (Barrier Attenuation)	52.0	-7.5	-7.5	-7.5	-7.5	-7.5	-7.5
Raw (Distance + Barrier)		54.8	46.6	56.5	60.0	62.6	62.9
60 Minute Hourly Adjustment		**54.8**	**46.6**	**56.5**	**60.0**	**62.6**	**62.9**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R5** *Project Name:* Opal
Source: Roof-Top Air Conditioning *Job Number:* 10958
Condition: Operational *Analyst:* A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	739.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	729.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	93.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	75.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	93.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	739.0	-43.4	-43.4	-43.4	-43.4	-43.4	-43.4
Shielding (Barrier Attenuation)	729.0	-5.8	-5.8	-5.8	-5.8	-5.8	-5.8
Raw (Distance + Barrier)		28.0	25.2	4.5	2.3	0.9	29.0
60 Minute Hourly Adjustment		**28.0**	**25.2**	**4.5**	**2.3**	**0.9**	**29.0**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R5** *Project Name:* Opal
Source: Parking Lot Vehicle Movements *Job Number:* 10958
Condition: Operational *Analyst:* A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	117.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	107.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	93.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	55.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	93.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	117.0	-20.5	-20.5	-20.5	-20.5	-20.5	-20.5
Shielding (Barrier Attenuation)	107.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0
Raw (Distance + Barrier)		29.6	26.2	30.2	33.2	36.6	49.0
60 Minute Hourly Adjustment		**29.6**	**26.2**	**30.2**	**33.2**	**36.6**	**49.0**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R6**
Source: Unloading/Docking Activity
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	657.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	647.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	92.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	56.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	92.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	657.0	-26.8	-26.8	-26.8	-26.8	-26.8	-26.8
Shielding (Barrier Attenuation)	647.0	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1
Raw (Distance + Barrier)		34.3	31.3	34.3	38.9	42.7	47.1
60 Minute Hourly Adjustment		**34.3**	**31.3**	**34.3**	**38.9**	**42.7**	**47.1**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R6**
Source: Outdoor Storage Movements
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	65.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	55.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	92.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	82.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	92.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	65.0	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7
Shielding (Barrier Attenuation)	55.0	-7.1	-7.1	-7.1	-7.1	-7.1	-7.1
Raw (Distance + Barrier)		54.8	46.6	56.5	60.0	62.6	62.9
60 Minute Hourly Adjustment		**54.8**	**46.6**	**56.5**	**60.0**	**62.6**	**62.9**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R6**
Source: Roof-Top Air Conditioning
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	654.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	644.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	92.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	75.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	92.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	654.0	-42.3	-42.3	-42.3	-42.3	-42.3	-42.3
Shielding (Barrier Attenuation)	644.0	-5.8	-5.8	-5.8	-5.8	-5.8	-5.8
Raw (Distance + Barrier)		29.1	26.3	5.6	3.4	2.0	30.1
60 Minute Hourly Adjustment		**29.1**	**26.3**	**5.6**	**3.4**	**2.0**	**30.1**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R6**
Source: Parking Lot Vehicle Movements
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	1,160.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	1,150.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	92.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	55.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	92.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	1,160.0	-35.5	-35.5	-35.5	-35.5	-35.5	-35.5
Shielding (Barrier Attenuation)	1,150.0	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9
Raw (Distance + Barrier)		18.7	15.3	19.3	22.3	25.7	38.1
60 Minute Hourly Adjustment		**18.7**	**15.3**	**19.3**	**22.3**	**25.7**	**38.1**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R7**
Source: Unloading/Docking Activity
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	266.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	266.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	266.0	-19.0	-19.0	-19.0	-19.0	-19.0	-19.0
Shielding (Barrier Attenuation)	266.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		48.2	45.2	48.2	52.8	56.6	61.0
60 Minute Hourly Adjustment		**48.2**	**45.2**	**48.2**	**52.8**	**56.6**	**61.0**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R7**
Source: Outdoor Storage Movements
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	136.0 feet	***Barrier Height:***	**8.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	126.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	136.0	-13.1	-13.1	-13.1	-13.1	-13.1	-13.1
Shielding (Barrier Attenuation)	10.0	-4.9	-4.9	-4.9	-4.9	-4.9	-4.9
Raw (Distance + Barrier)		50.6	42.4	52.3	55.8	58.4	58.7
60 Minute Hourly Adjustment		**50.6**	**42.4**	**52.3**	**55.8**	**58.4**	**58.7**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R7** *Project Name:* Opal
Source: Roof-Top Air Conditioning *Job Number:* 10958
Condition: Operational *Analyst:* A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	196.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	196.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	20.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	196.0	-31.9	-31.9	-31.9	-31.9	-31.9	-31.9
Shielding (Barrier Attenuation)	196.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		45.3	42.5	21.8	19.6	18.2	46.3
60 Minute Hourly Adjustment		**45.3**	**42.5**	**21.8**	**19.6**	**18.2**	**46.3**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R7** *Project Name:* Opal
Source: Parking Lot Vehicle Movements *Job Number:* 10958
Condition: Operational *Analyst:* A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	668.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	668.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	668.0	-31.9	-31.9	-31.9	-31.9	-31.9	-31.9
Shielding (Barrier Attenuation)	668.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		28.2	24.8	28.8	31.8	35.2	47.6
60 Minute Hourly Adjustment		**28.2**	**24.8**	**28.8**	**31.8**	**35.2**	**47.6**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R8**
Source: Unloading/Docking Activity
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	769.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	769.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	769.0	-28.2	-28.2	-28.2	-28.2	-28.2	-28.2
Shielding (Barrier Attenuation)	769.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		39.0	36.0	39.0	43.6	47.4	51.8
60 Minute Hourly Adjustment		**39.0**	**36.0**	**39.0**	**43.6**	**47.4**	**51.8**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R8**
Source: Outdoor Storage Movements
Condition: Operational

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	1,082.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	1,072.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	1,082.0	-31.1	-31.1	-31.1	-31.1	-31.1	-31.1
Shielding (Barrier Attenuation)	10.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		37.5	29.3	39.2	42.7	45.3	45.6
60 Minute Hourly Adjustment		**37.5**	**29.3**	**39.2**	**42.7**	**45.3**	**45.6**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R8** *Project Name:* Opal
Source: Roof-Top Air Conditioning *Job Number:* 10958
Condition: Operational *Analyst:* A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	814.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	814.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	20.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	814.0	-44.2	-44.2	-44.2	-44.2	-44.2	-44.2
Shielding (Barrier Attenuation)	814.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		33.0	30.2	9.5	7.3	5.9	34.0
60 Minute Hourly Adjustment		**33.0**	**30.2**	**9.5**	**7.3**	**5.9**	**34.0**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R8** *Project Name:* Opal
Source: Parking Lot Vehicle Movements *Job Number:* 10958
Condition: Operational *Analyst:* A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	761.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	761.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	761.0	-32.7	-32.7	-32.7	-32.7	-32.7	-32.7
Shielding (Barrier Attenuation)	761.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		27.4	24.0	28.0	31.0	34.4	46.8
60 Minute Hourly Adjustment		**27.4**	**24.0**	**28.0**	**31.0**	**34.4**	**46.8**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R1**
Source: Unloading/Docking Activity
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	284.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	284.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	284.0	-19.5	-19.5	-19.5	-19.5	-19.5	-19.5
Shielding (Barrier Attenuation)	284.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		47.7	44.7	47.7	52.3	56.1	60.5
60 Minute Hourly Adjustment		**47.7**	**44.7**	**47.7**	**52.3**	**56.1**	**60.5**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R1**
Source: Outdoor Storage Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	301.0 feet	***Barrier Height:***	**8.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	291.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	301.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0
Shielding (Barrier Attenuation)	10.0	-4.9	-4.9	-4.9	-4.9	-4.9	-4.9
Raw (Distance + Barrier)		43.7	35.5	45.4	48.9	51.5	51.8
60 Minute Hourly Adjustment		**43.7**	**35.5**	**45.4**	**48.9**	**51.5**	**51.8**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R1**
Source: Roof-Top Air Conditioning
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	381.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	381.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	20.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	381.0	-37.6	-37.6	-37.6	-37.6	-37.6	-37.6
Shielding (Barrier Attenuation)	381.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		39.6	36.8	16.1	13.9	12.5	40.6
60 Minute Hourly Adjustment		**39.6**	**36.8**	**16.1**	**13.9**	**12.5**	**40.6**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R1**
Source: Parking Lot Vehicle Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	128.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	128.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	128.0	-21.1	-21.1	-21.1	-21.1	-21.1	-21.1
Shielding (Barrier Attenuation)	128.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		39.0	35.6	39.6	42.6	46.0	58.4
60 Minute Hourly Adjustment		**39.0**	**35.6**	**39.6**	**42.6**	**46.0**	**58.4**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R2**
Source: Unloading/Docking Activity
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	284.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	274.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	284.0	-19.5	-19.5	-19.5	-19.5	-19.5	-19.5
Shielding (Barrier Attenuation)	274.0	-5.4	-5.4	-5.4	-5.4	-5.4	-5.4
Raw (Distance + Barrier)		42.3	39.3	42.3	46.9	50.7	55.1
60 Minute Hourly Adjustment		**42.3**	**39.3**	**42.3**	**46.9**	**50.7**	**55.1**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R2**
Source: Outdoor Storage Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	85.0 feet	***Barrier Height:***	**10.0 feet**
Noise Distance to Barrier:	75.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	85.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0
Shielding (Barrier Attenuation)	75.0	-10.6	-10.6	-10.6	-10.6	-10.6	-10.6
Raw (Distance + Barrier)		49.0	40.8	50.7	54.2	56.8	57.1
60 Minute Hourly Adjustment		**49.0**	**40.8**	**50.7**	**54.2**	**56.8**	**57.1**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R2**
Source: Roof-Top Air Conditioning
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	330.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	320.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	20.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	330.0	-36.4	-36.4	-36.4	-36.4	-36.4	-36.4
Shielding (Barrier Attenuation)	320.0	-5.1	-5.1	-5.1	-5.1	-5.1	-5.1
Raw (Distance + Barrier)		35.7	32.9	12.2	10.0	8.6	36.7
60 Minute Hourly Adjustment		**35.7**	**32.9**	**12.2**	**10.0**	**8.6**	**36.7**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R2**
Source: Parking Lot Vehicle Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	39.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	29.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	39.0	-13.4	-13.4	-13.4	-13.4	-13.4	-13.4
Shielding (Barrier Attenuation)	29.0	-5.7	-5.7	-5.7	-5.7	-5.7	-5.7
Raw (Distance + Barrier)		41.0	37.6	41.6	44.6	48.0	60.4
60 Minute Hourly Adjustment		**41.0**	**37.6**	**41.6**	**44.6**	**48.0**	**60.4**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R3**
Source: Unloading/Docking Activity
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	575.0 feet	***Barrier Height:***	**8.0 feet**
Noise Distance to Barrier:	135.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	440.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	575.0	-25.7	-25.7	-25.7	-25.7	-25.7	-25.7
Shielding (Barrier Attenuation)	135.0	-4.9	-4.9	-4.9	-4.9	-4.9	-4.9
Raw (Distance + Barrier)		36.6	33.6	36.6	41.2	45.0	49.4
60 Minute Hourly Adjustment		**36.6**	**33.6**	**36.6**	**41.2**	**45.0**	**49.4**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R3**
Source: Outdoor Storage Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	129.0 feet	***Barrier Height:***	**8.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	119.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	129.0	-12.7	-12.7	-12.7	-12.7	-12.7	-12.7
Shielding (Barrier Attenuation)	10.0	-4.9	-4.9	-4.9	-4.9	-4.9	-4.9
Raw (Distance + Barrier)		51.0	42.8	52.7	56.2	58.8	59.1
60 Minute Hourly Adjustment		**51.0**	**42.8**	**52.7**	**56.2**	**58.8**	**59.1**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R3**
Source: Roof-Top Air Conditioning
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	628.0	feet	***Barrier Height:***	**8.0 feet**
Noise Distance to Barrier:	140.0	feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	488.0	feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0	feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	20.0	feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0	feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	628.0	-42.0	-42.0	-42.0	-42.0	-42.0	-42.0
Shielding (Barrier Attenuation)	140.0	-9.3	-9.3	-9.3	-9.3	-9.3	-9.3
Raw (Distance + Barrier)		25.9	23.1	2.4	0.2	-1.2	26.9
60 Minute Hourly Adjustment		**25.9**	**23.1**	**2.4**	**0.2**	**-1.2**	**26.9**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R3**
Source: Parking Lot Vehicle Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	663.0	feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	663.0	feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0	feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0	feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0	feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0	feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	663.0	-31.8	-31.8	-31.8	-31.8	-31.8	-31.8
Shielding (Barrier Attenuation)	663.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		28.3	24.9	28.9	31.9	35.3	47.7
60 Minute Hourly Adjustment		**28.3**	**24.9**	**28.9**	**31.9**	**35.3**	**47.7**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R4**
Source: Unloading/Docking Activity
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	739.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	729.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	91.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	56.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	91.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	739.0	-27.8	-27.8	-27.8	-27.8	-27.8	-27.8
Shielding (Barrier Attenuation)	729.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Raw (Distance + Barrier)		33.4	30.4	33.4	38.0	41.8	46.2
60 Minute Hourly Adjustment		**33.4**	**30.4**	**33.4**	**38.0**	**41.8**	**46.2**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R4**
Source: Outdoor Storage Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	65.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	55.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	91.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	80.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	91.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	65.0	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7
Shielding (Barrier Attenuation)	55.0	-7.4	-7.4	-7.4	-7.4	-7.4	-7.4
Raw (Distance + Barrier)		54.5	46.3	56.2	59.7	62.3	62.6
60 Minute Hourly Adjustment		**54.5**	**46.3**	**56.2**	**59.7**	**62.3**	**62.6**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R4**
Source: Roof-Top Air Conditioning
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	846.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	836.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	91.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	75.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	91.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	846.0	-44.6	-44.6	-44.6	-44.6	-44.6	-44.6
Shielding (Barrier Attenuation)	836.0	-5.7	-5.7	-5.7	-5.7	-5.7	-5.7
Raw (Distance + Barrier)		26.9	24.1	3.4	1.2	-0.2	27.9
60 Minute Hourly Adjustment		**26.9**	**24.1**	**3.4**	**1.2**	**-0.2**	**27.9**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R4**
Source: Parking Lot Vehicle Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	1,074.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	1,064.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	91.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	55.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	91.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	1,074.0	-35.0	-35.0	-35.0	-35.0	-35.0	-35.0
Shielding (Barrier Attenuation)	1,064.0	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9
Raw (Distance + Barrier)		19.2	15.8	19.8	22.8	26.2	38.6
60 Minute Hourly Adjustment		**19.2**	**15.8**	**19.8**	**22.8**	**26.2**	**38.6**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R5**
Source: Unloading/Docking Activity
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	657.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	647.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	93.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	56.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	93.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	657.0	-26.8	-26.8	-26.8	-26.8	-26.8	-26.8
Shielding (Barrier Attenuation)	647.0	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1
Raw (Distance + Barrier)		34.3	31.3	34.3	38.9	42.7	47.1
60 Minute Hourly Adjustment		**34.3**	**31.3**	**34.3**	**38.9**	**42.7**	**47.1**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R5**
Source: Outdoor Storage Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	62.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	52.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	93.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	82.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	93.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	62.0	-6.3	-6.3	-6.3	-6.3	-6.3	-6.3
Shielding (Barrier Attenuation)	52.0	-7.5	-7.5	-7.5	-7.5	-7.5	-7.5
Raw (Distance + Barrier)		54.8	46.6	56.5	60.0	62.6	62.9
60 Minute Hourly Adjustment		**54.8**	**46.6**	**56.5**	**60.0**	**62.6**	**62.9**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R5**
Source: Roof-Top Air Conditioning
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	739.0	feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	729.0	feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0	feet	*Observer Height:*	5.0 feet
Observer Elevation:	93.0	feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	75.0	feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	93.0	feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	739.0	-43.4	-43.4	-43.4	-43.4	-43.4	-43.4
Shielding (Barrier Attenuation)	729.0	-5.8	-5.8	-5.8	-5.8	-5.8	-5.8
Raw (Distance + Barrier)		28.0	25.2	4.5	2.3	0.9	29.0
60 Minute Hourly Adjustment		**28.0**	**25.2**	**4.5**	**2.3**	**0.9**	**29.0**

STATIONARY SOURCE NOISE PREDICTION MODEL 5/30/2017

Observer Location: **R5**
Source: Parking Lot Vehicle Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	117.0	feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	107.0	feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0	feet	*Observer Height:*	5.0 feet
Observer Elevation:	93.0	feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	55.0	feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	93.0	feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	117.0	-20.5	-20.5	-20.5	-20.5	-20.5	-20.5
Shielding (Barrier Attenuation)	107.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0
Raw (Distance + Barrier)		29.6	26.2	30.2	33.2	36.6	49.0
60 Minute Hourly Adjustment		**29.6**	**26.2**	**30.2**	**33.2**	**36.6**	**49.0**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R6**
Source: Unloading/Docking Activity
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	657.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	647.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	92.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	56.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	92.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	657.0	-26.8	-26.8	-26.8	-26.8	-26.8	-26.8
Shielding (Barrier Attenuation)	647.0	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1
Raw (Distance + Barrier)		34.3	31.3	34.3	38.9	42.7	47.1
60 Minute Hourly Adjustment		**34.3**	**31.3**	**34.3**	**38.9**	**42.7**	**47.1**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R6**
Source: Outdoor Storage Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	65.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	55.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	92.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	82.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	92.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	65.0	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7
Shielding (Barrier Attenuation)	55.0	-7.1	-7.1	-7.1	-7.1	-7.1	-7.1
Raw (Distance + Barrier)		54.8	46.6	56.5	60.0	62.6	62.9
60 Minute Hourly Adjustment		**54.8**	**46.6**	**56.5**	**60.0**	**62.6**	**62.9**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R6**
Source: Roof-Top Air Conditioning
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	654.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	644.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	92.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	75.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	92.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	654.0	-42.3	-42.3	-42.3	-42.3	-42.3	-42.3
Shielding (Barrier Attenuation)	644.0	-5.8	-5.8	-5.8	-5.8	-5.8	-5.8
Raw (Distance + Barrier)		29.1	26.3	5.6	3.4	2.0	30.1
60 Minute Hourly Adjustment		**29.1**	**26.3**	**5.6**	**3.4**	**2.0**	**30.1**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R6**
Source: Parking Lot Vehicle Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	1,160.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	1,150.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	92.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	55.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	92.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	1,160.0	-35.5	-35.5	-35.5	-35.5	-35.5	-35.5
Shielding (Barrier Attenuation)	1,150.0	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9
Raw (Distance + Barrier)		18.7	15.3	19.3	22.3	25.7	38.1
60 Minute Hourly Adjustment		**18.7**	**15.3**	**19.3**	**22.3**	**25.7**	**38.1**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R7**
Source: Unloading/Docking Activity
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	266.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	266.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	266.0	-19.0	-19.0	-19.0	-19.0	-19.0	-19.0
Shielding (Barrier Attenuation)	266.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		48.2	45.2	48.2	52.8	56.6	61.0
60 Minute Hourly Adjustment		**48.2**	**45.2**	**48.2**	**52.8**	**56.6**	**61.0**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R7**
Source: Outdoor Storage Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	136.0 feet	***Barrier Height:***	**8.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	126.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	136.0	-13.1	-13.1	-13.1	-13.1	-13.1	-13.1
Shielding (Barrier Attenuation)	10.0	-4.9	-4.9	-4.9	-4.9	-4.9	-4.9
Raw (Distance + Barrier)		50.6	42.4	52.3	55.8	58.4	58.7
60 Minute Hourly Adjustment		**50.6**	**42.4**	**52.3**	**55.8**	**58.4**	**58.7**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R7**
Source: Roof-Top Air Conditioning
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	196.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	196.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	20.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	196.0	-31.9	-31.9	-31.9	-31.9	-31.9	-31.9
Shielding (Barrier Attenuation)	196.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		45.3	42.5	21.8	19.6	18.2	46.3
60 Minute Hourly Adjustment		**45.3**	**42.5**	**21.8**	**19.6**	**18.2**	**46.3**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R7**
Source: Parking Lot Vehicle Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	668.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	668.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	668.0	-31.9	-31.9	-31.9	-31.9	-31.9	-31.9
Shielding (Barrier Attenuation)	668.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		28.2	24.8	28.8	31.8	35.2	47.6
60 Minute Hourly Adjustment		**28.2**	**24.8**	**28.8**	**31.8**	**35.2**	**47.6**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R8**
Source: Unloading/Docking Activity
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	769.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	769.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	64.2	67.2	71.8	75.6	80.0
Distance Attenuation	769.0	-28.2	-28.2	-28.2	-28.2	-28.2	-28.2
Shielding (Barrier Attenuation)	769.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		39.0	36.0	39.0	43.6	47.4	51.8
60 Minute Hourly Adjustment		**39.0**	**36.0**	**39.0**	**43.6**	**47.4**	**51.8**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R8**
Source: Outdoor Storage Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	1,082.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	1,072.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	68.6	60.4	70.3	73.8	76.4	76.7
Distance Attenuation	1,082.0	-31.1	-31.1	-31.1	-31.1	-31.1	-31.1
Shielding (Barrier Attenuation)	10.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		37.5	29.3	39.2	42.7	45.3	45.6
60 Minute Hourly Adjustment		**37.5**	**29.3**	**39.2**	**42.7**	**45.3**	**45.6**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R8**
Source: Roof-Top Air Conditioning
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	814.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	814.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	20.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	74.4	53.7	51.5	50.1	78.2
Distance Attenuation	814.0	-44.2	-44.2	-44.2	-44.2	-44.2	-44.2
Shielding (Barrier Attenuation)	814.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		33.0	30.2	9.5	7.3	5.9	34.0
60 Minute Hourly Adjustment		**33.0**	**30.2**	**9.5**	**7.3**	**5.9**	**34.0**

STATIONARY SOURCE NOISE PREDICTION MODEL

5/30/2017

Observer Location: **R8**
Source: Parking Lot Vehicle Movements
Condition: Operational Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	761.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	761.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	60.1	56.7	60.7	63.7	67.1	79.5
Distance Attenuation	761.0	-32.7	-32.7	-32.7	-32.7	-32.7	-32.7
Shielding (Barrier Attenuation)	761.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		27.4	24.0	28.0	31.0	34.4	46.8
60 Minute Hourly Adjustment		**27.4**	**24.0**	**28.0**	**31.0**	**34.4**	**46.8**

APPENDIX 10.1:

TEMPORARY CONSTRUCTION NOISE BARRIER ATTENUATION

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STATIONARY SOURCE NOISE PREDICTION MODEL

5/31/2017

Observer Location: **R1**
Source: Peak Construction Activity
Condition: Construction Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	135.0 feet	***Barrier Height:***	**10.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	125.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	50.0	79.6	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	135.0	-8.6	-8.6	-8.6	-8.6	-8.6	-8.6
Shielding (Barrier Attenuation)	10.0	-7.2	-7.2	-7.2	-7.2	-7.2	-7.2

STATIONARY SOURCE NOISE PREDICTION MODEL

5/31/2017

Observer Location: **R2**
Source: Peak Construction Activity
Condition: Construction Mitigated

Project Name: Opal
Job Number: 10958
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	44.0 feet	***Barrier Height:***	**10.0 feet**
Noise Distance to Barrier:	34.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	50.0	79.6	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	44.0	1.1	1.1	1.1	1.1	1.1	1.1
Shielding (Barrier Attenuation)	34.0	-10.5	-10.5	-10.5	-10.5	-10.5	-10.5

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APPENDIX 10.2:

TEMPORARY CONSTRUCTION NOISE BARRIER EXAMPLE PHOTOS

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Temporary Construction Noise Barrier Examples

I-Beam & Acoustic Material 01

I-Beam & Acoustic Material 02

I-Beam & Acoustic Material 03

K-Rail Plywood & Acoustic Material

K-Rail Temporary Fence & Acoustic Material

K-Rail-Mounted Acoustic Material 01

Temporary Construction Noise Barrier Examples

Pillar & Acoustic Material

Straw Bales 01

Straw Bales 02

Temporary Fence & Acoustic Material 01

Temporary Fence & Acoustic Material 02