APPENDIX D
Noise

ACOUSTICAL ANALYSIS ASSOCIATES, INCORPORATED

ACOUSTICAL ANALYSIS

PROPOSED KATHERINE MEADOWS DEVELOPMENT
SANTA SUSANA, CALIFORNIA

PREPARED FOR

COLTON LEE COMMUNITIES
223 EAST THOUSAND OAKS BOULEVARD, SUITE 307
THOUSAND OAKS, CALIFORNIA 91360

PREPARED BY

ACOUSTICAL ANALYSIS ASSOCIATES, INC.
SIMI VALLEY, CALIFORNIA

Initial Release: February 1, 2007
Revision A: June 1, 2007

INTRODUCTION

The project is a proposed Leasehold Manufactured Home Community with both 1- and 2-story residences located south of the Union Pacific Railroad line entirely within the un-incorporated area of Ventura County and just south of the City limits of Simi Valley, California (see Figure 1). Since the project is located adjacent to the railroad mainline, Ventura County requires an acoustical analysis to determine if the noise level standards of the Noise Element of the General Plan will be exceeded, and to provide recommendations for mitigation as may be required.

Appendix A provides definitions of the acoustical terminology used in this report. Unless otherwise stated, all sound levels reported in this analysis are A-weighted sound pressure levels in decibels (dB). A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards utilize A-weighted sound levels, as they correlate well with public reaction to noise.

CRITERIA FOR ACCEPTABLE NOISE EXPOSURE

The County of Ventura General Plan and the Ventura County Initial Study Assessment Guidelines establish land use compatibility for noise sensitive uses proposed near railroads in terms of three different noise metrics. Community Noise Equivalent Level is the 24-hour average sound level (CNEL). CNEL is the weighted average noise exposure for a typical (or annual average) day, determined after adding 5 dB to noise levels occurring in the evening (7:00 p.m. to 10:00 p.m.) and adding 10 dB to noise levels which occur at night between 10:00 p.m. and 7:00 a.m. The County's thresholds are CNEL values of 60 dB for exterior noise exposure in outdoor activity areas and 45 dB for interior noise exposure inside residential buildings. The intent of the exterior and interior noise level thresholds of the County is to provide an acceptable noise environment for outdoor activities and recreation and indoor communication and sleep. In addition, the exterior noise level cannot exceed an Equivalent Sound Level (L_{eq}) of 65dB (A) during any hour (L_{eqh}). Also, near railroads, the exterior sound levels may not exceed an L(10) of 65dB (A). L(10) is the 10^{th} percentile sound level that is exceeded 10% of the time period, such as an hour.

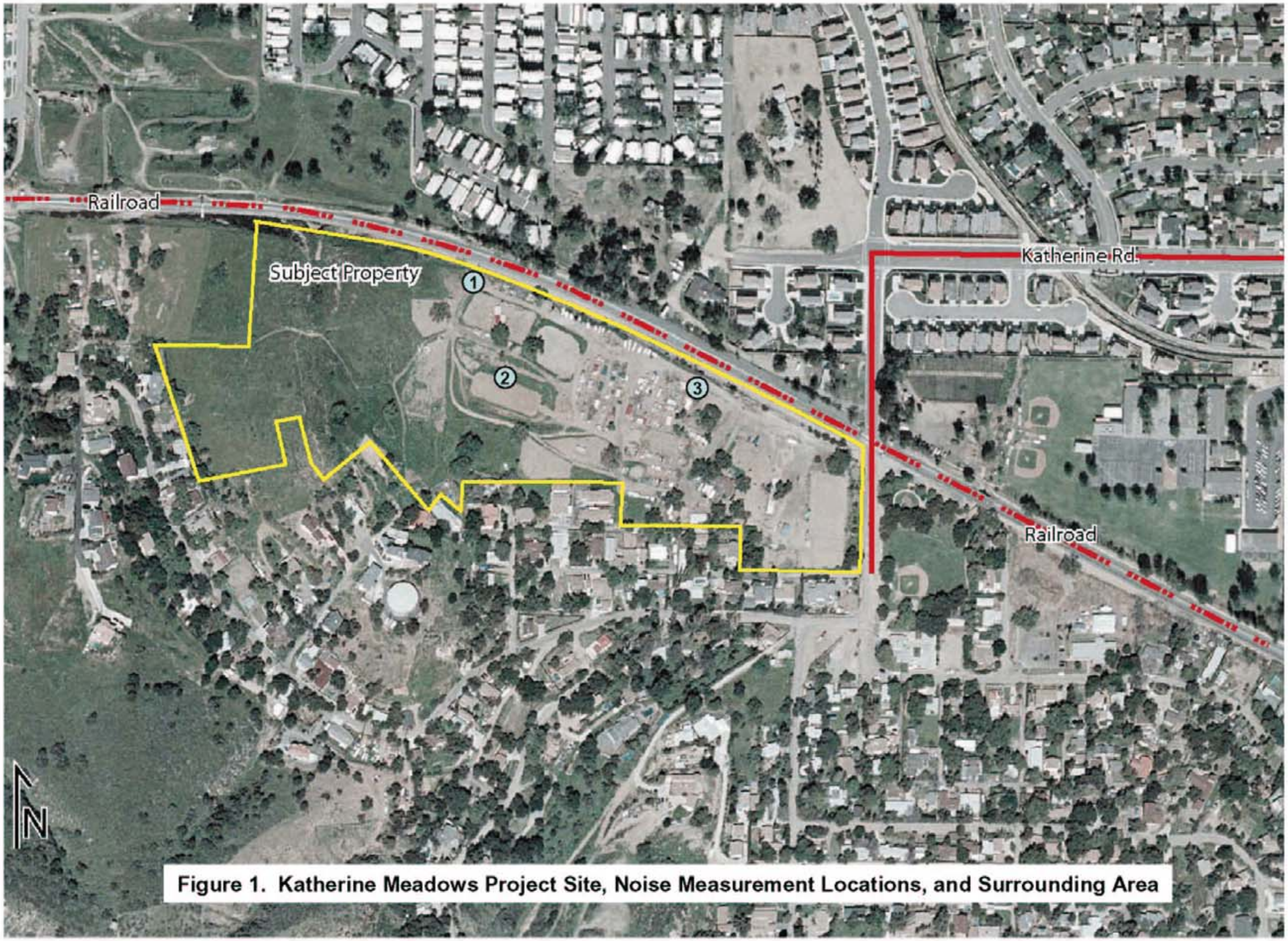


Figure 1. Katherine Meadows Project Site, Noise Measurement Locations, and Surrounding Area

EXISTING AND FUTURE NOISE ENVIRONMENT

Railroad Operations:

The Union Pacific railroad tracks in the project vicinity are presently utilized for both freight and passenger train operations. Passenger trains are operated by Metrolink and Amtrak. Based on data obtained from the passenger train operators, presently 22 Metrolink and 10 Amtrak trains pass by the project site on a daily basis. According to Union Pacific offices, there are presently approximately 6-8 freight train movements per day in the Simi Valley area. Freight train operations are expected to remain at the same levels into the foreseeable future. Approximately half (50%) of freight train movements generally occur during nighttime hours (10 p.m.-7:00 a.m.). Additionally, there are four passenger train operations (Metrolink) which occur during nighttime hours. Table 1. shows a summary of railroad operations data assumed for this analysis.

TABLE 1

RAILROAD ACTIVITY DATA ON THE UNION PACIFIC TRACKS IN SIMI VALLEY

		Number of Trains		
Train Type	Direction	Day (7 am-7 pm)	Evening (7 pm - 10 pm)	Night (10 pm-7 am)
Freight	Eastbound Westbound	2 2	0 0	2 2
Passenger - Amtrak	Eastbound Westbound	4 3	1 1	0 1
Passenger - Metrolink	Eastbound Westbound	8 10	0 1	3 0

Sources: Amtrak & Metrolink current schedules, Union Pacific Transportation, personal communication

Railroad Noise Level Measurements:

Sound level measurements were conducted within the project site at three locations shown as Sites 1, 2, and 3 on Figure 1 on January 4, 2007 to document noise exposure from individual train operations affecting the project site. Measurement Sites 1, 2, and 3 were located at approximately 70, 300 and 100 feet from the railroad right-of-way, respectively. The purpose of placing monitors at varying distances from the railroad was to determine site-specific attenuation of railroad noise levels due to distance.

Noise monitoring equipment consisted of three Larson-Davis Laboratories (LDL) Model 870 sound level meters equipped with Bruel & Kjaer (B&K) Type 4176 1/2" microphones. Each measurement system was calibrated in the field prior to use with a LDL Type CA-250 acoustical calibrator certified to be in compliance with National Bureau of Standards (NBS) reference levels to ensure the accuracy of the measurements. The instrumentation complies with applicable requirements of the American National Standards Institute (ANSI) and the International Electrotechnical Commission (IEC) for sound level meters.

Measurements of 14 passenger and 4 freight trains were conducted during the measurement period. Table 2 provides a summary of railroad noise measurement data.

TABLE 2

SUMMARY OF RAILROAD NOISE MEASUREMENT RESULTS
PROPOSED KATHERINE MEADOWS DEVELOPMENT
SANTA SUSANA, CALIFORNIA

Time	Type of Train	Direction	#Locos/#Cars	Estimated Speed, mph	Duration, Sec	L_{max}, dB	SEL, dB
Site 1: 70 feet from railroad right-of-way							
8:42 a.m.	PM	EB	1/3	35	9.5	82.7	89.3
8:44 a.m.	PA	WB	2/5	13	21.9	81.8	92.1
9:42 a.m.	PM	EB	1/3	40	19.0	91.9	97.6
10:10 a.m.	PA	WB	1/5	47	19.1	92.1	98.2
10:40 a.m.	F	EB	3/74	20	164.5	96.4	103.3
11:00 a.m.	PA	EB	1/5	37	14.9	89.4	95.7
11:21 a.m.	PM	EB	1/5	fast	45.9	90.2	98.0
11:23 a.m.	PM	WB	---	very slow	20.2	73.7	83.8
12:27 a.m.	F	WB	9/45	34	72.7	90.1	103.7
1:30 p.m.	PA	WB	1/5	50	12.1	91.1	97.9
1:33 p.m.	F	WB	3/40	10	68.6	74.9	91.1
2:47 p.m.	PM	EB	1/4	38	12.9	90.5	95.5
3:45 p.m.	PA	EB	1/5	23	15.6	85.9	91.8
3:52 p.m.	PA	WB	1/6	45	12.1	89.9	96.4
4:15 p.m.	F	EB	3/4	27	24.7	91.7	98.5
4:30 p.m.	PM	WB	1/3	51	10.5	90.4	95.5
5:12 p.m.	PM	EB	1/3	26	9.9	76.9	84.5
5:18 p.m.	PM	WB	1/3	34	21.7	89.4	94.5

TABLE 2

SUMMARY OF RAILROAD NOISE MEASUREMENT RESULTS
PROPOSED KATHERINE MEADOWS DEVELOPMENT
SANTA SUSANA, CALIFORNIA

Time	Type of Train	Direction	#Locos/#Cars	Estimated Speed, mph	Duration, Sec	L_{max}, dB	SEL, dB
Site 2: 300 feet from railroad right-of-way							
8:42 a.m.	PM	EB	1/3	35	---	87.9	89.3
8:44 a.m.	PA	WB	2/5	13	---	74.0	78.8
9:42 a.m.	PM	EB	1/3	40	25.7	77.2	85.8
10:09 a.m.	PA	WB	1/5	47	28.4	83.2	89.8
10:40 a.m.	F	EB	3/74	20	173.1	89.9	97.9
11:00 a.m.	PA	EB	1/5	37	20.6	80.5	87.0
11:21 a.m.	PM	EB	1/5	fast	6.1	78.5	88.0
11:23 a.m.	PA	WB	---	very slow	24.4	61.2	73.3
12:26 a.m.	F	WB	9/45	34	79.5	76.3	91.0
1:30 p.m.	PA	WB	1/5	50	13.4	76.1	83.7
1:33 p.m.	F	WB	3/40	10	---	---	---
2:47 p.m.	PM	EB	1/4	38	17.5	76.9	85.1
3:45 p.m.	PA	EB	1/5	23	25.6	71.9	82.3
3:52 p.m.	PA	WB	1/6	45	13.4	73.7	81.6
4:15 p.m.	F	EB	3/4	27	35.5	89.4	95.0
4:30 p.m.	PM	WB	1/3	51	13.2	75.2	81.7
5:12 p.m.	PM	EB	1/3	26	14.1	71.8	77.7
5:18 p.m.	PM	WB	1/3	34	30.6	75.3	84.9
Site 3: 100 feet from railroad right-of-way							
8:42 a.m.	PM	EB	1/3	35	---	---	---
8:44 a.m.	PA	WB	2/5	13	---	---	---
9:42 a.m.	PM	EB	1/3	40	18.0	84.6	91.7
10:09 a.m.	PA	WB	1/5	47	17.8	90.4	95.0
10:40 a.m.	F	EB	3/74	20	138.3	90.9	102.4
10:59 a.m.	PA	EB	1/5	37	16.6	88.0	92.9
11:20 a.m.	PM	EB	1/5	fast	20.6	91.1	96.3
11:21 a.m.	PA	WB	---	very slow	---	---	---
12:26 a.m.	F	WB	9/45	34	74.0	86.7	99.4
1:30 p.m.	PA	WB	1/5	50	9.6	82.4	88.4
1:32 p.m.	F	WB	3/40	10	29.4	72.8	85.7

TABLE 2 SUMMARY OF RAILROAD NOISE MEASUREMENT RESULTS PROPOSED KATHERINE MEADOWS DEVELOPMENT SANTA SUSANA, CALIFORNIA							
Time	**Type of Train**	**Direction**	**#Locos/#Cars**	**Estimated Speed, mph**	**Duration, Sec**	**L_{max}, dB**	**SEL, dB**
2:47 p.m.	PM	EB	1/4	38	14.1	88.0	93.5
3:45 p.m.	PA	EB	1/5	23	18.8	93.9	96.7
3:52 p.m.	PA	WB	1/6	45	9.5	80.7	87.5
4:15 p.m.	F	EB	3/4	27	22.7	97.9	103.9
4:29 p.m.	PM	WB	1/3	51	8.5	84.2	89.6
5:12 p.m.	PM	EB	1/3	26	16.4	92.1	95.9
5:17 p.m.	PM	WB	1/3	34	23.5	83.4	91.7

F = Freight EB = Eastbound
PA = Passenger, Amtrak WB = Westbound
PM = Passenger, Metrolink

Source: Acoustical Analysis Associates, Inc.

There are a variety of railroad operating conditions which occur in Simi Valley due to the presence of the railroad station, grade crossings, curves, grades and congested areas within the city. For this reason, speeds and the use of the warning horn vary considerably from location to location. The most significant variable in measured levels is whether or not the horn is in use during the measurements.

During the project site inspection and noise measurements, it was noted that train horns are audible at the project site. Based on observations of 14 passenger and 4 freight trains during the noise survey period (8:30 am to 5:30 pm on January 4, 2007) trains do not normally sound the warning horn adjacent to the project site, but at some distance away (approximately 200 ft), due to the nearby grade crossing at Katherine Rd. Also, it was noted that eastbound trains generally travel at lower speeds as they accelerate away from the Simi Valley Metrolink Station. Figure 2 shows the time history of A-weighted sound level during a "typical" train passby.

<u>Measured Hourly Noise Levels</u>

The Ventura County Assessment Thresholds are also specified in terms of the hourly equivalent sound level (L_{eqh}) and the L(10) percentile sound level. The noise levels measured at the project site are presented in terms of these noise metrics in Figures 3 and 4. Figure 3 shows that the threshold of 65 dB(A) for L_{eqh} is currently exceeded during several hours of the day. Figure 4 shows that the threshold of 60 dB(A) for L(10) is NOT exceeded, with a margin of about 6 dB(A).

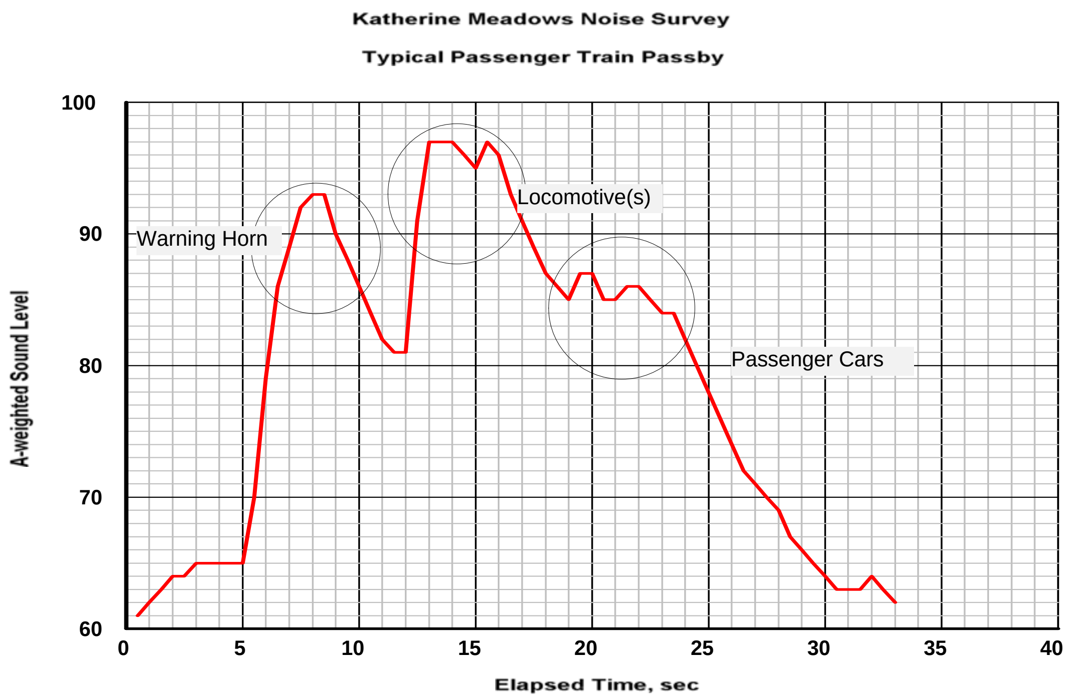


Figure 2. A-level Time History during Typical Train Passby

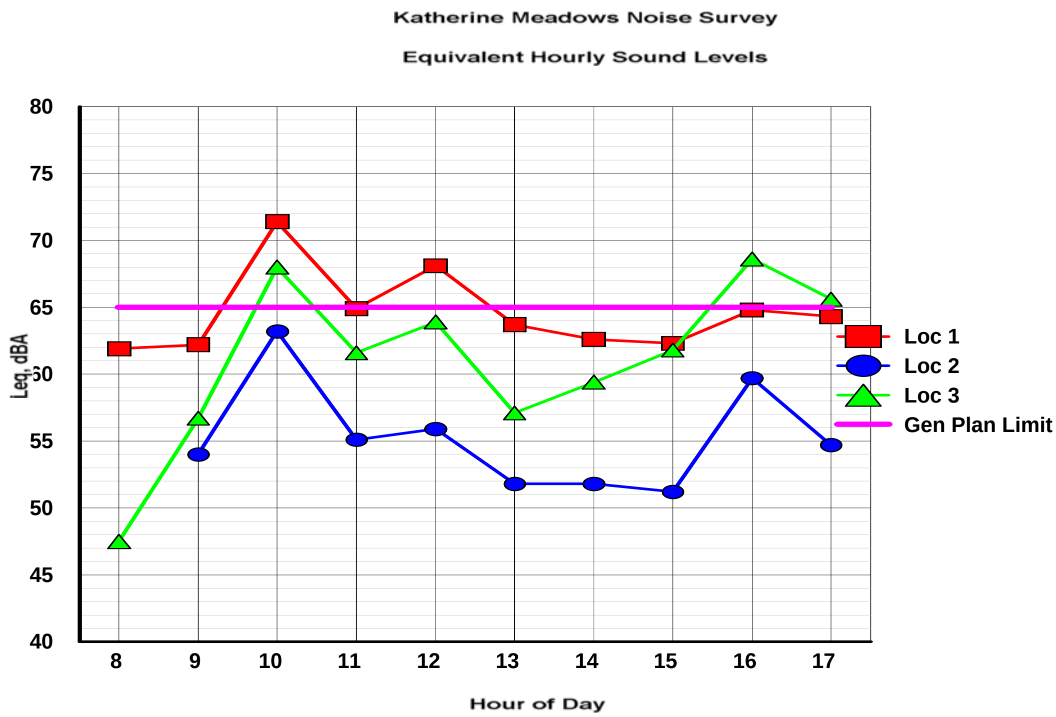


Figure 3. Katherine Meadows Noise Survey - Equivalent Hourly Sound Levels

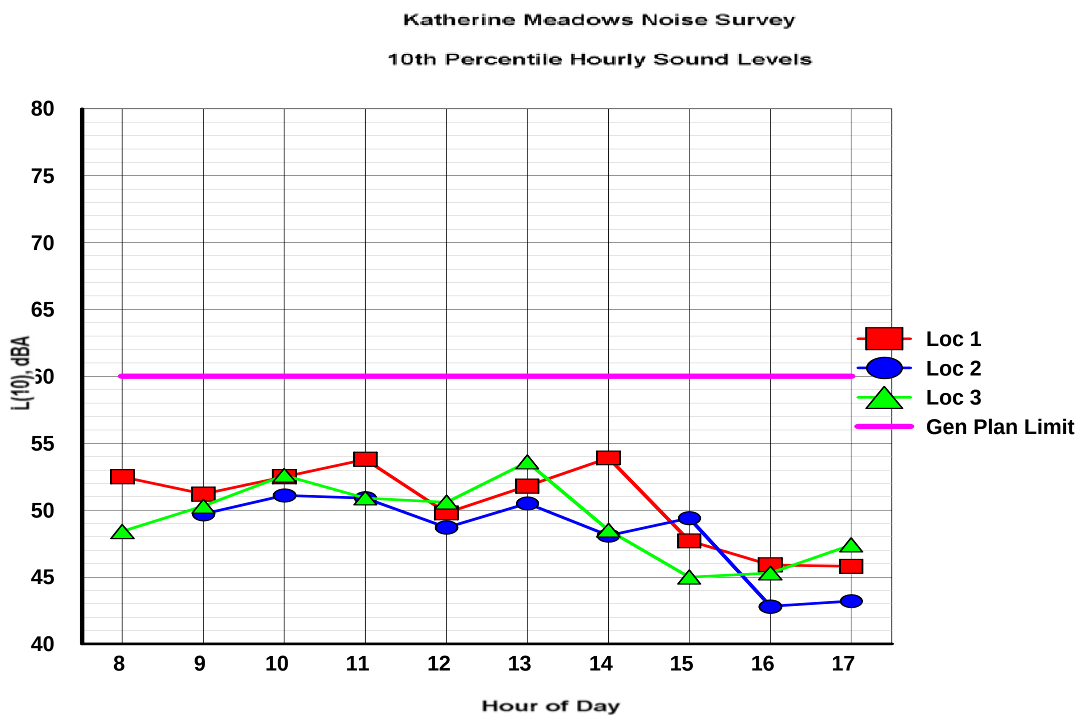


Figure 4. Katherine Meadows Noise Study - 10th Percentile Hourly Sound Levels

Calculation of Railroad CNEL Values:

The CNEL due to railroad operations is calculated based upon the loudness of individual train passbys, the number of passbys within a typical 24-hour day and the time of day the passbys occur. The calculation procedure is described by the following formula:

$$CNEL = \underline{SEL} + 10 \log N_{eq} - 49.4$$

where,

$\underline{SEL}$ is the average SEL for a train passbys,

N_{eq} is the equivalent number of train passbys in a typical 24-hour period determined by adding 3 times the number of evening events (7:00 p.m. to 10:00 p.m.), and 10 times the number of nighttime events (10:00 p.m.-7:00 a.m.) to the actual number of daytime events (7:00 a.m.-7:00 p.m.), and 49.4 is a time constant equal to 10 log the number of seconds in the day.

Using the above-described formula and average SEL values for individual passbys by freight and passenger trains (Table 2), the calculated CNEL values for railroad operations (as assumed in Table 1) at the closest proposed building setback (assumed to be about 80 feet from the center of the tracks) would be about 69 dB. Railroad noise exposure is expected to remain at about the same levels in the future, unless there is a dramatic increase in nighttime train operations. The CNEL results are displayed graphically in Figure 5. The approximate location of the 60 and 65 dB CNEL contours within the project site are shown on Figure 6. The noise exposure contours shown on Figure 6 are for the undeveloped site, and do not account for any proposed changes due to noise mitigation measures.

Summary of Noise Measurement Results

The noise survey results are compared against the Ventura County Noise Thresholds in Table 3. As shown, the CNEL and the hourly L_{eq} thresholds are exceeded, but the L(10) threshold is not. Noise mitigation must be included in the project design in order to reduce exterior noise levels below County impact thresholds.

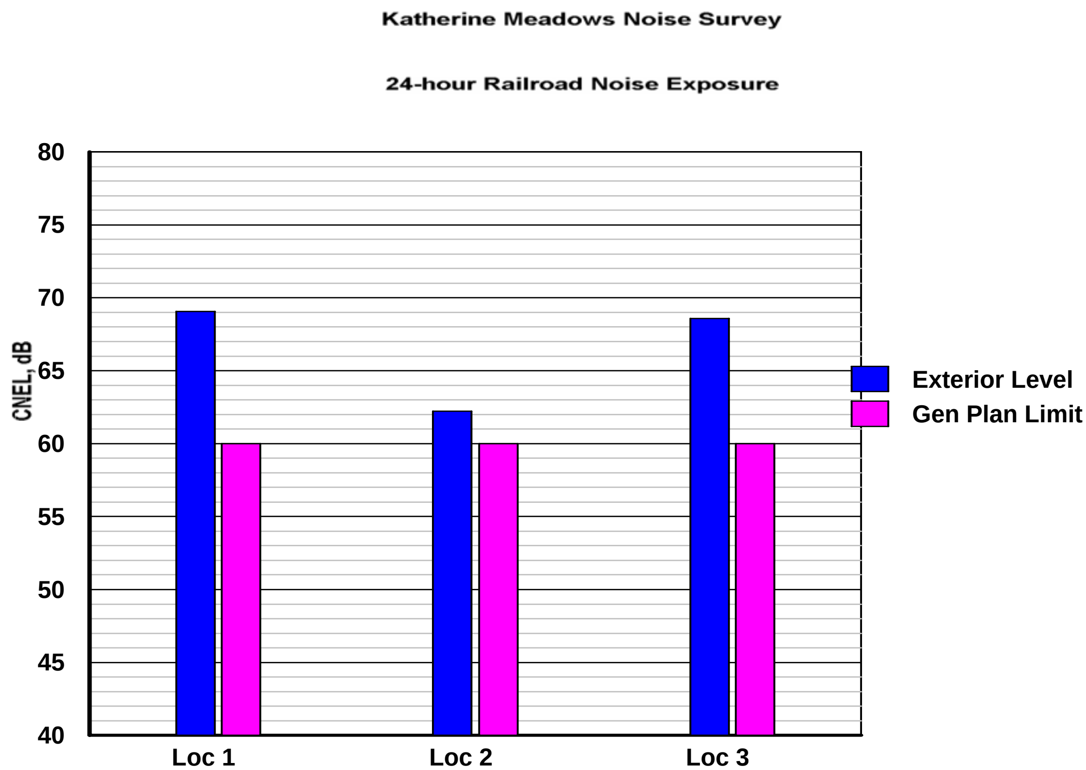


Figure 5. Katherine Meadows Noise Survey - 24-hour Railroad Noise Exposure

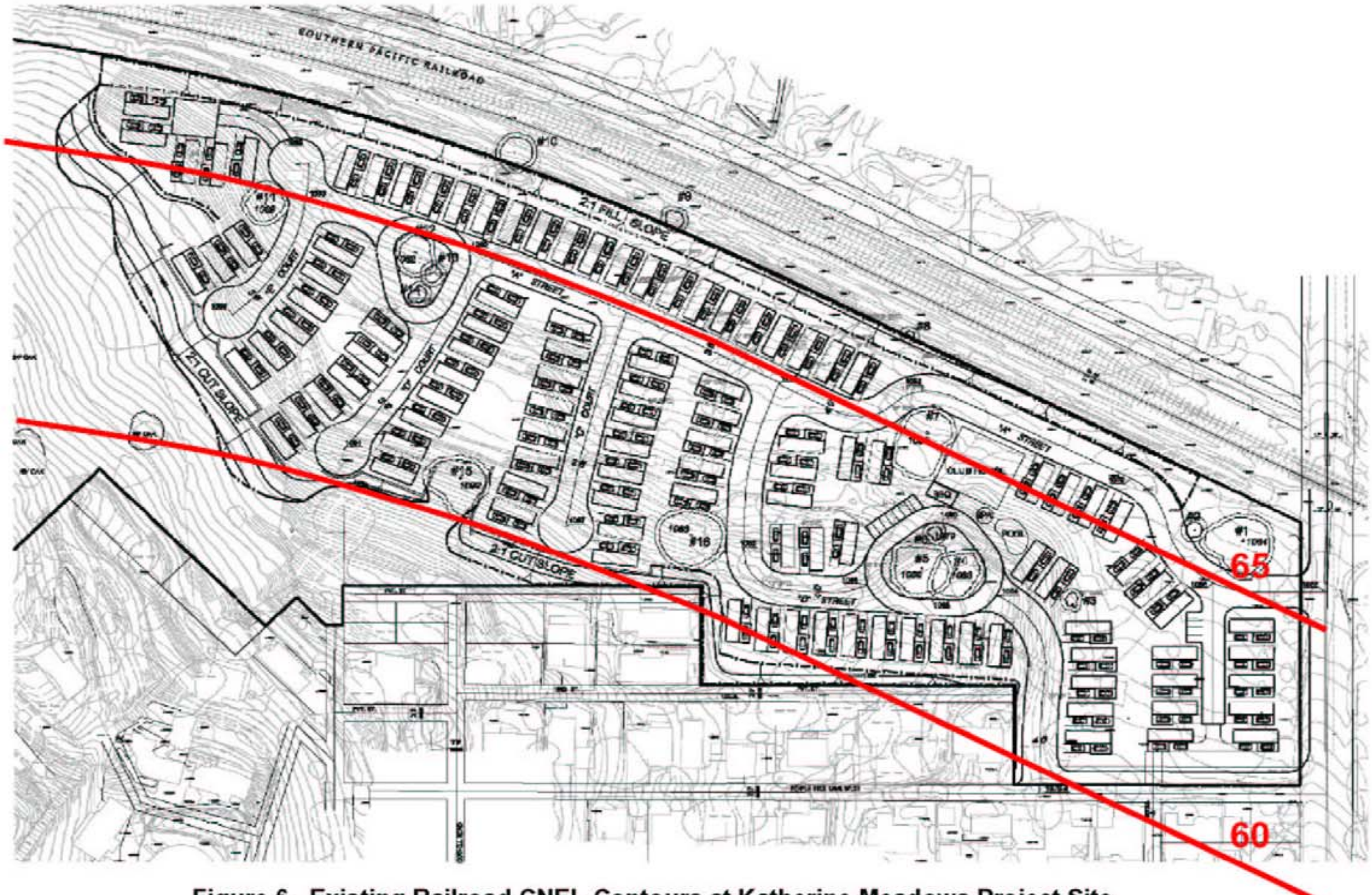


Figure 6. Existing Railroad CNEL Contours at Katherine Meadows Project Site

Table 3 Summary of Noise Measurement Results

Loc	Existing CNEL	Threshold for Impact	Noise Exceedance
1	69.1	60.0	9.1
2	62.2	60.0	2.2
3	68.6	60.0	8.6

Loc	Existing Max Leqh	Threshold for Impact	Noise Exceedance
1	71.4	65.0	6.4
2	63.2	65.0	-1.8
3	68.6	65.0	3.6

Loc	Existing Max L(10)	Threshold for Impact	Noise Exceedance
1	53.9	60.0	-6.1
2	51.1	60.0	-8.9
3	53.6	60.0	-6.4

ANALYSIS

Exterior Noise:

Future outdoor activity areas closest to the railroad would be the backyards of residences which are proposed for location adjacent to the railroad right-of-way. These outdoor activity areas represent worst-case conditions. Future homes that will be located beyond the first row of homes will be exposed to lower levels due to the increased distance from the track and shielding provided by intervening buildings.

According to the project plans, future project grade will be such that the nearest lots along the railroad will be elevated above the rail bed. Additionally, the project developer has proposed to construct a property-line wall along the north project boundary for areas of the project adjacent to railroad right-of-way. Figure 7 shows a typical cross section depicting the proposed location of first row of future homes relative to the railroad.

FIGURE 7
Typical Project Cross Section

The effectiveness of a soundwall for reducing exterior noise exposure in outdoor activity areas of future homes adjacent to the railroad tracks was evaluated using a barrier attenuation model. The model calculates barrier insertion loss based upon the geometric relationship between the source, barrier and receiver. For the analysis, the effective source height for a passing train locomotive was assumed to be 15 feet above the rails, and the effective source height for cars was assumed to be 2 feet above the rails. The receiver height for persons standing in a backyard was assumed to be 5 feet above the project grade.

For the soundwall analysis, it was assumed that the project grade will be about 25 feet above the top of the rails along the western frontage of the project site, decreasing to less than 10 feet above at the eastern end. The results of the soundwall analysis (displayed in Table 4) show that a property-line soundwall of a height of 8 feet above future building pads would reduce railroad noise levels by over 10 dB within the backyards of homes closest to the railroad in the western portion, but a height of 10 feet is required in the eastern portion. This means that, with the soundwall in place, future railroad noise levels within backyards adjacent to the railroad would range between 55-58 dB CNEL.

In order for a soundwall to be effective, it will need to be constructed of massive materials and without gaps or openings. Suitable materials are masonry or stucco on both sides of a wood stud frame. Wood of sufficient thickness may also be used, but wood is *not* recommended due to its tendency to weather and warp over time. Also, if the final grading plan for the project indicate that grading will be different from the assumptions stated above, the soundwall calculations will have to be revised.

The recommended soundwalls will have no measurable effect on train noise levels experienced on the north side of the railroad opposite the project site. This conclusion is based on noise measurements obtained before and after construction of an approved subdivision approximately 1 mile west of the subject property (See Appendix B).

Interior Noise:

The interior noise level threshold of the County of Ventura is 45 dB CNEL. The worst-case exterior noise exposure would potentially occur at backyards of homes closest to the railroad tracks. All homes adjacent to the railroad will be single story, so there will be no second floor exterior residential living areas. The highest exterior railroad noise levels at the ground-floor elevations of these homes would be about 58 dB CNEL behind the acoustical barriers described above. This means that outdoor to indoor noise level reductions (NLR) of 13 dB or more will be required to comply with the City's interior noise level standard.

The NLR which will be provided by a building shell may be calculated by assuming a typical railroad noise level spectrum, determining the composite transmission loss of the various components of the affected building facades, correcting for room absorption and calculating the overall A-weighted noise level within the room. This calculation process was performed using transmission loss values for wall partitions compiled by the California Office of Noise Control, and the construction components listed below:

WALL	STC
5/8" gypsum board on both sides of 2x4 studs @ 16" o.c. R-19 insulation	38
WINDOW	
Dual glaze double strength glass	26

Typical construction meeting today's more stringent thermal insulation requirements will generally provide 20-25 dB of noise reduction with windows and doors closed. The interior noise level due to exterior railroad sources was calculated accounting for the transmission loss of the building components and the absorption present within typical interior spaces. A range of room sizes and window areas was assumed, resulting in interior noise levels between 31 and 34 dB CNEL due to railroad activity. This meets the 45 dB CNEL requirement for interior noise. Because windows are the acoustical “weak link” in typical residential construction, a specification for a minimum STC (Sound Transmission Class) value of 26 for the window will ensure that the building shell achieves the required NLR (Noise Level Reduction).

Table 4 Summary of Railroad Barrier Noise Reduction

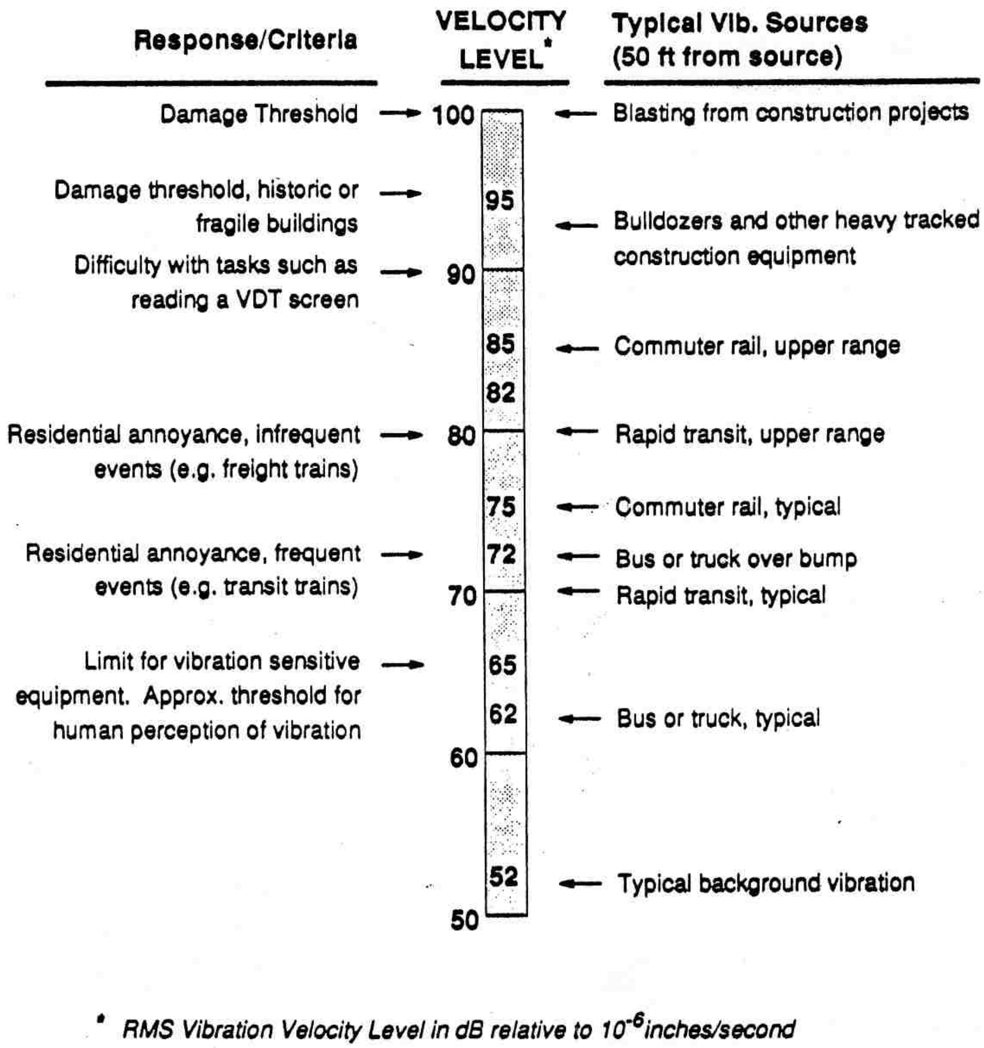
Loc	Existing CNEL	Future CNEL with Barrier of Given Height		
		6 ft	8 ft	10 ft
1	69.1	59.4	58.3	57.4
2	62.2	55.3	53.0	51.1
3	68.6	62.9	60.6	58.6

Loc	Existing Max Leqh	Future Max Leqh with Barrier of Given Heigh		
		6 ft	8 ft	10 ft
1	71.4	61.7	60.6	59.7
2	63.2	56.2	54.0	52.1
3	68.6	62.9	60.6	58.6

Railroad Vibration:

This section of the report develops the expected impact of vibration from train passbys on the proposed project. The County of Ventura General Plan does not address vibration impacts. Figure 8 shows typical levels of ground-borne vibration in terms of vertical velocity level in dB relative to 1 micro inch/sec for different sources and the expected community response. As an example, the threshold of residential annoyance is 80 dB for infrequent events such as the level freight trains typically produce at 50 feet distance. Residents will be annoyed by much more frequent events generating a lower level (72 dB), such as from rapid transit trains. Commuter rail trains (such as Metrolink and Amtrak) typically generate about 75 dB velocity level, with a maximum of about 85 dB for higher speed (>60 mph) commuter trains. The threshold of perception is about 65 dB, and damage thresholds are 95 dB and above.

The vertical velocity vibration levels expected at the proposed project site were estimated using measured data from other locations adjacent to commuter train lines. Figure 9 displays the estimated maximum vibration levels at different distances from the railroad and at different train speeds. The actual velocity levels depend upon the soil conditions at a specific location, but the presented levels are representative. As shown in Figure 9, the maximum velocity levels at the nearest residences (75 to 100 feet from the rail line) are expected to range between 70 and 75 dB. This is the level reached momentarily as the locomotive passes by. Passenger and freight train cars generate much lower vibration levels during their passby. As shown in Figure 8, these levels are below the level expected to cause annoyance from relatively infrequent events. It should be noted that there are many existing residences in the area located at similar and closer distances to the railroad experiencing similar or higher levels of vibration during train passbys. Consequently, vibration experienced at future residences within the project site would be less than significant.



Source: Acoustical Analysis Associates, Inc.

Figure 8. Typical Levels of Ground-Borne Vibration

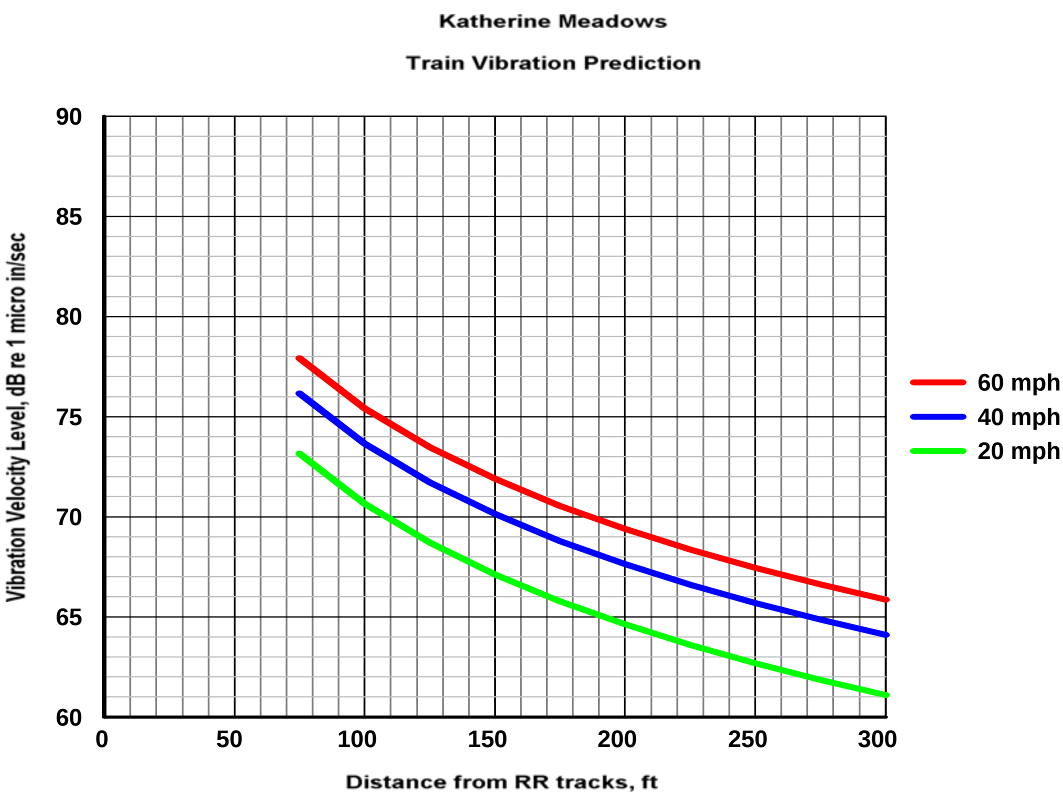


Figure 9. Katherine Meadows - Train Vibration Prediction

CONCLUSIONS AND RECOMMENDATIONS

The design of the proposed single-family homes within the Katherine Meadows Development will comply with the noise level thresholds set by the County of Ventura, with the following noise mitigation measures incorporated.

Exterior Noise Exposure:

1. As recommended by the acoustical consultant, a noise barrier with a height of 8 to 10 feet above future building pads should be constructed along the north property lines of lots adjacent to the railroad as indicated in Figure 8. Suitable materials for the noise barrier include masonry or block wall, stucco on both sides of a wood stud frame or an earthen berm. A combination of wall and berm may also be used. Other barrier designs or materials may be acceptable, but should be approved by a qualified acoustical consultant prior to construction.

Interior Noise Exposure:

2. Windows and sliding glass doors of homes adjacent to the railroad should be required to have a minimum STC (Sound Transmission Class) rating of 26.

3. Exterior doors of first row of homes adjacent to the railroad should be solid core with perimeter weatherstripping and threshold seals.

4. Air conditioning or mechanical ventilation should be provided for homes adjacent to the railroad to allow occupants to close doors and windows for the required acoustical isolation.

5. Roof or attic vents directly facing the railroad should be baffled so that sound must take an indirect route when entering the attic space.

These conclusions are based upon the best available field test data for the noise sources under consideration. Careful workmanship, including caulking of joints and base plates, is required to ensure that the acoustical performance of installed assemblies will be consistent with calculated results. Panel integrity should not be compromised by poorly sealed penetrations or by flanking paths. It is the responsibility of the builder to ensure that all materials and construction practices employed for this project are consistent with the design assumptions used for this analysis, and with these recommendations. AAAI is not responsible for degradation of acoustical performance due to substitutions, deletions, modifications or defects in manufacture or workmanship.

Sincerely,
ACOUSTICAL ANALYSIS ASSOCIATES, INC.

Michael P. Bucka
Supervisory Consultant

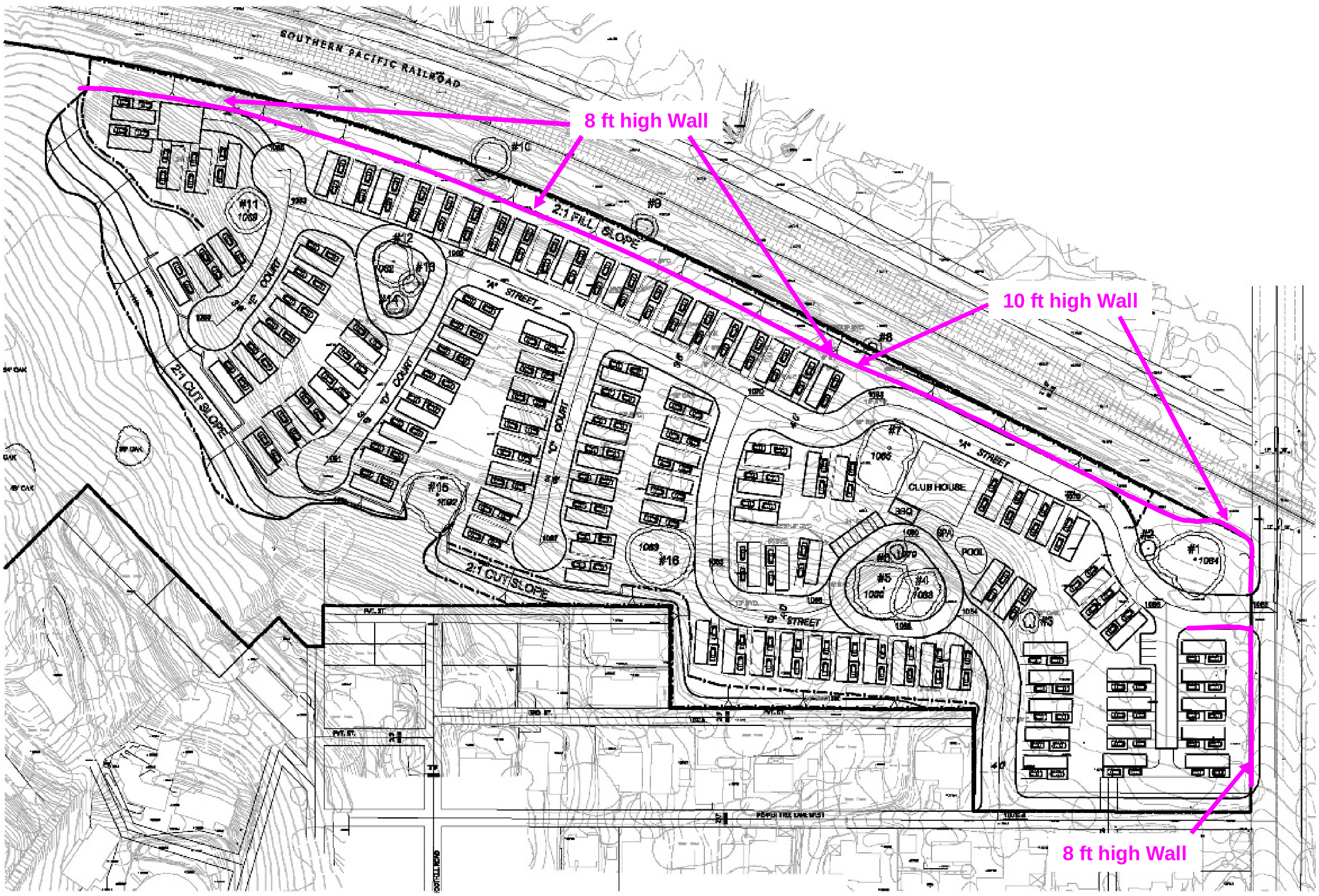


Figure 10. Katherine Meadows Project – Noise Reduction Barrier Locations

APPENDIX A
ACOUSTICAL TERMINOLOGY

AMBIENT NOISE LEVEL:	The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.
CNEL;	Community Noise Equivalent Level. The average equivalent 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 before 7:00 a.m. and after 10:00 p.m.
DECIBEL, dB:	A unit for describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound meassured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Ldn:	Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition of ten decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.
Leq:	Equivalent Sound Level. The sound level containing the same total energy as a time-varying signal over a given sample period. Leq is typically computed over 1,8 and 24-hour sample periods.

NOTE: CNEL and Ldn represent daily levels of noise exposure averaged on an annual basis, while Leq represents the average noise exposure for a shorter time period, typically one hour.

Lmax:	The maximum noise level recorded during a noise event.
Ln:	The sound level exceeded “n” percent of the time during a sample interval (L90, L50, L10, etc.). L10 equals the level exceeded 10 percent of the time.

A-2
ACOUSTICAL TERMINOLOGY

NOISE EXPOSURE CONTOURS: Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and Ldn contours are frequently utilized to describe community noise exposure to noise.

SEL or SENEL: Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to a duration of one second. More specifically, it is the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on a reference pressure of 20 micropascals and a reference duration of one second.

SOUND 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 in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.

APPENDIX B

The following is an extract from the post-construction noise survey report for Parker Ranch:

“The construction of the soundwall south of the railroad along the Parker Ranch property line had no measurable effect on train noise levels measured in the Katherine Street neighborhood on the north side of the railroad.

Figures 12 and 13 illustrate how the soundwall, and most of the Parker Ranch homes, are blocked by the train during a passby. The direct path from the train to the receiver controls the noise level. The sound reflected from the opposite side of the railroad and back to the receiver is attenuated by the extra distance traveled and by the train itself, and is insignificant compared to the direct sound path.”

Figure 12. View from Site 1 of Parker Ranch soundwall and homes before and during train passby

Figure 13. View from Site 5 of Parker Ranch soundwall and homes before and during train passby

Table D-1
Typical Construction Equipment Noise Levels

Equipment Type Noise Source	*50-Foot Noise Level (L_{eq}) dBA[2, 3]*	*Noise Level Range (L_p) dBA[2, 3]*	*50-Foot Maximum Noise Level (L_{max}) dBA[2 3]*
Air Compressor (portable)[4]	81	76-89	89
Air Compressor (stationary)	82	76-89	89
Auger, Drilled Shaft Rig	82	76-89	89
Backhoe	85	81-90	90
Bar Bender	82	78-88	85
Chain Saw	85	72-88	88
Compactor	82	81-85	85
Concrete Batch Plant	92	80-96	96
Concrete Mixer (small trailer)	67	65-68	68
Concrete Mixer Truck	85	69-89	89
Concrete Pump Trailer	82	74-84	84
Concrete Vibrator	76	68-81	81
Crane, Derrick	88	79-90	90
Crane, Mobile	83	80-85	85
Dozer (Bulldozer)	80	77-90	90
Excavator	87	83-92	92
Forklift	84	81-86	86
Front End Loader	79	77-90	90
Generator	78	71-87	87
Gradall	82	78-85	85
Grader	85	79-89	89
Grinder	80	75-82	82
Hydraulic Hammer	102	99-105	105
Impact Wrench	85	75-85	85
Jack Hammer	82	75-88	88
Paver	89	82-92	92
Pile Driver (Impact/ Sonic/ Hydraulic)	101/96/65	94-107/90-99/65	107/99/65
Pavement Breaker	82	75-85	85
Pneumatic Tool	85	78-88	88
Pump	76	68-80	80
Rock Drill	98	83-99	99
Roller	74	70-83	83

Table D-1
Typical Construction Equipment Noise Levels

Equipment Type Noise Source	*50-Foot Noise Level (L_{eq}) dBA[2, 3]*	*Noise Level Range (L_p) dBA[2, 3]*	*50-Foot Maximum Noise Level (L_{max}) dBA[2 3]*
Sand Blaster	85	80-87	87
Saw, Electric	78	59-80	80
Scraper	88	82-91	91
Shovel	82	77-90	90
Tamper	86	85-88	88
Tractor	82	77-90	90
Trencher	83	81-85	85
Trucks (Under Load)	88	81-95	95
Water Truck	90	89-94	94
Other Equipment with Diesel Engines	82	75-88	88

Source: Ventura County, 2005. Appendix A Typical Equipment Noise, Construction Phases and Use Factors
Note 1. Table based on EPA studies and measured data from various construction equipment and manufacturer's data.
Note 2. Equipment noise levels are at 50 feet from individual construction equipment and with no other noise contributors.
Note 3. Portable air compressor rated at 75 cfm or greater and operating at greater than 50 psi