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TO: Djamila Cabugos
Sunstone Winery
125 N. Refugio Road, Santa Ynez, CA 93460

SUBJECT: Acoustical analysis of music venue for the Special Event MCUP application for parcel number 141-460-012.

BACKGROUND

The property is situated south of Highway 246 in Santa Barbara County, CA and adjacent to the Santa Ynez River. The owner's intent is to have musical events performed during the year and to have amplified music for the participants. The following analysis is to estimate the average sound levels which could be expected on the property and to determine if the average A-weighted sound levels exceed 65 dBA at the property lines.

ANALYSIS

A single, amplified music location area was considered. The specific region chosen for the analysis is southeast of the villa building (see Fig. 1, the area within the red line, Ref. 1). The music orientation was chosen to project sound toward the northwest, toward the villa building, and away from the Santa Ynez River. In addition, non-amplified music from a single instrument was considered for the area to the north of the villa entrance.



Figure 1: The area within the red line is where the amplified music is proposed to be located.

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In estimating the amplified sound levels on this property, loudspeakers at several locations were used. The sound level at 10 feet from the front of a single loudspeaker is defined to be 92 dBA. The sound levels and combined directivities of the multiple loudspeakers were derived from a single loudspeaker (JBL Professional PRX635, Ref. 2). The sound pressure level spectrum for each loudspeaker used in the analysis is listed in Table I. Two loudspeaker arrays were considered. The first array used two loudspeakers and the second array four loudspeakers. In addition, the approximate spectrum for an acoustic guitar is given in Table I (Ref. 3).

The propagated sound is attenuated by spherical spreading of the sound. Spherical spreading of sound reduces the sound level by 6 dB for every doubling of distance from the source. In addition, atmospheric attenuation of the sound levels is included for the propagating sound (Ref. 4). There is little atmospheric attenuation at low frequencies and the attenuation rate increases with frequency. Absorption of the sound by the ground and foliage were not taken into account. Because the the source is directed at the building, shielding by the building was taken into account. Property line sound level calculations were made by using the CNEL analysis (Ref. 5) with the band operating during the hours between 4 PM and 10 PM. The 65 dBA contour used in the figures was not corrected for CNEL. In this case the CNEL calculation reduces the A-weighted sound levels by approximately 3 dB.

Frequency [Hz]	Average Sound Pressure Level [dB re. 20 μPa] at 10 ft for a Single Loudspeaker	Average Sound Pressure Level [dB re. 20 μPa] at 10 ft for a Single Guitar
63	84	35
125	90	40
250	92	55
500	91	60
1000	88	61
2000	78	53
4000	74	48
8000	68	43

Table I: Average sound pressure level spectra of a single JBL Professional PRX635 loudspeaker generating 92 dBA at 10 ft and an acoustic guitar at 10 ft.

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Figure 2 (Ref. 1) is an illustration of the locations of the two loudspeakers for the 100 person wedding venue. The reference measurement location is indicated by the star at the end of the dance floor. With each loudspeaker operating at the 92 dBA, the average, measured sound level at the star location should be 90 dBA.

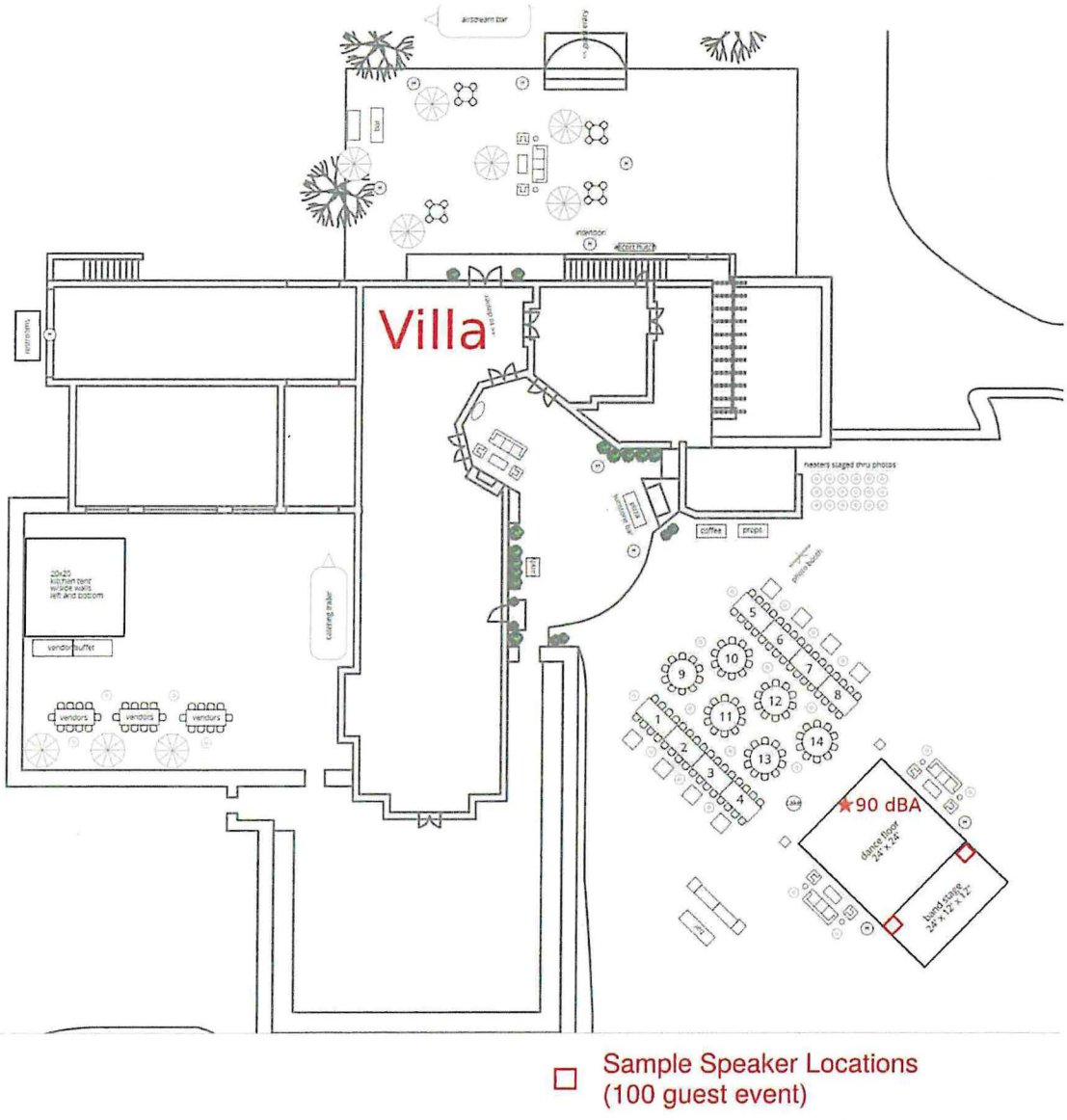


Figure 2: Illustration of the two loudspeaker locations and the reference sound level (90 dBA) for this study.

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Figure 3 (Ref. 1) is an illustration of the calculated sound levels and the music position (yellow circle in the contour line) for the two loudspeaker case. The blue lines are an overlay of the property lines on the figure (Ref. 6). The main sound is directed to the northwest toward the villa building. At the closest property line location (to the north) from the music position the sound level is 56 dBA CNEL. The calculated 65 dBA sound level contour (yellow curve) does not reach the property lines in any direction. The other property lines are far away from the proposed venue, and, as a result, the sound levels are less than 65 dBA at those property lines.

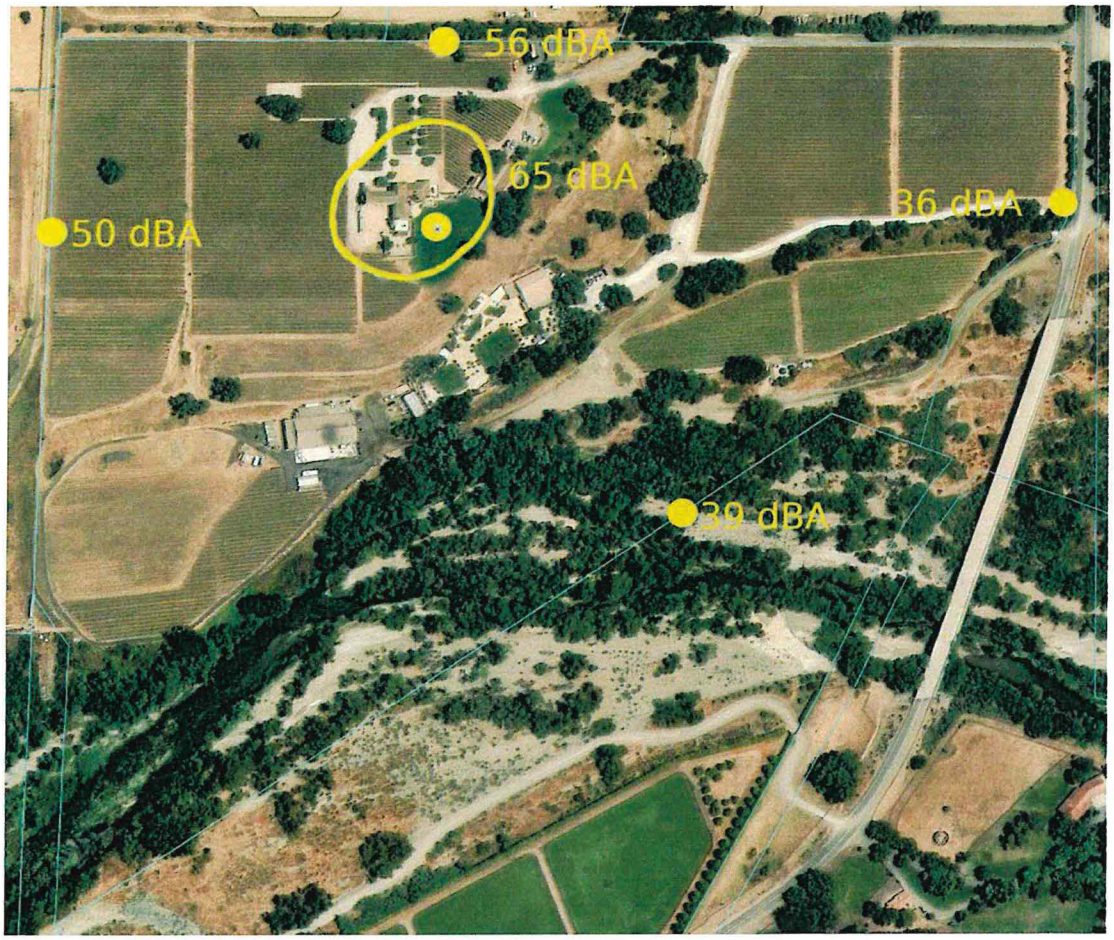


Figure 3: Average A-weighted Sound Levels from a two loudspeaker music source. (Property line calculations use the CNEL standard for amplified music from 4 PM to 10 PM.)

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Figure 4 (Ref. 1) is an illustration of the locations of the four loudspeakers for the 200 person wedding venue. The reference measurement location is indicated by the star in the middle of the dance floor. With each loudspeaker operating at the 92 dBA sound level, the average, measured sound level at the star location should be 85 dBA.

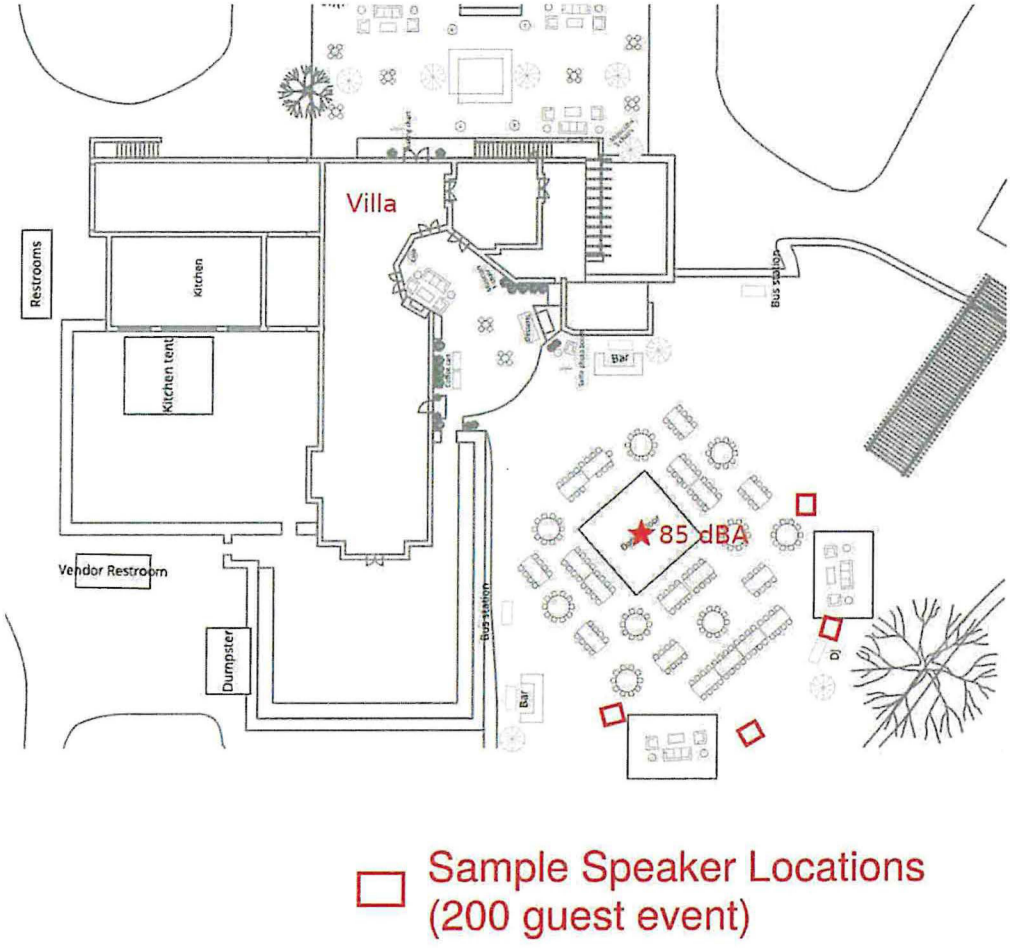


Figure 4: Illustration of the four loudspeaker locations and the reference sound level (85 dBA) for this study.

Figure 5 (Ref. 1) is an illustration of the calculated sound levels and the music position (yellow circle in the contour line) for the four loudspeaker case. The blue lines are an overlay of the property lines on the figure (Ref. 6). The main sound is directed to the northwest toward the villa building. At the closest property line location (to the north) from the music position the sound level is 61 dBA CNEL.

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The calculated 65 dBA sound level contour (yellow curve) does not reach the property lines in any direction. The other property lines are far away from the proposed venue, and, as a result, the sound levels are less than 65 dBA at those property lines.

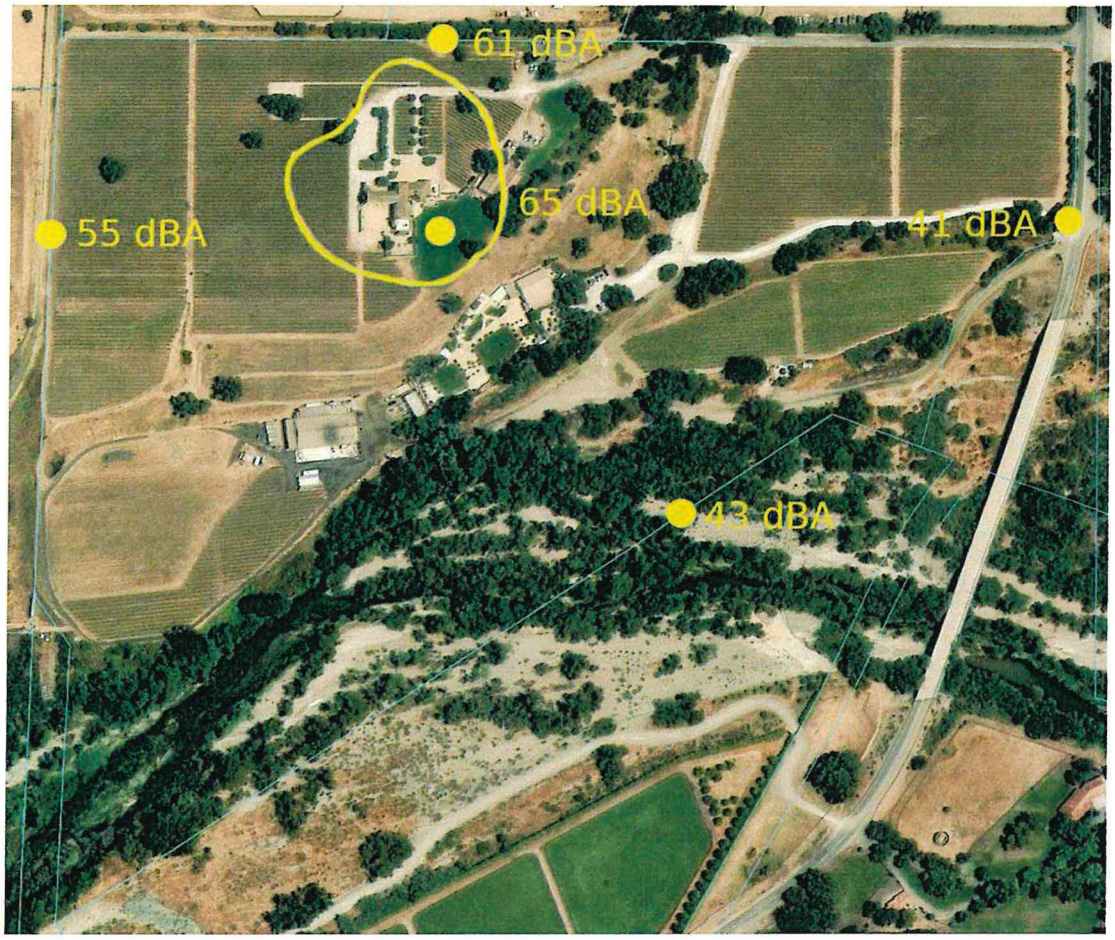


Figure 5: Average A-weighted Sound Level from a four loudspeaker music source. (Property line calculations use the CNEL standard for amplified music from 4 PM to 10 PM.)

Figure 6 (Ref. 1) shows the location of the musician who will welcome the wedding participants. The musician use a guitar (or other, non-amplified musical instrument) will stroll within the area of the villa entrance. The musician will play for approximately one hour. The northernmost point is 290 feet from the northern property line. It is estimated that the maximum, non-amplified sound level at the northern property line will not exceed 30 dBA. Due to brief time, this value has not been corrected for CNEL. This value is much less than the music sound

levels from either of the amplified venues and will not affect the sound levels presented in Figures 3 and 5.

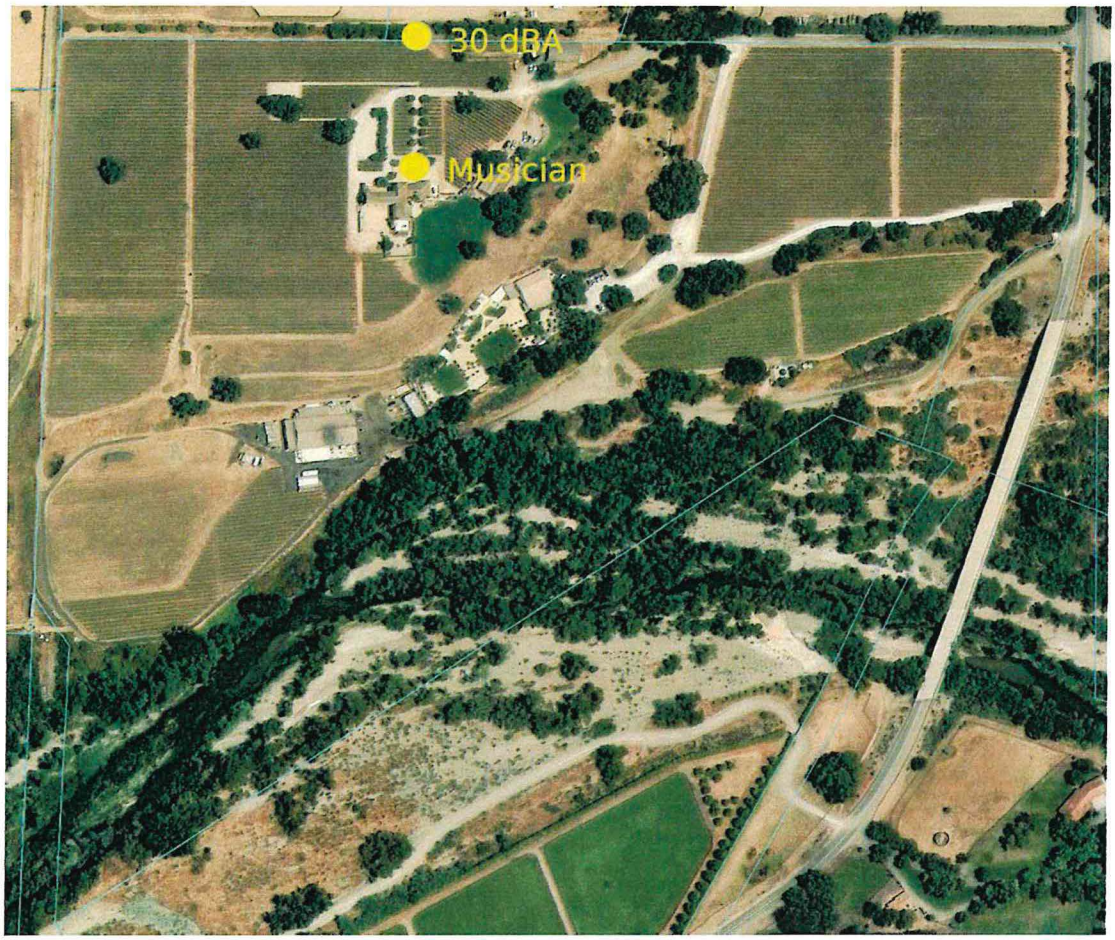


Figure 6: Average A-weighted Sound Level from a musician with an acoustic instrument located near the villa entrance to welcome guests during the reception. The value has not been corrected for CNEL.

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CONCLUSIONS

As long as the average sound levels do not exceed the reference sound levels in Figures 2 and 4, the average, amplified music sound levels at the property lines will not exceed 65 dBA CNEL. Homes or businesses on adjacent properties will not be exposed to average sound levels from these sources which exceed the county requirements (Ref. 5). Un-amplified music in the area north of the villa entrance will not exceed the 65 dBA sound limits.



Herbert Kuntz

REFERENCES

1. These figures were supplied by Flowers & Associates. The sound levels and contours were added to the original figures.

2. https://www.princeton.edu/3D3A/Directivity/JBL%20Professional%20PRX635/index_H.html

3. Harry F. Olson, Music, Physics and Engineering, Second Edition (Dover Publications, Inc., 1967).

4. ANSI S1.26-1995, "American National Standard method for calculation of the absorption of sound by the atmosphere (Acoustical Society of America, New York, 1995), 59F and 70%RH.

5. Environmental Thresholds and Guidelines Manual, County of Santa Barbara, Planning and Development (January 2021), Section 13.B.3.

6. Santa Barbara County assessor map: APN 141-460-012.