APPENDIX F
NOISE REPORT

ATSConsulting
acoustics, transportation + strategy

MEMORANDUM

To: [redacted]
Royal Investors Group, LLC

From: [redacted]
ATS Consulting

Date: [redacted]

Subject: [redacted]

Table of Contents

List of Figures

1. INTRODUCTION AND SUMMARY OF FINDINGS

This memorandum summarizes the results of noise measurements and analysis completed by ATS Consulting for the proposed Royal Investors Group residential development project in the city of Victorville. Figure 1 shows the layout of the proposed development, while Figure 2 shows the surrounding area. The project site is currently undeveloped. It lies in the space bounded by both Eucalyptus Street to the north, Oak Hill Road to the East, Godwin Drive to the West, and Solano Road to the South. The area is currently sparsely developed with a few single family residences near the proposed site. The main source of noise is the light traffic from Eucalyptus Street directly adjacent to the property, and heavy traffic from State Highway 395 about 1,250 feet to the east.

The primary issues for this study are:

- Whether projected future sound levels will exceed the City of Victorville standards for residential developments. The City of Victorville has an exterior noise standard of 60 dBA CNEL for residential developments (V.M.C. 16-6.12). CNEL, the Community Noise Equivalent Level, is a cumulative measure of total noise exposure over a 24-hour period.* Where this standard is exceeded, measures to mitigate the noise, such as sound walls or improved building sound insulation, should be specified.
- Whether noise generated by the project will affect other noise sensitive receptors. The primary noise source that would be associated with the proposed project is traffic into and out of the development.
- Whether noise from construction of the proposed project will adversely affect existing noise sensitive land uses.

The conclusions of this noise study are:

1. Current traffic on Eucalyptus Street and State Highway 395 produces a CNEL of 57 dBA, while future noise is projected at 59 dBA, just below the 60 dBA limit. As a result, mitigation is not required for this development.
2. The small footprint of the project combined with the sparsely populated area, make it highly unlikely that the project will cause a significant increase in noise to the other single-family houses surrounding the project.
3. Construction noise could be intermittently intrusive at residences that are adjacent to the site. The construction will be in compliance with Section 16-6.12 of the City of Victorville Code of Ordinances that prohibits the use of construction equipment between the hours of 7:00 p.m. and 7:00 a.m., Monday through Saturday, or at any time on Sunday. The contractor should be required to employ best practices to minimize noise (e.g., only use equipment with outfitted with efficient mufflers to control the noise emissions).

* The technical terms used in this report are defined in Section 2 (page 4).

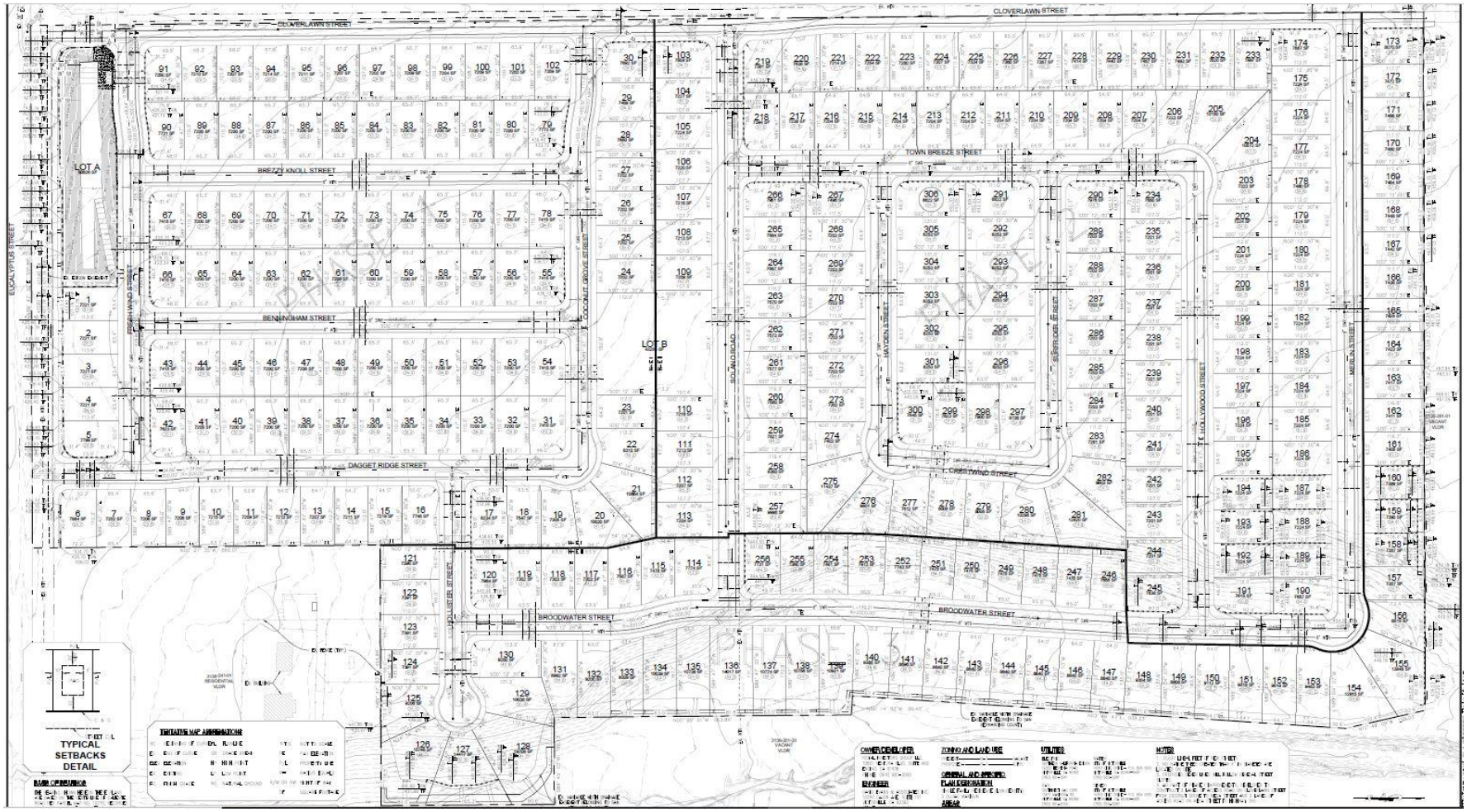


Figure 1. Site Plan of Proposed Development

Figure 2: Overview of Surrounding Area, with Measurement Site Identified with a Pin

2. FUNDAMENTALS OF TRAFFIC NOISE

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise is generally defined as unwanted or excessive sound. Sound can vary in intensity by over one million times within the range of human hearing. This is one reason that a logarithmic scale, known as the decibel scale (dB), is used to quantify sound intensity and compress the scale to a more meaningful range. The other reason is that human hearing is approximately logarithmic. A one decibel change in sound level is perceived similarly regardless of the how loud the existing sound is.

Sound is characterized by both its amplitude and frequency (or pitch). The human ear does not hear all frequencies equally. In particular, the ear deemphasizes low and very high frequencies. To better approximate the sensitivity of human hearing, the A-weighted decibel scale has been developed. A-weighted decibels are abbreviated as "dBA". On this scale, the human range of hearing extends from approximately 3 dBA to around 140 dBA. As a point of reference, Figure 3 includes examples of A-weighted sound levels from common indoor and outdoor sounds.

Using the decibel scale, sound levels from two or more sources cannot be directly added together to determine the overall sound level. Rather, the combination of two sounds at the same level yields an increase of 3 dBA. The smallest recognizable change in sound level is approximately 1 dBA. A 3-dBA increase is generally considered perceptible, whereas a 5-dBA increase is readily perceptible. A 10-dBA increase is judged by most people as an approximate doubling of the perceived loudness.

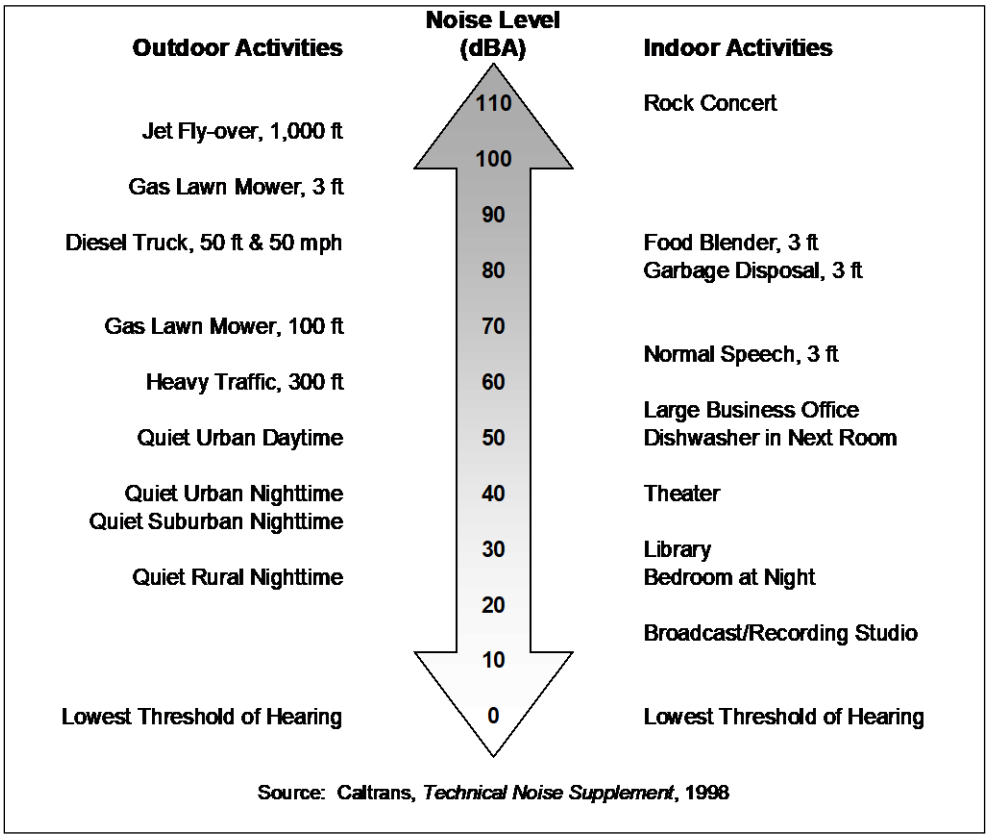


Figure 3. Typical Outdoor and Indoor Noise Sources

Two of the primary factors that reduce levels of environmental sounds are increasing the distance between the sound source to the receiver and having intervening obstacles such as walls, buildings, or terrain features that block the direct path between the sound source and the receiver. Factors that act to increase the loudness of environmental sounds include moving the sound source closer to the receiver, sound enhancements caused by reflections, and focusing caused by various meteorological conditions.

Following are brief definitions of the two measures of environmental noise that have been used in this study:

- **Equivalent Sound Level (Leq)**: Environment sound fluctuates constantly. The equivalent sound level (Leq), sometimes referred to as the energy average sound level, is the most common means of characterizing community noise. Leq represents a constant sound that, over the specified period, has the same sound energy as the time-varying sound. The short- and long-term noise measurements taken for this project are reported in terms of the 1-second and 1-hour Leqs.
- **Community Noise Equivalent Level (CNEL)**: CNEL is basically a 24-hour Leq with adjustments to reflect the greater sensitivity of most people to noise during the evening (7 PM to 10 PM) and nighttime (10 PM to 7 AM). The adjustments are a 5 dBA penalty for evening noise and a 10-dBA penalty for nighttime noise. The effect of the penalties are that in the calculation of CNEL, an event that occurs during the evening hours is equivalent to three of the same events during the daytime hours and an event in the nighttime hours is equivalent to ten of the same event during the daytime hours.

  CNEL is very similar to the more common “Day Night Average Level”, which is usually abbreviated as Ldn or DNL. The only difference is that Ldn does not include the evening adjustment. In most residential communities, CNEL will be 0 to 0.5 dB greater than Ldn. CNEL and Ldn are the most common measures of total community noise over a 24-hour period. They are used by most cities in California, the Federal Transit Administration, the Federal Aviation Administration, and many other state and federal agencies to evaluate residential noise impacts from proposed transportation projects.

3. REGULATORY SETTING

The city of Victorville has guidelines set by the Victorville Municipal Code. This sets the limits for construction noise, but there are no regulations on residential noise limits. As such, the County of San Bernardino Code is used to set the acceptable noise limits for new residential development.

The County of San Bernardino sets two separate residential noise limits for two different sources: stationary and mobile. Residential noise from stationary sources from 7 a.m. to 10 p.m. has an allowable Leq of 55 dBA, while from 10 p.m. to 7 a.m. has an allowable Leq of 45 dBA. Since there are no stationary noise sources near the proposed development, the noise limits as set by the mobile noise limit, which includes traffic noise. Residential noise from these sources are allowed to be 45 dBA for interior settings and 60 dBA for exterior settings.

For construction noise, The Victorville Municipal Code prohibits the use of construction equipment between the hours of 7:00 p.m. and 7:00 a.m., Monday through Saturday, or at any time on Sunday or federal holidays. The code also sets a daytime noise limit at residential property at 65 dBA, though an exception is granted for “construction activity on private properties that are determined by the Building Official to be essential to the completion of a project.”

4. EXISTING CONDITIONS

The proposed development site is a large tract of undeveloped land in the southwest corner of Victorville. Current sound levels on the site are relatively quiet, with the majority of the activity coming from Eucalyptus Street, a minor street which passes right by the property, and State Highway 395, a major thoroughfare about 1250 feet to the east. The streets in this area are relatively straight with few stops and turns and a speed limit of 45 miles per hour on Eucalyptus Street and 55 miles per hour of State Highway 395. In addition, minor noise sources include distant traffic on Interstate 15, local arterials, occasional aircraft overflights, and noise from adjacent developments.

Existing noise levels were documented with measurements taken by ATS between October 13th and October 15th. 1-second and 1-hour Leqs were taken at a site on the property with the highest noise levels, the northeast corner of the property where there is maximum exposure from both Eucalyptus Street and State Highway 395. Figure 4 is a photograph of the microphone location.

The measurement results for are shown graphically in Figure 5. The heavy line is the 1-hour Leq values and the lighter lines are the 1-second Leq values. The 1-second values fluctuate around the 1-hour values by ±5 to ±15 dBA. Events that were not representative of normal traffic were removed, which can be seen in red. These were single events at abnormally high levels or with frequencies not usually seen generated by broadband traffic. Since the measurement was longer than 24 hours, multiple CNEL values were calculated, the maximum of which was 57 dBA.

Figure 4. Photograph of Measurement Location

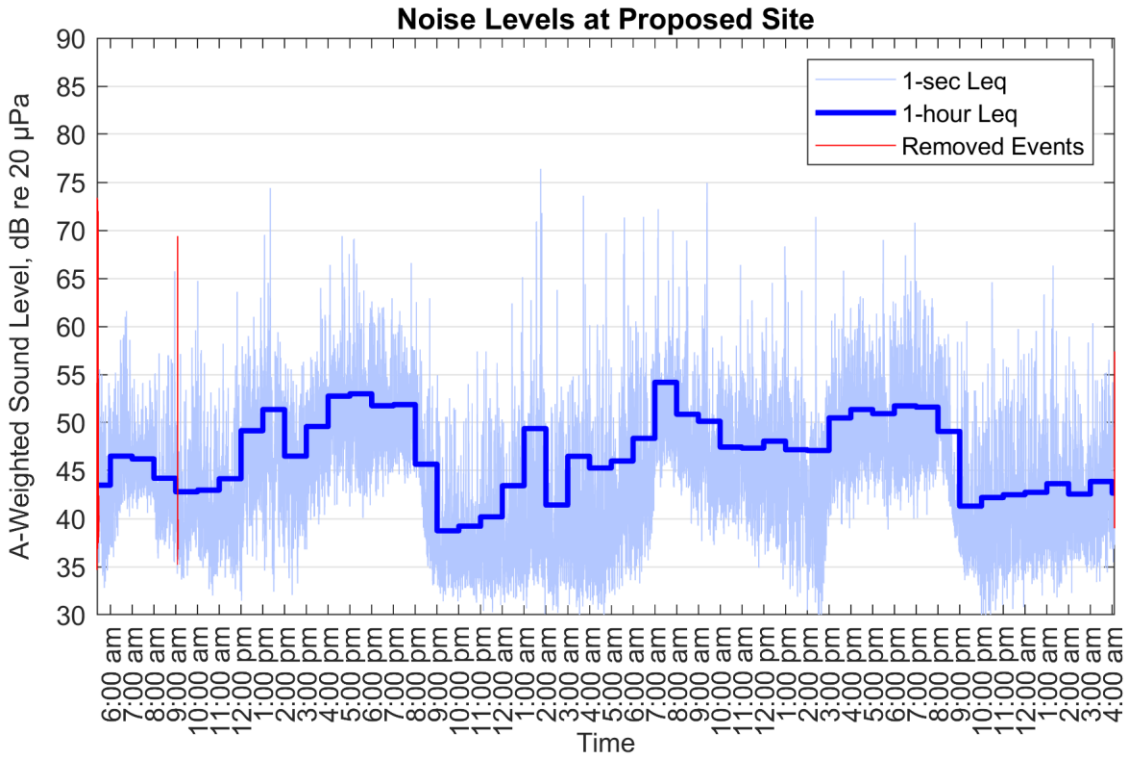


Figure 5: Noise Measurements Taken at Northeastern Edge of Property

5. FUTURE NOISE LEVELS

The main noise source that will affect the project is the traffic from both Eucalyptus Street and State Highway 395. The noise projections focus on noise from both sources at the first row of buildings facing these streets to the north and east. This section covers the approach and assumptions used to develop the noise projections, identifies the locations where the future noise levels are likely to exceed the City of Victorville acceptability threshold of 60 dBA CNEL, and discusses the mitigation approaches.

5.1 Noise Projection Approach and Assumptions

Since the measurement ran for longer than 24 hours, multiple CNEL values could be derived depending on the 24-hour block chosen. A CNEL was calculated for every full 24-hour time block during the measurement, and the largest value was used in this analysis to give the most conservative estimates. That CNEL was found to be 57 dBA at the location of the microphone.

To estimate future conditions, as well as impacts to existing receivers, an analysis of traffic noise was necessary. The Federal Highway Administration “Traffic Noise Model” computer program (TNM version 2.5) was used to conduct that analysis. Following are the key assumptions made when developing the TNM model:

- The modeled receivers were located on the northern and eastern edge of the property site, 10 feet from the property line. Since the main concern is the 60 CNEL outdoor level, noise projections were made for ground level receivers. The ear level of a person standing on the ground was assumed to be 5 ft

- For State Highway 395, each traffic lane was modeled as a roadway, with median lanes and shoulders modeled as roadways without traffic. Eucalyptus Street was modeled with 1 roadway lane representing two lanes of traffic for model simplification.

The noise projections are based on average daily traffic (ADT) on Eucalyptus Street of 2,475 vehicles and 26,500 vehicles for State Highway 395. Information for Eucalyptus Street was received from the 2018 City of Victorville from their internal traffic counts, while for State Route 395, data was taken from CalTrans 2018 online traffic database. For projections of CNEL, it is necessary to estimate the distribution of traffic between automobiles and heavy trucks. Since the area around Eucalyptus Street is mostly single-family homes and lacks routes allowing for thru traffic, heavy trucks were estimated at 1% of the total traffic. For State Highway 395, the aforementioned CalTrans database estimated 15% heavy truck traffic. Posted speeds of 45 miles per hour on Eucalyptus Street and 55 miles per hour of State Highway 395 were used. The TNM run was compared to the measurement in order to check the accuracy of the model. The CNEL was measured at 57 dBA, and the model also produced a result of 57 dBA, confirming the accuracy of the model.

5.2 Predicted Future Noise Levels

Noise predictions were made for multiple first-row locations within the proposed development, but the noisiest predictions were all at the northeast corner, so the model was simplified into one receiver. Sites nearby the proposed development were also modeled to determine if the project will cause impacts on nearby neighbors. The two closest existing receivers to the proposed project at 11707 Goodwin Dr and 11324 Mesa View Dr.

For future conditions, the model was run with 2040 traffic counts obtained by SBCTA. The PM Peak hour counts on State Route 395 south of Eucalyptus is projected to be 3001 vehicles northbound and 1853 vehicles southbound. 2018 traffic levels, obtained by CalTrans, shows a breakdown of 82% automobiles, 3% medium trucks and 5% heavy trucks. The same breakdown was used in the future analysis. For Eucalyptus street, the total peak hour traffic from SBCTA of 93 vehicles was used. Considering this is a minor residential street that does not connect to another major road or shopping center west of 395, and no heavy trucks were observed during multiple trips out to the site, 2% heavy trucks were assumed as a reasonable worst-case scenario. Running this through the model obtained a peak hour Leq of 57 dBA.

To convert the peak-hour Leq to CNEL the following equation was used, obtained from the Caltrans Technical Noise Supplement to the Traffic Noise Analysis Protocol (September 2013).

$$CNEL = L_{eq}(h)_{pk} + 10\log_{10}\left({}^{4.17}/_{P}\right) + 10\log_{10}(d + 4.77e + 10N)$$

Where Leq(h)pk is the peak hour Leq, P is the percent of traffic that occurs in the peak hour, d is the percent traffic that occurs during daytime hours, e is the percent traffic that occurs during evening hours, and N is the percent traffic that occurs during nighttime hours.

To obtain the hourly traffic percentages, the 2018 Eucalyptus Street Victorville internal traffic counts was used, which was the only traffic source to include an hourly breakdown. Using these counts, the following percentages were found: peak hour 7.7%, daytime 67%, evening 13%, and nighttime 19%. The CalTrans current traffic included a peak hour percentage for state route 395 of 12%. Considering the higher the percentage of traffic that is peak hour, the lower the CNEL adjustment is, this means 7.7% is a conservative estimate. The process gave a future CNEL of 59 dBA, 1 dBA below the mitigation threshold. The increases for the nearby properties were found to be less than 1 dBA, so no mitigation is required.

6. CONSTRUCTION NOISE

Due to the sparse nature of the surrounding land, no construction impacts are expected, with two exceptions: single-family residences at 11707 Goodwin Dr and 11324 Mesa View Dr. The Victorville Municipal Code prohibits the use of construction equipment between the hours of 7:00 p.m. and 7:00 a.m., Monday through Saturday, or at any time on Sunday or federal holidays. This means that any intrusive noise would be limited to daytime hours. The Victorville Code of Ordinances sets a daytime noise limit at residential property at 65 dBA, though an exception is granted for "construction activity on private properties that are determined by the Building Official to be essential to the completion of a project." Considering the short distances between the new proposed units on the northwest corner of the property, and the two aforementioned single family residences, this exception would need to be granted to for some of the highest noise generating construction activities.

6.1 Predicted Levels of Construction Noise

The loudest portion of the construction process would be during the clearing and preparation of the site. This would require large earth moving equipment and trucks on the site for eight to ten hours per day over a period of several months.

There are two receivers to the north of the project where there will be line-of-sight to construction activities, 11707 Goodwin Dr and 11324 Mesa View Dr. 11707 Goodwin Dr might be especially challenging, since the proposed site directly borders this property to the east and the south.

ATS used the following assumptions to estimate Leq at 11707 Goodwin Dr over an 8-hour shift during the site clearing and preparation phase:

1. The loudest piece of equipment would be a bulldozer or similar earth moving equipment with a noise emission of 85 dBA at a distance of 50 feet when operating under full load.
2. The bulldozer would operate at full load 50% of the time. At other times, it would be at lower power settings or idling. This means that the Leq noise level over an 8-hour shift would be 82 dBA at a distance of 50 feet from the center of the worksite.

Construction will almost certainly cause a drastic increase in the daytime noise levels for 11707 Goodwin Dr. A similar but lesser result should be expected at 11324 Mesa View Dr. Although no specific criteria have been established for impacts from construction noise when a waiver is granted, increases of this magnitude are usually considered impacts. Communication between the contractor and these properties could be appropriate to try and mutually find a way to mitigate impacts.

6.2 Minimizing Construction Noise Impacts

Noise impacts during the site clearing and preparation phase will be limited to a period of eight to twelve weeks. However, the contractor should be required to limit construction to daytime hours as specified in San Bernardino County Code of Ordinances. To further minimize potential construction noise impacts, other best-practices to reduce noise levels should be followed by the contractor, including:

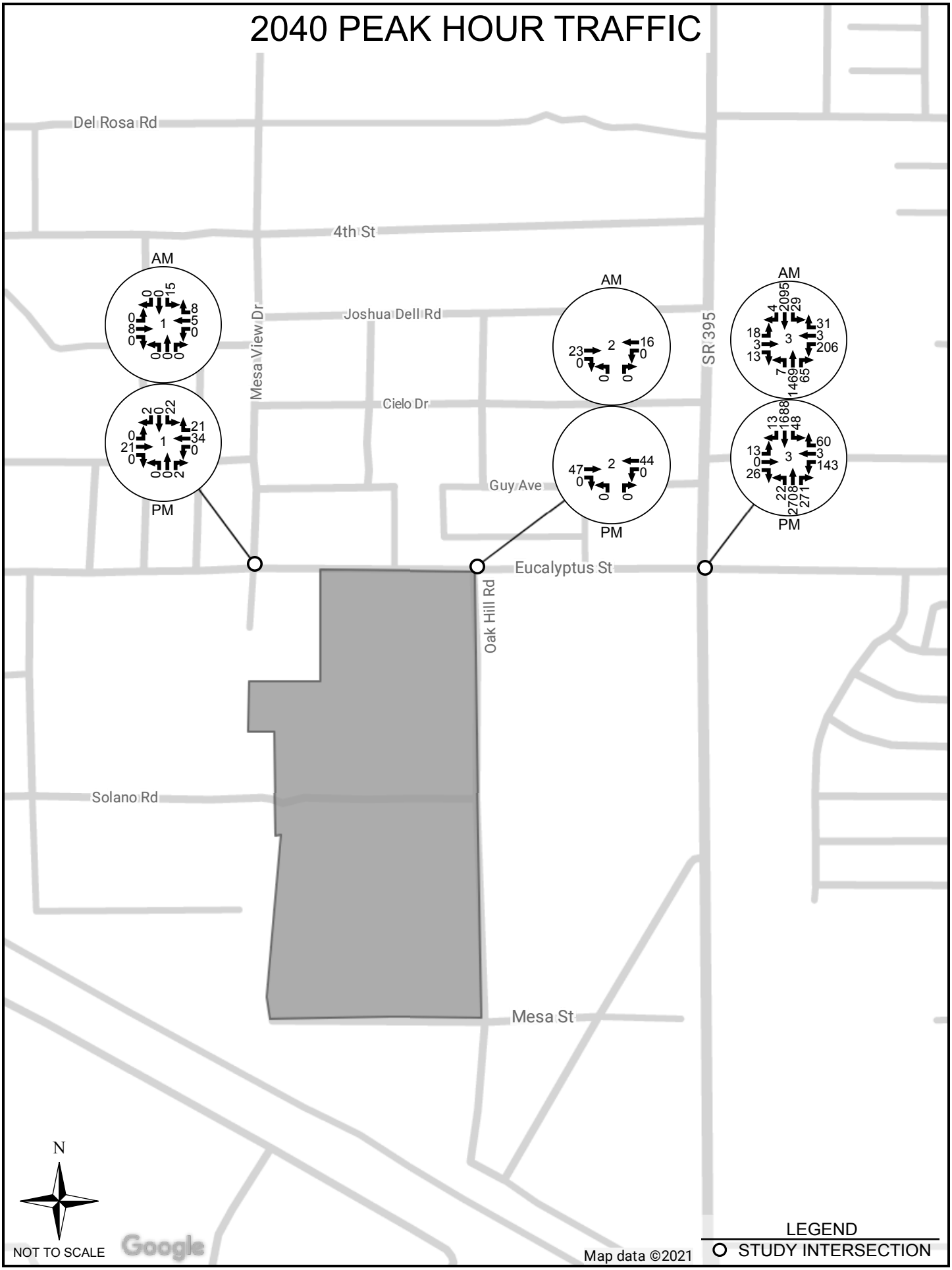
- Installing and maintaining effective mufflers on construction equipment,
- Locating equipment and staging areas as far from residences as possible,
- Limiting unnecessary idling of equipment,
- Minimize the use of backup alarms where possible without compromising worker safety.

For the residences at 11707 Goodwin Dr, a 6-foot high temporary sound wall could be constructed along the property line, which would reduce noise levels by 5 to 10 dBA, if extra reduction is deemed helpful.

It should be noted that if bulldozing takes place for the majority of the day near the adjacent residences, it would create a daily Leq of 82 dBA, since they are roughly 50 feet away. This would represent an increase of 30+ dBA in the daytime noise levels, based on the ATS measurement. These levels should be avoided by making sure that the contractor does not do all the grading -or using any other loud mechanical equipment- for locations close to adjacent property on a single day.

7. APPENDIX

2040 PEAK HOUR TRAFFIC



Counts Unlimited, Inc.

PO Box 1178
Corona, CA 92878
Phone: 951-268-6268
email: counts@countsunlimited.com

City of Victorville
Eucalyptus Avenue
E/ Highway 395
24 Hour Directional Volume Count

VIC055
Site Code: 189-18720

Start Time	18-Oct-18 Thu	Eastbound Morning	Eastbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Westbound Morning	Westbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		3	23			2	27				
12:15		5	23			0	15				
12:30		3	11			1	26				
12:45		2	23	13	80	6	14	9	82	22	162
01:00		1	22			3	21				
01:15		4	19			3	16				
01:30		2	22			1	13				
01:45		2	24	9	87	3	**25**	10	75	19	162
02:00		6	9			0	**24**				
02:15		3	25			2	**15**				
02:30		1	17			3	**26**				
02:45		2	17	12	68	5	17	10	82	22	150
03:00		2	8			5	16				
03:15		3	13			9	13				
03:30		4	25			7	8				
03:45		0	20	9	66	14	9	35	46	44	112
04:00		2	17			10	14				
04:15		1	27			11	16				
04:30		1	30			17	19				
04:45		0	25	4	99	13	18	51	67	55	166
05:00		2	33			13	21				
05:15		0	**38**			13	16				
05:30		2	**21**			10	13				
05:45		5	**34**	9	126	24	14	60	64	69	190
06:00		22	**44**			39	19				
06:15		8	23			20	16				
06:30		**15**	27			19	14				
06:45		**16**	14	61	108	**32**	16	110	65	171	173
07:00		**14**	26			**34**	10				
07:15		**22**	29			**24**	5				
07:30		7	15			**30**	4				
07:45		9	21	52	91	27	30	115	49	167	140
08:00		20	22			15	28				
08:15		10	15			6	11				
08:30		8	16			19	6				
08:45		10	17	48	70	13	4	53	49	101	119
09:00		9	17			15	2				
09:15		9	16			12	3				
09:30		8	12			17	9				
09:45		5	8	31	53	11	4	55	18	86	71
10:00		8	6			18	4				
10:15		11	8			14	0				
10:30		4	3			16	2				
10:45		18	14	41	31	8	4	56	10	97	41
11:00		3	8			16	0				
11:15		13	10			11	0				
11:30		11	2			12	5				
11:45		13	12	40	32	20	0	59	5	99	37
Total		329	911	329	911	623	612	623	612	952	1523
Combined Total		1240		1240		1235		1235		2475	
AM Peak	-	06:30	-	-	-	06:45	-	-	-	-	-
Vol.	-	67	-	-	-	120	-	-	-	-	-
P.H.F.		0.761				0.882					
PM Peak	-	-	05:15	-	-	-	01:45	-	-	-	-
Vol.	-	-	137	-	-	-	90	-	-	-	-
P.H.F.			0.778				0.865				
Percentage		26.5%	73.5%			50.4%	49.6%				
ADT/AADT		ADT 2,475		AADT 2,475							