

Perry Estate

Austin, Texas

Environmental Noise Study – Summary Report of Environmental Noise Criteria and Recommendations

Report No. 12048-02

February 05, 2013

Perry Estate

Austin, Texas

Environmental Noise Study – Summary Report of Environmental Noise Criteria and Recommendations

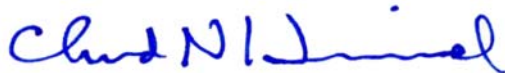
Report No. 12048-02

February 05, 2013

Prepared for

Perry Estate, LLC

Submitted by



Chad N. Himmel, PE
Associate, JEAoustics
TxBPE Reg. No. 90175

Perry Estate, Austin, Texas

Environmental Noise Study – Summary Report of Environmental Noise Criteria and Recommendations

February 05, 2013

Chad N. Himmel, PE
JEAcoustics
Austin, Texas 78756

Prepared for:
Perry Estate, LLC

Perry Estate, LLC, retained JEAcoustics (JEA) to provide environmental noise analysis and consultation services for The Perry Estate redevelopment in Austin, Texas. Proposed events at Perry Estate are to include acoustic and amplified music and speech announcements. If event noises are loud enough, they have the potential to disturb sensitive receivers, such as residential areas beyond the property boundaries and residential areas planned for the project site. JEA's scope of services includes a noise study to develop design criteria for outdoor music noise, to determine conditions affecting residential uses on and adjacent to the proposed project, plus development of design recommendations for environmental acoustics and noise control. The primary intents of this study are to determine and recommend noise control measures necessary to (a) conform with existing city ordinance and code noise restrictions, (b) prevent unreasonable interior noise intrusions for residential structures on the property and (c) prevent noise annoyance due to sound transmissions across property boundaries from events held on the site.

In this study, JEA reviewed various indoor and outdoor noise limits and noise assessment procedures,^{1,2,3,4,5,6,7,8} and low frequency noise criteria^{9,10,11} and information^{12,13} available from published references. In addition, JEA conducted a series of ambient noise measurements in the vicinity of Perry Estate to be used as a basis for developing allowable outdoor noise criteria for proposed events and music sounds, in order to prevent disturbance of residents with event sounds. JEA found that typical amplified event music and noise may easily achieve existing city ordinance and code noise restrictions, but that event noises must be managed and limited in order to achieve the suggested noise criteria to prevent disturbances. In other words, city code does not provide a reliable basis for preventing disturbance; much stricter limits are needed and recommended for this project. Noise management and limiting methods must also include methods for limiting low-frequency noise to achieve suggested goals. Limits in terms of A-weighted (dBA) and C-weighted (dBC) sound levels were established for the project in **Table 1**.

Table 1: Allowable Average (Leq) Outdoor Event Noise Levels Received at Dwellings

Condition to be prevented most of the time at a dwelling	Day (7am-7pm)		Evening-Night (7pm-7am)	
	LeqA (dBA)	LeqC (dBC)	LeqA (dBA)	LeqC (dBC)
Severe Disturbance	55	65	50	62
Disturbance	50	60	45	57
Audible	40	50	35	47

A detailed sound propagation model of the Perry Estate site and vicinity was constructed to analyze, develop and validate various noise sources and noise limiting solutions. Preliminary noise limiting solutions have been recommended, including the following, which may be used partially or altogether to achieve project goals. Further evaluation and design will be needed by the owner, planners, architects, engineers, and/or sound system designers to determine how the following measures will be implemented to achieve the goals.

- Limit the scheduled hours to daytime only, or strictly limit evening hours and limit the frequency and duration of events.
- Use an electronic sound level management system to limit amplified noise produced by sound systems to levels indicated in **Table 2**. In the evening (7pm-10pm), achieve the equivalent of 55 dBA / 67 dBC or less at a distance of 50 feet from the amplified sound sources; in the daytime (7am-7pm), 60 dBA / 70 dBC.
- Restrict the use of louder non-amplified musical instruments. Establish a detailed list of approved and disallowed instruments based on typical loudness, such as a limit of 85 dBA / 95 dBC at a distance of 3 feet.
- Limit the size of the performing non-amplified ensembles or groups, for example, no more than five performers at the same time.

Table 2: Allowable Average (Leq) Outdoor Amplified Sound and Non-Amplified Music Noise Levels

Distance from loudspeaker or performance source/stage	Day (7am-7pm)		Evening (7pm-10pm)	
	LeqA (dBA)	LeqC (dBC)	LeqA (dBA)	LeqC (dBC)
7'	75	85	70	82
17'	70	80	65	77
30'	65	75	60	72
50'	60	70	55	67
100'	55	65	50	62
250'	50	60	45	57

Noise levels are intended to be measured as an equivalent average (Leq) with a sound level meter set to "Fast" averaging (a 1/8-second time constant) for a duration of at least 30 seconds, or up to 3 minutes, as needed to measure sound that accurately represents continuous and recurring Perry Estate event noise in excess of background sounds that may come from off-site. Peak noise levels (Lmax) may be allowed to exceed the Leq levels by no more than 10 dB. If the sound level meter or monitoring device to be used does not have a "Fast" averaging setting and can only be set to "Slow" averaging (a 1-second time constant) the allowable values should be reduced by 3 dB.

- Confirm with practice that sound limiting works, that the amplified and non-amplified noise levels can be monitored without interference from off-site noises from traffic, flyovers, etc., that event participants can enjoy the events with limited sound levels, and that noise levels achieve the intended goals. Conduct listening or sound measurement tests on site to validate results with event music presentation, and engage the community to solicit or gauge their reaction. Adjust event schedules, allowed instruments lists, shielding/enclosure, and sound management system settings if necessary.

Other optional noise mitigation solutions recommended in this report include the following, which could be added to the measures listed above, if needed to achieve goals.

- Design the sound system to have minimal wattage, low volume displacement speakers, and other measures to ensure the system is not capable of producing very loud levels of low-frequency (bass) noise.
- Use shielding structures, lightweight shells, or partial enclosures to direct event sounds away from residential receivers, and arrange speaker orientations facing away from residents.

Details regarding this noise study, criteria, analyses, and preliminary recommendations are presented in JEA report 12048-01, December 19, 2012.

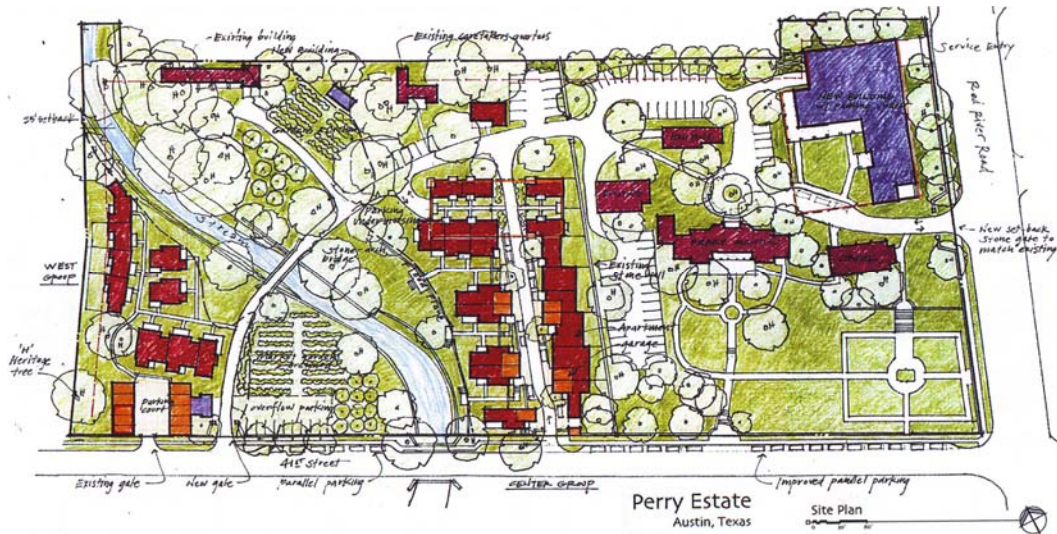


Figure 1: Perry Estate Site Plan



Figure 2: Perry Estate and Vicinity

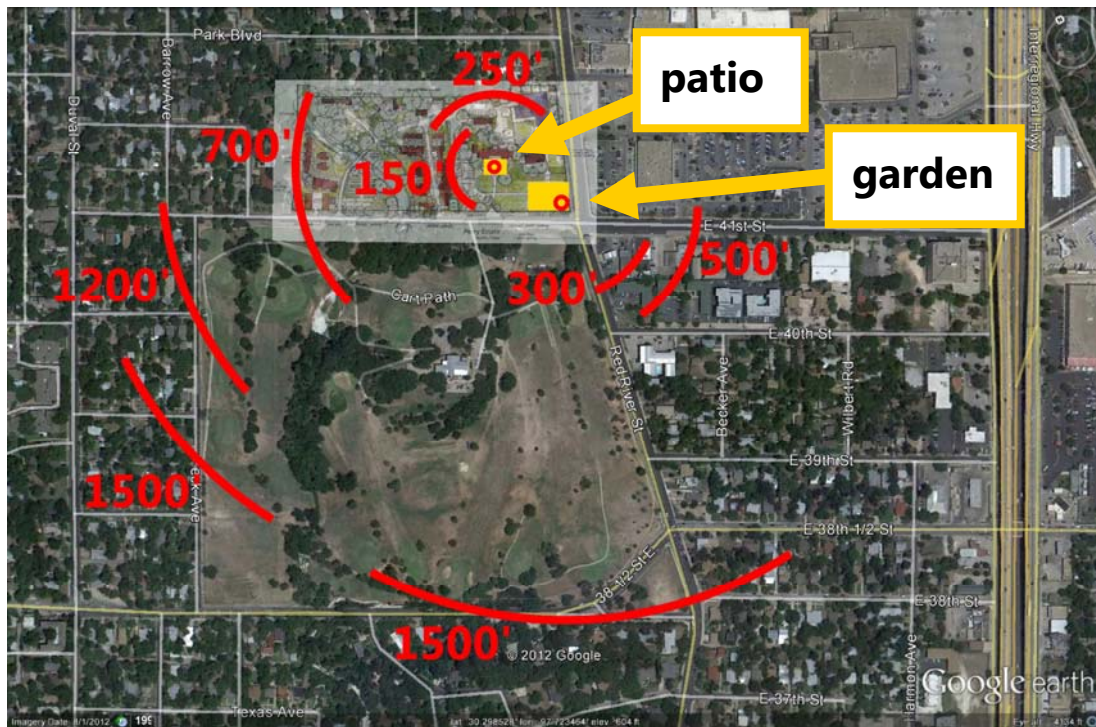


Figure 3: Event Areas and Distances to Nearest Dwellings

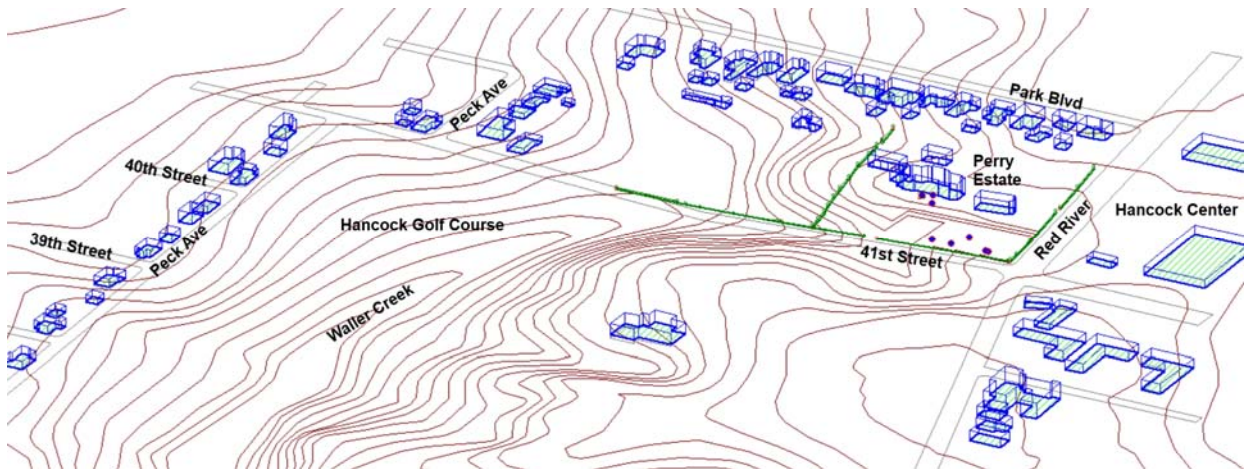


Figure 4: SoundPLAN Model Configuration

C-weighted noise contour results (dBC) received at the 2nd floor level for representative amplified and non-amplified events with sound levels limited are shown in the illustrations below. A-weighted (dBA) results exhibit similar propagation, with lower dB values as expected.

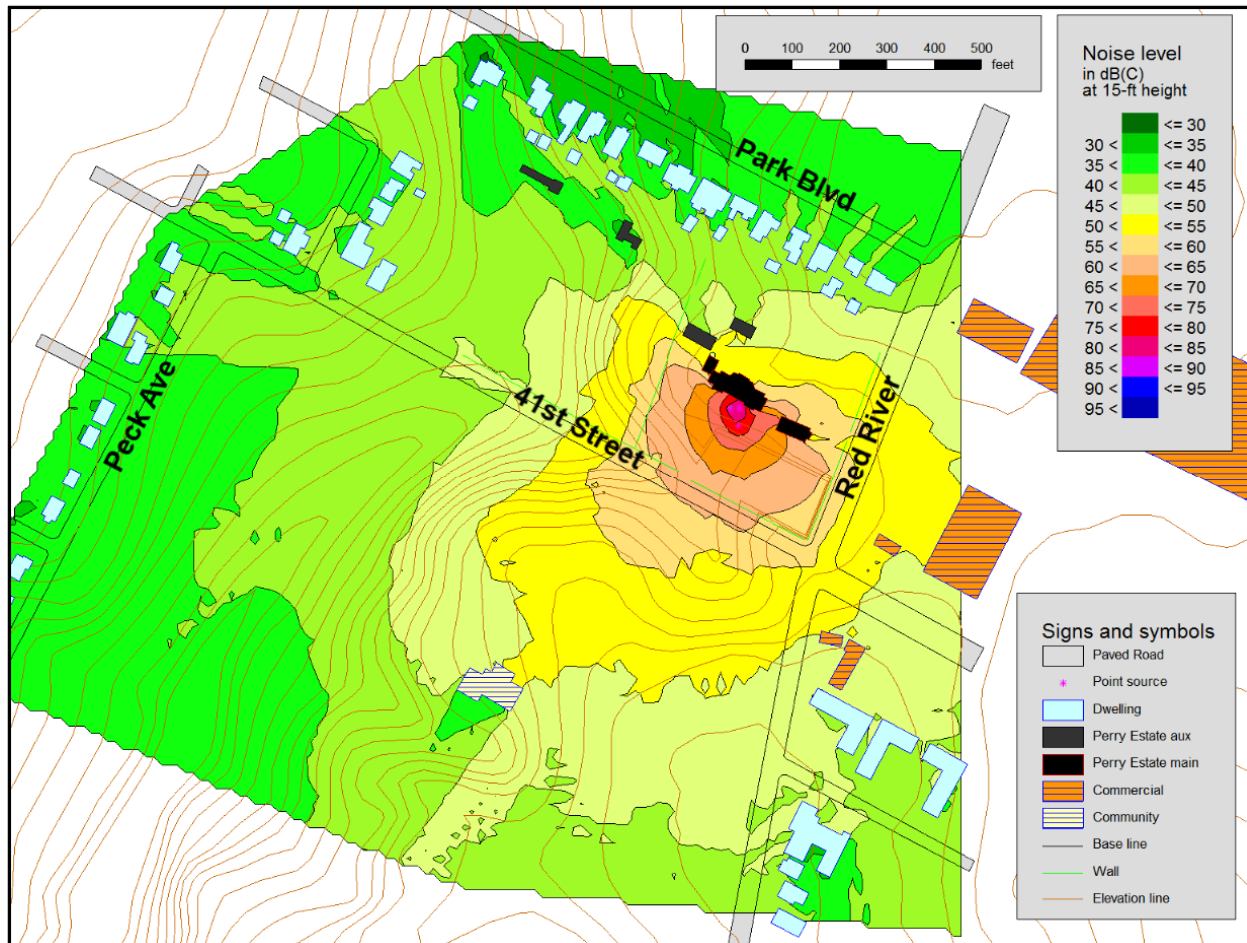


Figure 5: SoundPLAN Model Results with Limited Amplified Music and Average Crowd Noise at Mansion Patio

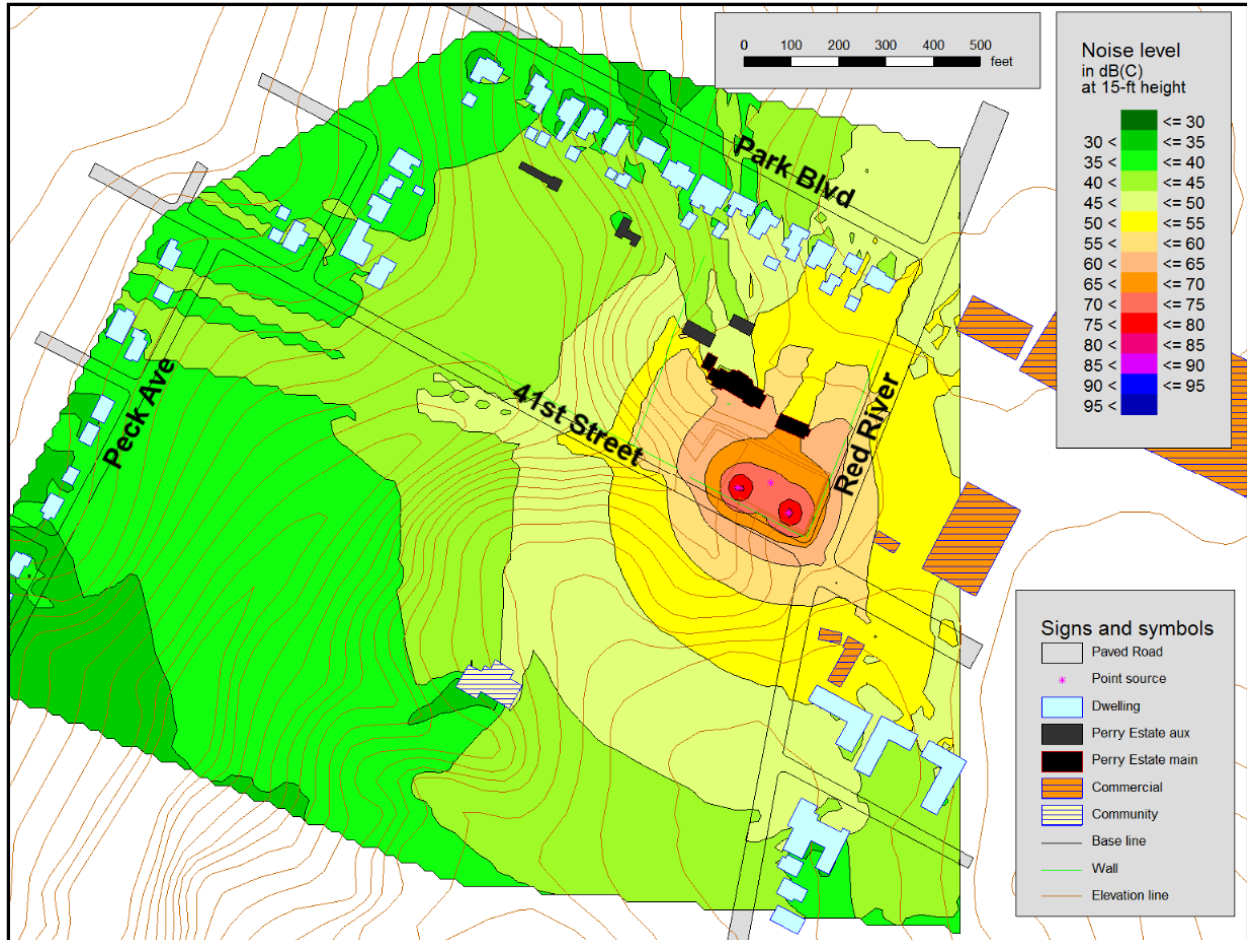


Figure 6: SoundPLAN Model Results with Limited Amplified Music and Average Crowd Noise at Sunken Garden

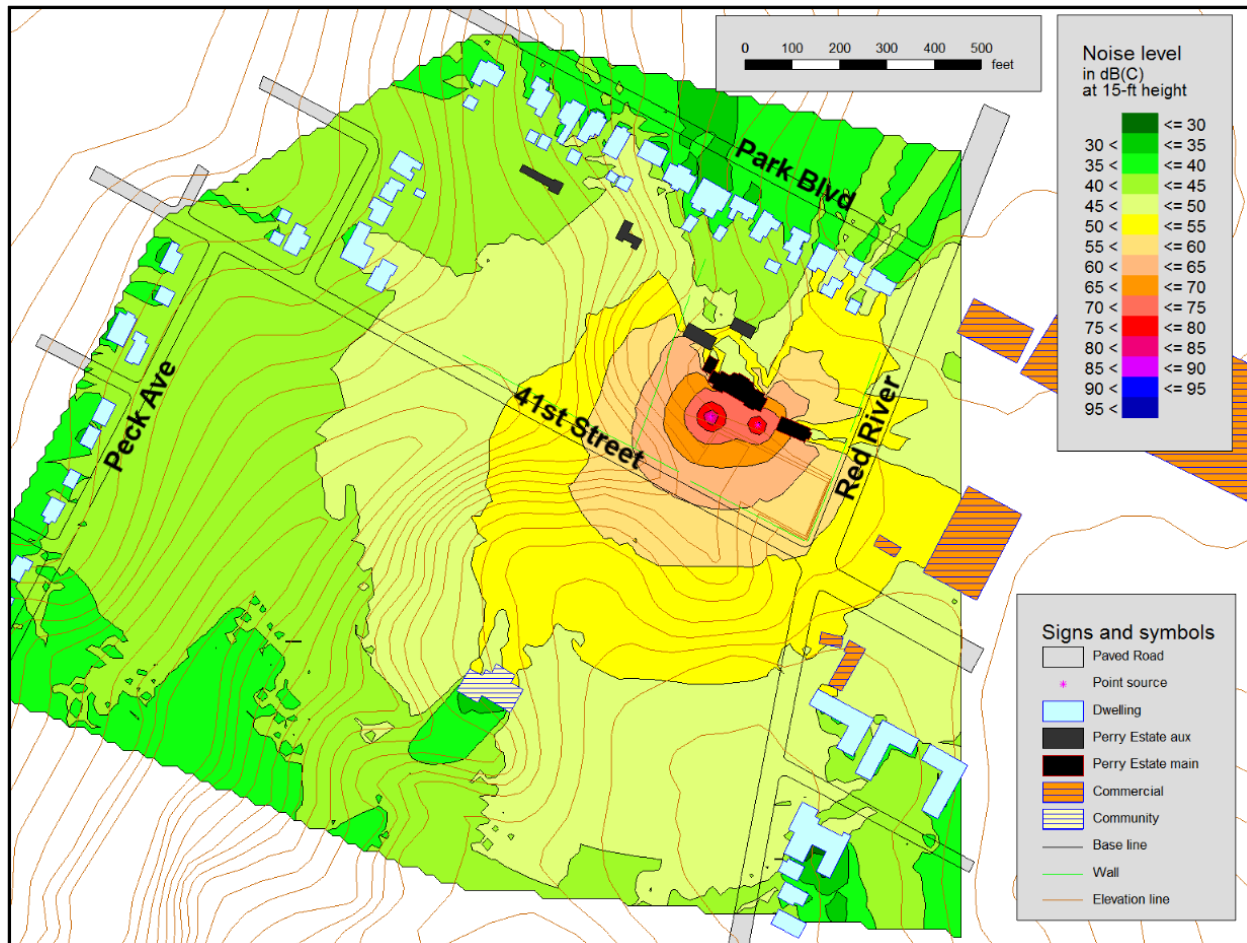


Figure 7: SoundPLAN Model Results with Non-Amplified Music and Average Crowd Noise at Mansion Patio

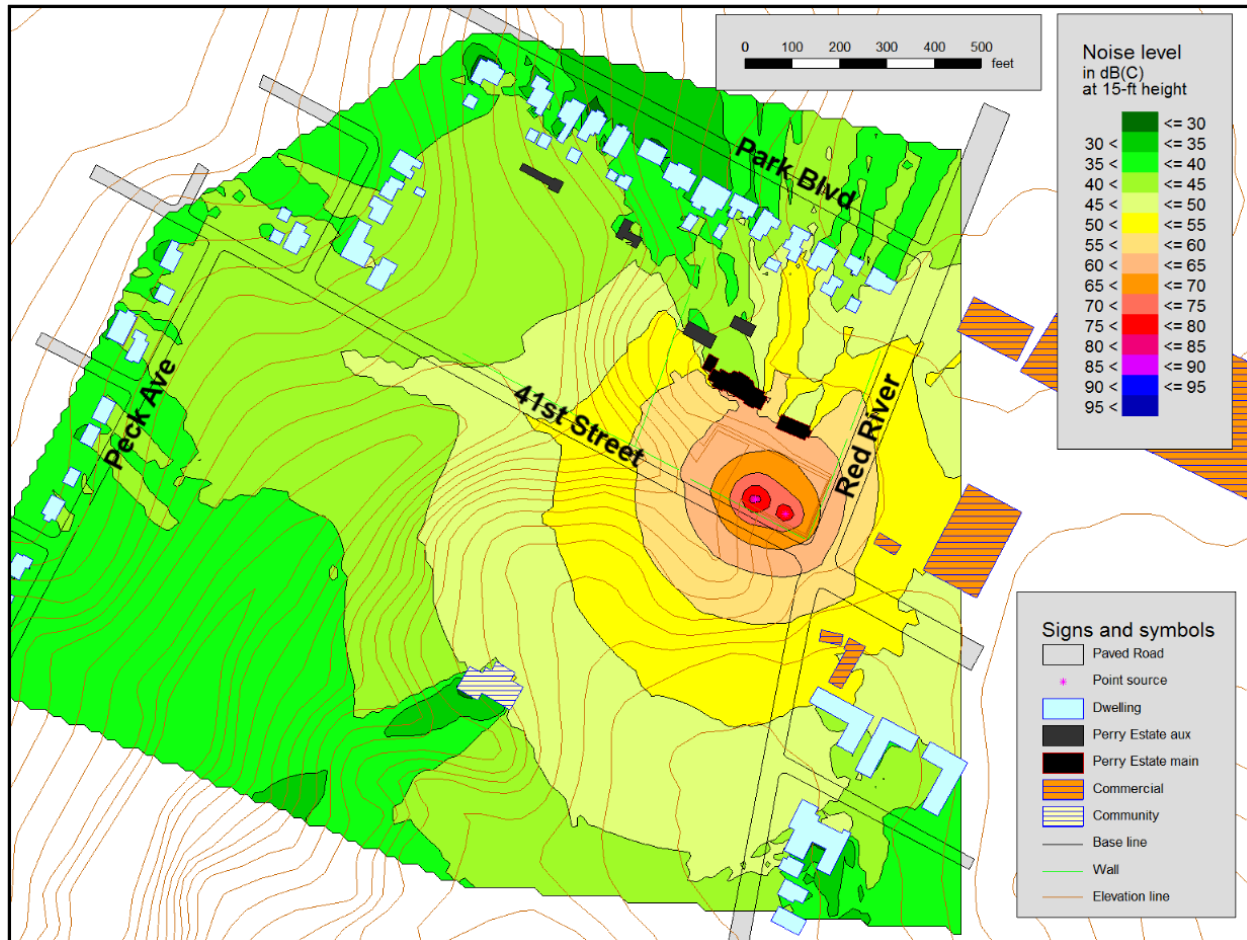


Figure 8: SoundPLAN Model Results with Non-Amplified Music and Average Crowd Noise at Sunken Garden

Audio System Noise Limiters or Sound Level Management Systems

Supplier Contact Info.

ACO Pacific, Inc.
2604 Read Avenue
Belmont, CA 94002
650.595.8588
www.acopacific.com

Grozier Technical Systems, Inc.
157 Salisbury Road
Brookline MA 02445
617.277.1133
www.grozier.com/AutomaticSPLcontrol.shtml

Scantek, Inc.
6430 #C, Dobbin Rd
Columbia, MD 21045
410.290.7726
www.scantekinc.com

Lime Technologies*
209 Great Preston Road, Ryde, PO33 1AY, UK
08712 233127
www.noiselimiters.co.uk

Sound Limiters*
404 Clipsley Lane
Haydock, St Helens, WA11 0SX, UK
01744 29621
www.soundlimiters.com

*Can configure for 120V and ship to the US

REFERENCES

- ¹ *Geneva Guidelines For Community Noise*. World Health Organization, Ed. Birgitta Berglund, Thomas Lindvall, Dietrich H Schwela. 1999
- ² Geoff Leventhall, Peter Pelmeier and Dr Stephen Benton. *A Review of Published Research on Low Frequency Noise and its Effects*. Department for Environment, Food and Rural Affairs, London. 2003
- ³ George F. Hessler, Jr. *Proposed criteria in residential communities for low-frequency noise emissions from industrial sources*. J. Noise Control Eng. 52 (4), 2004
- ⁴ N. Broner, Sinclair Knight Merz, *A Simple Outdoor Criterion for Assessment of Low Frequency Noise Emission*. Acoustics Australia, Melbourne. Vol. 39 No. 1-7. 2011
- ⁵ Broner, N., and Leventhall, H. G. *Low frequency noise annoyance assessment by Low Frequency Noise Rating (LFNR) Curves*. Journal of Low Frequency Noise and Vibration 2, 20–28. 1983
- ⁶ Title 24, Part 51 – *Environmental Criteria and Standards* (24 CFR Subtitle A 4-1-04 Edition 51.101). U.S. Department of Housing and Urban Development, Washington, DC.
- ⁷ *The Noise Guidebook*. U.S. Department of Housing and Urban Development, U.S. Government Printing Office, Washington, DC. 1991
- ⁸ EPA 550/9-81-423 – *Guidelines for Considering Noise in Land Use Planning and Control*. U.S. Environmental Protection Agency – Federal Interagency Committee on Urban Noise, Washington, DC. 1980
- ⁹ Din 45680 – “*Messung und Bewertung tieffrequenter Geräuschmissionen in der Nachbarschaft*” (*Measurement and assessment of low-frequency noise emissions in the neighborhood*). Deutsches Institut Für Normung, Berlin. 1997
- ¹⁰ P. McCullough¹ and J. O. Hetherington, *A Practical Evaluation of Objective Noise Criteria used for the Assessment of Disturbance due to Entertainment Music*. The Chartered Institute of Environmental Health, Volume:4 Issue:2. 2005
- ¹¹ Ian Rushforth, Andy Moorhouse, Peter Styles. *A Case Study of Low Frequency Noise Assessed using DIN 45680 Criteria*. Low Frequency Noise, Vibration and Active Control, Multi Science Brentwood, Essex. Vol. 21, No. 4. 2002
- ¹² Joseph Keefe. *Noise exposure in marching bands*. J. Acoustical Society of America, Volume 118, Issue 3. 2005
- ¹³ *An Engineering Approach to the Acoustic Design of Contemporary Entertainment Venues*. Ken Marriott Industrial Commercial & Technical Consultants (ICTC), Croydon, Surrey. Proceedings of the Institute of Acoustics. 2002