

Recommendations are provided to ensure that the project operations meet the Town’s noise ordinance. MD traveled to the project site and performed several baseline measurements to gather the existing condition at or near the site. Measurements were performed at the property boundaries which were used to define the existing noise condition at the site. MD utilized Type 1 sound level meters that meet ANSI S.4 engineering standards to record minute-by-minute baseline data

2.0 Local Acoustical Requirements

MD compared the results of the noise assessment to Section 10-7-3 of the Town of Paradise Valley, Town Code. The Town Code states: “Table 1 sets forth the noise level limits for stationary sources, and it is unlawful to project a sound or noise, except those caused by motor vehicles, from one property into another in excess of the stated limits”.

Table 1: Limiting Noise Levels for Stationary Sources

<u>TIME</u>	<u>MAXIMUM ALLOWABLE NOISE LEVEL dB (A)</u>
7:00 a.m. to 10:00 p.m.	56
10:00 p.m. to 7:00 a.m. and on all Sundays and specified legal holidays	45

Therefore, project operations must comply with the Town’s noise limit of 56 dBA during daytime (7AM to 10PM) hours and 45 dBA during nighttime (10PM to 7AM) hours

3.0 Study Method and Procedure

Existing Noise Condition/Baseline

On July 7, 2020 four (4) 10-minute baseline noise measurements were conducted at the project site from 9:10 AM to 10:01 AM. The project site is adjacent to Lincoln Drive (a major arterial roadway) to the north and resort property beyond Lincoln Drive continuing north, special use medical on the east, resort to the south, and residential to the west. Noise data indicate that the ambient noise level ranges from 47.0 dBA Leq near the residence on the west to 63.9 dBA Leq near E Lincoln Drive on the north. Additional field notes and photographs are provided in Appendix B. While on site, MD noted that the primary source of noise was traffic and construction on E Lincoln Drive.

Current noise levels along Lincoln Drive exceed the Town’s 56 dBA noise ordinance. Per the Town’s noise ordinance, traffic noise is exempt however it should be noted that the baseline conditions were monitored for reporting purposes. The noise level of 63.9 dBA was recorded within 40 feet of the centerline of the roadway. The noise would be approximately 60 dBA at 100 feet. This information is relevant because it demonstrates that the project site operational noise level (e.g. patios) are impacted by existing traffic conditions.

Stationary Noise Level Prediction Modeling

SoundPlan Acoustic Modeling Software (SP) was utilized to model the operational noise levels from the project site. SP acoustical modeling software is capable of evaluating stationary noise sources (e.g., loudspeakers for live events, parking lots, crowds, loading/unloading, patios, etc.) and much more. SP’s software utilizes algorithms (based on inverse square law) to calculate noise level projections. The software allows the user to input specific noise sources, spectral content, sound barriers, building placement,

topography, and sensitive receptor locations. In addition, SP can model the noise sources as point sources, line sources, and area sources. Noise level output data is located in Appendix C.

The future worst-case noise level projections were modeled using referenced sound level data for the various stationary on-site sources (event lawn, resort pool, outdoor patio, delivery location, and 3rd floor amenity). The model assumes noise projections at 5-feet above the ground level. In addition, the model evaluates the noise producers at varying heights (e.g. 25 feet in the air for the 3rd floor amenities vs 3 feet in the air for the pool area). Table 2 below outlines the referenced noise levels used to calibrate the models.

Table 2: Reference Sound Level Measurements for SoundPlan Model

Source	Source Type	Reference Level (dBA)	Distance (ft)
Pool Area	Point Source	70	3
Loudspeakers	Point Source	91	5
Patio	Point Source	70	5
3 rd Floor Amenities	Point Source	70	5
Loading/Unloading Area	Point Source	75	10
Event Lawn/Audience (200 people) ¹	Point Source	63	50
Event Lawn/Audience (50 people) ¹	Point Source	57	50

1. See reference levels from Bollard Acoustics, (Winery and Farm Brewing Zoning Acoustical Study, 2019), Appendix E. Bollard Acoustics measured 60 dBA for 100 people however doubling or halving the number of audience would result in a 3 dBA increase or reduction per logarithmic addition following acoustical principles.

Event Lawn Assumptions

Monday – Saturday – 7AM to 10PM

The event lawn assumes two (2) loudspeaker PA system with music or DJ and were modeled as a point source with a reference noise level of 91 dBA at 5 feet. Event lawn/audience was modeled as a point source with a reference noise level of 63 dBA at 50 feet.

Sundays and Holidays – 7AM to 10PM

The event lawn during Sundays and Holidays was modeled assuming no live music on the even lawn and a maximum of 50 people on the lawn. This assumption were used to ensure compliance to the Town's 45 dBA noise limit. A deviation from these assumptions has the potential to exceed the Town's noise limit at the western property line.

The resort pool was modeled as an point source with reference levels of 70 dBA at 3 feet. This represents low level music and patrons utilizing the pool area. It should be noted that typical conversations have a noise level of 60 dBA at 3 feet. Therefore, this assumption of 70 dBA is conservative.

The outdoor patios and 3rd floor amenity areas were modeled as point sources with a reference noise level of 70.0 dBA at 3 feet. This represents noise levels associated with patron conversation and low-level music. It should be noted that typical conversations have a noise level of 60 dBA at 3 feet. Therefore, this assumption of 70 dBA is conservative.

The loading/unloading area (delivery location) was modeled as an point source with a reference level of 75 dBA at 10 feet. This is to represent the average noise level of an idling truck and would be a temporary increase. MD has provided reference sound level cut sheet from measurements performed at MD's facility.

The SP model assumes that all noise sources are operating simultaneously (worst-case scenario), when in actuality the noise will be intermittent and lower in noise level.

4.0 Findings and Recommendations

Weekdays – 7AM to 10PM

Scenario 1:

Scenario 1 places the speaker system at the northeast section of the event lawn projecting the sound to the southwest (worst case scenario) and an audience of approximately 200 people. This scenario also implements three (3) five-foot walls at the south west edge of the event lawn. Receptors 1-4 were placed at the property lines based on where noise is projected to be the loudest.

Scenario 1 - Project Operational Noise Levels

Appendix C shows the operational Project Noise Levels at the property lines. Operational Project Noise Levels at the adjacent uses are anticipated to range between 46 dBA to 56 dBA Leq (depending on the location), which complies with the Town's noise ordinance.

Scenario 1 - Project Plus Ambient Operational Noise Levels

Table 3 demonstrates the operational Project Noise Levels plus the ambient noise levels which is provided to demonstrate the change in noise level as a result of the event lawn, resort pool, outdoor patio, delivery location, and 3rd floor amenity. It should be noted that the 3rd floor amenity will have no outdoor speakers or amplified music. It should also be noted that the eastern property line has the potential to exceed the Town's noise ordinance depending on the type of truck, however the use to the east is the backside of a commercial building and more than likely wouldn't be significantly impacted by loading/unloading noise. Project plus ambient noise level projections are anticipated to range between 52 to 64 dBA Leq at receptors (R1 – R4).

Table 3: Event Lawn Scenario 1 – Worst-case Predicted Operational Leq Noise Level¹

Receptor ¹	Existing Ambient Noise Level (dBA, Leq) ²	Project Noise Level (dBA, Leq) ³	Total Combined Noise Level (dBA, Leq)	Daytime (7AM - 10PM) Stationary Noise Limit (dBA, Leq)	Exceeds Standard Yes/No ⁴	Change in Noise Level as Result of Project
1	64	49	64	56.0	No	0.1
2	47	55	56		No	8.3
3	51	46	52		No	1.1
4	47	56	57		No	9.5
5	NA	43	NA	NA	NA	NA

Notes:
¹ Receptors 1-4, represent the adjacent property lines. Receptor 5 is the maximum allowable limit 5' from the speakers to not exceed the Town limit.
² See Appendix B for existing noise levels and locations
³ See Appendix C for the operational noise level projections at said receptors.
⁴ The baseline noise condition already exceeds the Town's noise ordinance. The project only noise level does not exceed the noise ordinance and therefore the project would still be in compliance.

As shown in Table 3, the analyzed portion of the project will increase the worst-case noise level by approximately 0.1 to 9.5 dBA Leq at receptors (R1 – R4). Receptor 5 (R5) is the project noise level approximately 158 feet from the project across E Lincoln Drive and is for comparative purposes only.

Receptor 6 (R6) is the maximum allowable noise level five feet from the speakers (91 dBA) at the event lawn area as to not exceed the Town's 56 dBA limit at the nearest property line.

It should be noted that if the noise does not exceed the Town's noise ordinance at the project site's property line, it will not exceed the Town's noise ordinance at a further distance. Sound dissipation follows the inverse law principle which is sound drops off at a 6 dB for every doubling of distance.

Sundays/Holiday

Scenario 2:

Scenario 2 removes the speaker system at the event lawn and a group of approximately 50 guests. Receptors 1-4 were placed at the property lines based on where noise is projected to be the loudest.

Scenario 2 - Project Operational Noise Levels

Appendix C shows the operational Project Noise Levels at the property lines. Operational Project Noise Levels at the adjacent uses are anticipated to range between 37 dBA to 54 dBA Leq (depending on the location), which complies with the Town's noise ordinance.

Scenario 2 - Project Plus Ambient Operational Noise Levels

Table 4 demonstrates the operational Project Noise Levels plus the ambient noise levels which is provided to demonstrate the change in noise level as a result of the event lawn, resort pool, outdoor patio, delivery location, and 3rd floor amenity. It should be noted that the 3rd floor amenity will have no outdoor speakers or amplified music. It should also be noted that the loading dock noise will be a temporary increase in noise even though the model shows it as a continuous noise source. It should be noted that MD could not confirm that deliveries would happen on weekends and holidays. Therefore, these levels potentially could be lower. Project plus ambient noise level projections are anticipated to range between 49 to 64 dBA Leq at receptors (R1 – R4).

Table 4: Scenario 2 - Worst-case Predicted Operational Leq Noise Level¹

Receptor ¹	Existing Ambient Noise Level (dBA, Leq) ²	Project Noise Level (dBA, Leq) ³	Total Combined Noise Level (dBA, Leq)	Sunday and Holiday (7AM - 10PM) Stationary Noise Limit (dBA, Leq)	Exceeds Standard Yes/No ⁴	Change in Noise Level as Result of Project
1	64	45	64	45.0	No	0.1
2	47	45	49		No	2.0
3	51	37	51		No	0.2
4	47	39	48		No ⁵	0.2
5	NA	35	NA	NA	NA	NA

Notes:

¹ Receptors 1-4, represent the adjacent property lines.

² See Appendix B for existing noise levels and locations

³ See Appendix C for the operational noise level projections at said receptors.

⁴ The baseline noise condition already exceeds the Town's noise ordinance. The project only noise level does not exceed the noise ordinance and therefore the project would still be in compliance.

⁵ The noise level has the potential to exceed the City's noise ordinance if loading/unloading (idling trucks) occurs on Sundays and Holidays at R4. Therefore, an agreement has been made with the City that no loading/unloading (idling trucks) will occur on Sundays and Holidays at R4

As shown in Table 4, the analyzed portion of the project will increase the worst-case noise level by approximately 0.1 to 2.0 dBA Leq at receptors (R1 – R4). Receptor 5 (R5) is the project noise level approximately 158 feet from the project across E Lincoln Drive and is for comparative purposes only.

It should be noted that if the noise does not exceed the Town's noise ordinance at the project site's property line, it will not exceed the Town's noise ordinance at a further distance. Sound dissipation follows the inverse square law principle which is sound drops off at a 6 dB for every doubling of distance.

Mitigation Measures

To meet the Town's Daytime 56 dBA limit the analyzed portion of the project must implement the following mitigation measures.

- Loudspeaker/PA system must not exceed 91 dBA at 5-feet from the speakers for Scenario 1 configuration. These limits will be built into the contract and levels will be set by computer to reduce user error.
- All live music or events (e.g. DJ, live band) must be concluded and be moved indoors at or before 10:00 PM per the Town's noise ordinance on Weekdays.
- Any background or directional speakers at the pool area, third floor amenity and/or patios must not be perceptible at the property line. This can be achieved via the volume adjusted through the volume control knob.
- The project must implement three (3) CMU (or equivalent) walls at the south west edge of the event lawn as to block noise to the adjacent property.

To meet the Town's Sunday/Holiday 45 dBA limit the analyzed portion of the project must implement the following mitigation measures.

- Only non-amplified events with a maximum of 50 people on the lawn area provided the said event noise level does not exceed the Town's 45 dBA limit at the property line. Levels will be measured using on-site sound level meter.
- Loudspeaker/PA system must be used inside and not on the Event Lawn area.
- Loading/unloading and idling trucks must not occur on Sunday's and Holidays.

5.0 Conclusions

MD is pleased to provide this noise study and recommendations for The Smoke Tree Resort. No sound levels would exceed the Town's standard if the required mitigation measures are followed. If you have any questions regarding this analysis or need further review, please call our office at (602) 774-1950.

Sincerely,
MD Acoustics, LLC



Mike Dickerson, INCE
Principal



Robert Pearson.
Acoustical Consultant

Appendix A

Glossary of Acoustical Terms

Glossary of Terms

A-Weighted Sound Level: The sound pressure level in decibels as measured on a sound level meter using the A-weighted 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. A numerical method of rating human judgment of loudness.

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.

C-Weighted Sound Level: The sound pressure level in decibels as measured on a sound level meter using the C-weighted filter network. The C-weighting filter greatly de-emphasizes very high frequency components of the sound and slightly de-emphasizes the very low frequency components. A numerical method of rating human judgment of loudness.

Community Noise Equivalent Level (CNEL): The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of five (5) decibels to sound levels in the evening from 7:00 to 10:00 PM and after addition of ten (10) decibels to sound levels in the night before 7:00 AM and after 10:00 PM.

Decibel (dB): A unit for measuring the amplitude of a sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micro-pascals.

dB(A): A-weighted sound level (see definition above).

dB(C): C-weighted sound level (see definition above).

dB(Z): Z-weighted sound level (see definition of dB above).

Equivalent Sound Level (LEQ): The sound level corresponding to a steady noise level over a given sample period with the same amount of acoustic energy as the actual time varying noise level. The energy average noise level during the sample period.

Habitable Room: Any room meeting the requirements of the Uniform Building Code or other applicable regulations which is intended to be used for sleeping, living, cooking or dining purposes, excluding such enclosed spaces as closets, pantries, bath or toilet rooms, service rooms, connecting corridors, laundries, unfinished attics, foyers, storage spaces, cellars, utility rooms and similar spaces.

Human Sensitivity to Sound: In general, the healthy human ear can hear between 20 Hz to 20,000 Hz. Frequencies below 125 Hz are typically associated with low frequencies or bass. Frequencies between 125 Hz and 5,000 Hz are typically associated with mid-range tones. Finally, frequencies between 5,000 and 20,000Hz are typically associated with higher range tones.

The human ear is sensitive to changes in noise levels, depending on the frequency. Generally speaking, the healthy human ear is most sensitive to sounds between 1,000 Hz and 5,000 Hz (A-weighted scale) and perceives a sound within that range as being more intense than a sound with a higher or lower frequency with the same magnitude. At lower and higher frequencies, the ear can become less sensitive depending on a number of factors. Table 1 provides a brief summary of how humans perceive changes in noise levels.

Table 1: Change in Noise Level Characteristics¹

Changes in Intensity Level, dBA	Changes in Apparent Loudness
1	Not perceptible
3	Just perceptible
5	Clearly noticeable
10	Twice (or half) as loud

https://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/polguide/polguide02.cfm

L(n): The A-weighted sound level exceeded during a certain percentage of the sample time. For example, L10 in the sound level exceeded 10 percent of the sample time. Similarly, L50, L90 and L99, etc.

Noise: Any unwanted sound or sound which is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying. The State Noise Control Act defines noise as "...excessive undesirable sound...".

Percent Noise Levels: See L(n).

Sound Level (Noise Level): The weighted sound pressure level obtained by use of a sound level meter having a standard frequency-filter for attenuating part of the sound spectrum.

Sound Level Meter: An instrument, including a microphone, an amplifier, an output meter, and frequency weighting networks for the measurement and determination of noise and sound levels.

Single Event Noise Exposure Level (SENEL): The dB(A) level which, if it lasted for one second, would produce the same A-weighted sound energy as the actual event.

Appendix B
Short Term Noise Measurement

10-Minute Continuous Noise Measurement Datasheet

Project:	Smoke Tree Resort / Baseline	Site Observations:	Clear sky, measurement was performed within 5-feet of existing property line. Ambient noise consisted of traffic along and construction on Lincoln Drive.
Site Address/Location:	7101 E Lincoln Drive, Prsrdise City, AZ		
Date:	7/7/2020		
Field Tech/Engineer:	Robert Pearson		

General Location:

Sound Meter: LD SN: 10569

Settings: A-weighted, slow, 1-sec, 10-minute interval

Meteorological Con.: 92 degrees F, 2 to 5 mph wind, eastern direction

Site ID: ST-1 thru ST-4

Site Topo: Flat

Ground Type: Hard site conditions, reflective

Noise Source(s) w/ Distance:

- 1 - C/L of Lincoln Drive is approx. 40ft from meter
- 2 - 5 feet from West Property line
- 3 - 5ft from South Property line
- 4 - 5ft from East property line

Figure 1: Monitoring Locations

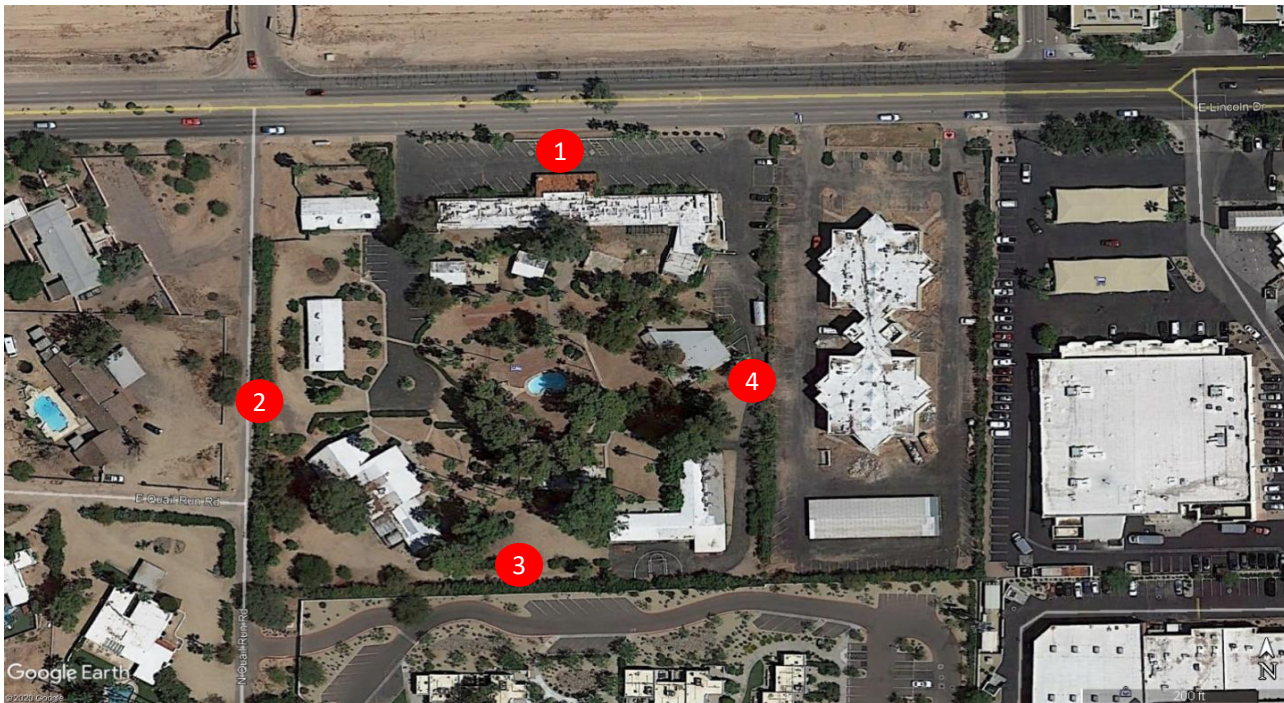


Figure 2: ST-1 Photo



Figure 3: ST-2 Photo



10-Minute Continuous Noise Measurement Datasheet - Cont.

Project: Smoke Tree Resort / Baseline
Site Address/Location: 7101 E Lincoln Drive, Prsrdise City, AZ
Site ID: ST-1 thru ST-4

Figure 4: ST-3 Photo



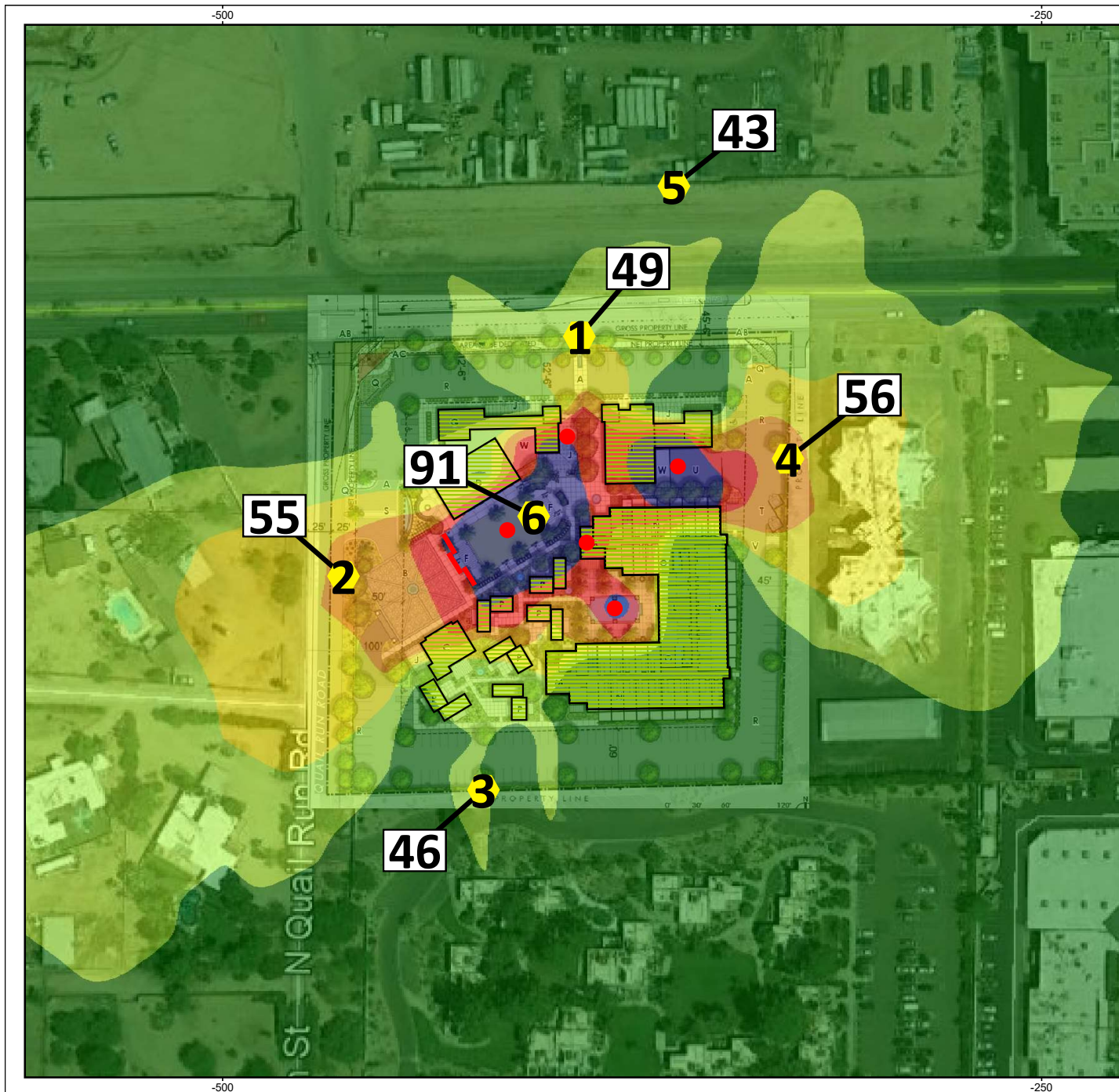
Figure 5: ST-4 Photo



Table 1: Morning - Baseline Noise Measurement Summary

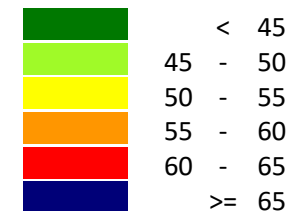
Location	Start	Stop	Leq	Lmax	Lmin	L2	L8	L25	L50	L90
1	9:10 AM	9:20 AM	63.9	75.2	49.7	66.9	636	62.1	60.6	56.0
2	9:27 AM	9:37 AM	47.4	62.2	41.1	51.5	49.6	46.8	45.5	42.5
3	9:39 AM	9:49 AM	51.3	60.0	42.8	56.1	55.4	51.7	47.7	44.8
4	9:51 AM	10:01 AM	47.0	63.7	43.2	49.3	47.8	46.3	45.7	44.6

Appendix C
Operational Worst Case
Noise Level and Contours

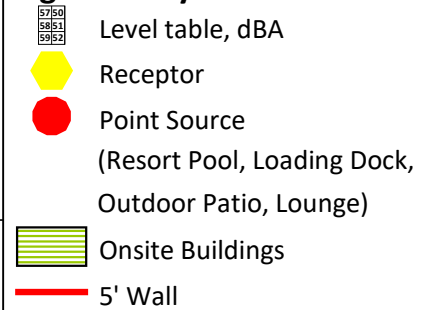


03602003_Smoke Tree Resort Noise Level Contours Event Lawn Scenario 1 - Weekday

Levels in dB(A)

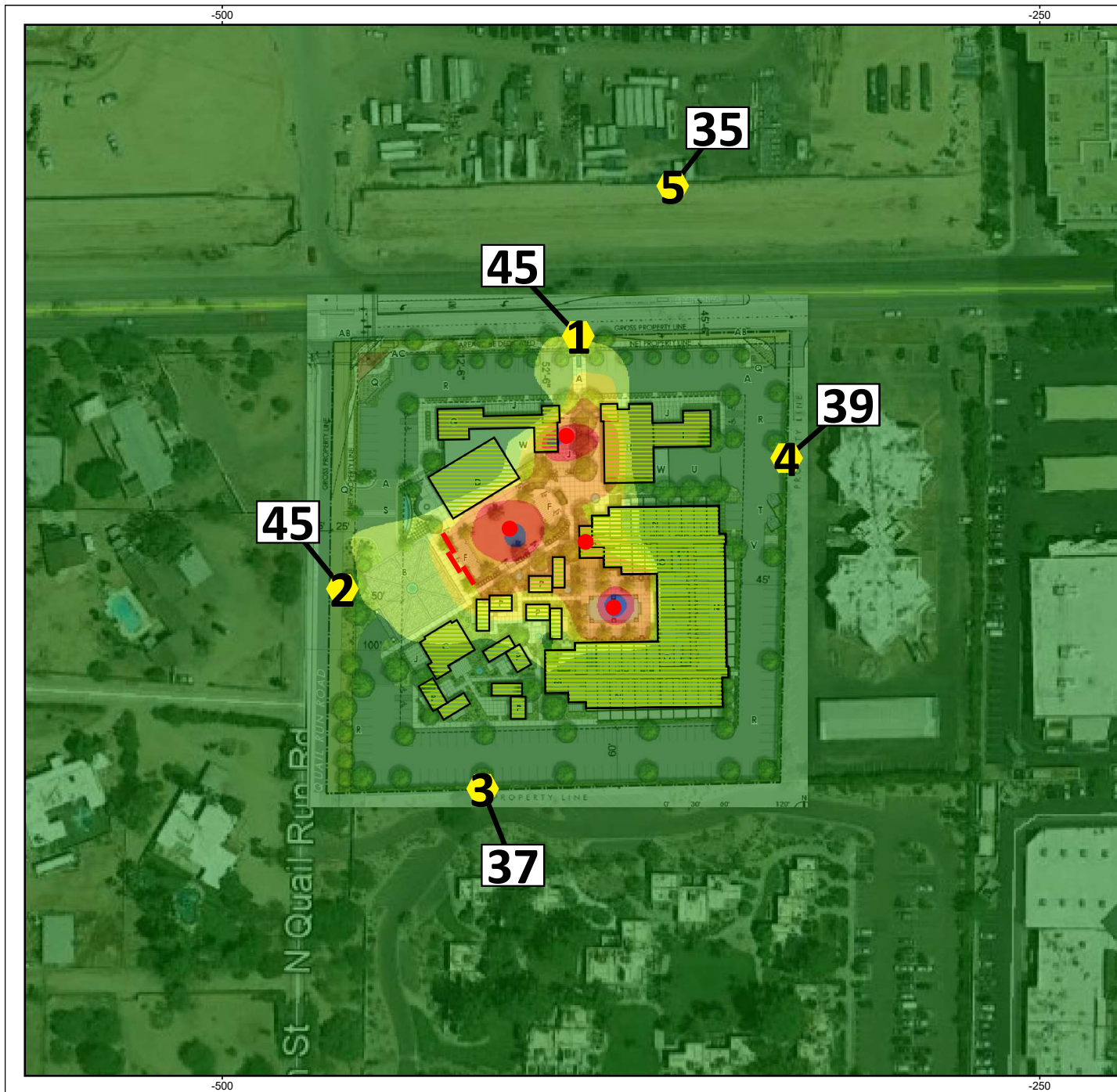


Signs and symbols



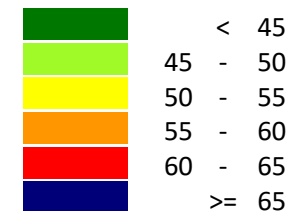
Length scale 1:100



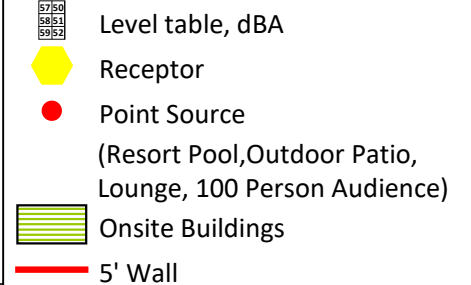


**03602003_Smoke Tree Resort
Noise Level Contours
Scenario 2 - Holiday/Sunday**

Levels in dB(A)



Signs and symbols



Length scale 1:100



The noise level has the potential to exceed the City's noise ordinance if loading/unloading (idling trucks) occurs on Sundays and Holidays at R4. Therefore, an agreement has been made with the City that no loading/unloading (idling trucks) will occur on Sundays and Holidays at R4

Appendix D
SoundPLAN Modeling
Input/Output

Smoke Tree Resort

Octave spectra of the sources in dB(A) - Situation 2: Outdoor SP

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Name	Source type	I or A m,m²	Li dB(A)	R'w dB	L'w dB(A)	Lw dB(A)	KI dB	KT dB	LwMax dB(A)	DO-Wall dB	Time histogram	Emission spectrum	63Hz dB(A)	125Hz dB(A)	250Hz dB(A)	500Hz dB(A)	1kHz dB(A)	2kHz dB(A)	4kHz dB(A)	8kHz dB(A)	16kHz dB(A)
	Point				84.0	84.0	0.0	0.0		0	100%/24h					84.0					
Event Lawn/Crowd Audience	Point				94.6	94.6	0.0	0.0		0	100%/24h					94.6					
Loading Dock	Point				94.5	94.5	0.0	0.0		0	100%/24h	Idling Heavy Diesel Truck	40.7	66.0	72.8	84.0	91.5	89.3	84.2	74.6	58.0
Lounge	Point				84.5	84.5	0.0	0.0		0	100%/24h					84.5					
PA System	Point				105.0	105.0	0.0	0.0		0	100%/24h	12' from Two 15" Loud Speakers	90.7	94.3	100.7	100.4	92.9	91.7	90.5	86.4	74.9
Pool	Point				84.0	84.0	0.0	0.0		0	100%/24h					84.0					

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Smoke Tree Resort

Contribution spectra - Situation 2: Outdoor SP

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Source	Time slice	Sum	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
		dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
Receiver Receiver 1 FI G Lr,lim		dB(A)	Leq,d 49.3 dB(A)																										
3	Leq,d	44.0														44.0													
Event Lawn/Crowd Audience	Leq,d	33.0														33.0													
Loading Dock	Leq,d	29.8	-51.6	-42.3	-34.1	-29.0	-21.0	-12.4	-7.8	9.3	1.6	4.5	6.8	10.6	14.5	16.4	17.3	20.2	24.5	20.0	20.1	19.7	17.4	14.9	12.2	9.9	4.1	-3.4	-11.9
Lounge	Leq,d	35.9														35.9													
PA System	Leq,d	47.2	-23.2	-14.6	10.8	20.4	27.6	42.2	38.2	35.0	34.5	30.0	35.0	35.8	35.5	38.4	33.7	25.0	23.8	26.9	28.1	26.0	18.3	20.6	15.4	10.5	7.2	-0.2	-8.1
Pool	Leq,d	18.0														18.0													
Receiver Receiver 2 FI G Lr,lim		dB(A)	Leq,d 55.4 dB(A)																										
3	Leq,d	33.0														33.0													
Event Lawn/Crowd Audience	Leq,d	48.1														48.1													
Loading Dock	Leq,d	28.0	-54.5	-44.8	-36.2	-30.6	-22.1	-13.7	-10.2	7.1	-0.6	-1.0	1.0	5.0	10.6	12.7	14.0	19.7	23.7	18.8	18.4	17.3	14.0	10.5	6.6	2.0	-5.5	-15.5	-27.4
Lounge	Leq,d	37.7														37.7													
PA System	Leq,d	54.4	-20.0	-11.1	14.6	23.6	31.1	45.8	42.0	40.5	41.4	39.8	46.6	43.1	42.2	46.6	44.1	36.9	34.9	37.5	37.3	36.4	29.6	34.2	30.3	27.4	26.4	21.5	16.4
Pool	Leq,d	31.7														31.7													
Receiver Receiver 3 FI G Lr,lim		dB(A)	Leq,d 45.8 dB(A)																										
3	Leq,d	21.7														21.7													
Event Lawn/Crowd Audience	Leq,d	41.1														41.1													
Loading Dock	Leq,d	20.4	-59.5	-50.7	-43.0	-38.4	-30.7	-23.0	-18.5	-1.7	-9.8	-7.5	-5.5	-1.6	2.7	5.0	6.5	10.7	15.4	11.1	11.3	10.9	8.3	5.3	1.9	-2.2	-9.4	-19.2	-31.1
Lounge	Leq,d	31.4														31.4													
PA System	Leq,d	43.7	-25.0	-16.6	8.7	18.0	25.0	39.2	34.6	30.8	30.4	29.9	35.6	31.5	29.7	32.4	27.3	18.2	15.6	17.6	16.2	12.6	3.5	6.7	1.6	-3.1	-6.4	-13.2	-20.9
Pool	Leq,d	22.9														22.9													
Receiver Receiver 4 FI G Lr,lim		dB(A)	Leq,d 56.4 dB(A)																										
3	Leq,d	25.6														25.6													
Event Lawn/Crowd Audience	Leq,d	46.1														46.1													
Loading Dock	Leq,d	55.5	-41.4	-31.4	-22.4	-16.4	-7.4	1.6	7.8	26.4	19.4	20.4	23.4	28.4	34.8	37.8	39.8	45.4	50.4	46.3	46.6	46.5	44.3	42.1	39.6	36.9	31.9	25.3	18.1
Lounge	Leq,d	18.0														18.0													
PA System	Leq,d	45.9	-28.2	-19.4	6.4	16.3	23.9	38.9	35.2	32.7	33.3	32.7	38.3	33.9	35.6	37.9	32.4	21.8	19.0	21.8	22.2	18.7	9.6	10.7	5.2	-0.2	-4.9	10.5	1.2
Pool	Leq,d	16.1														16.1													
Receiver Receiver 5 FI G Lr,lim		dB(A)	Leq,d 43.4 dB(A)																										
3	Leq,d	33.4														33.4													
Event Lawn/Crowd Audience	Leq,d	32.9														32.9													
Loading Dock	Leq,d	29.3	-55.6	-46.3	-38.0	-32.8	-24.7	-15.2	-9.6	8.1	1.3	4.6	6.4	10.2	15.2	17.0	17.8	20.6	24.5	19.4	19.0	17.8	14.5	11.0	7.4	5.0	-1.9	-11.1	-21.5
Lounge	Leq,d	28.7														28.7													
PA System	Leq,d	42.1	-30.5	-21.7	4.1	14.0	21.6	36.6	32.4	29.8	30.0	28.1	33.2	29.6	30.0	32.4	29.1	19.4	17.6	20.0	20.3	16.6	9.5	11.8	6.0	-0.5	-5.7	-15.4	-25.7
Pool	Leq,d	15.1														15.1													

Smoke Tree Resort
Contribution spectra - Situation 2: Outdoor SP

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Source	Time slice	Sum	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
		dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
Receiver Receiver 6		FI	G	Lr,lim	dB(A)	Leq,d 91.5 dB(A)																							
3	Leq,d	47.0														47.0													
Event Lawn/Crowd Audience	Leq,d	67.4														67.4													
Loading Dock	Leq,d	35.7	-47.9	-38.2	-29.6	-24.1	-15.5	-7.1	-3.0	14.4	6.7	7.4	9.6	13.6	19.0	21.1	22.2	27.0	31.2	26.3	25.9	25.0	22.0	18.9	15.6	12.1	6.1	-1.4	-9.8
Lounge	Leq,d	45.7														45.7													
PA System	Leq,d	91.4	12.2	21.0	46.7	56.6	64.2	79.2	76.2	75.1	76.3	77.9	84.9	81.5	79.7	84.0	81.3	73.2	72.1	75.5	75.1	74.3	67.9	73.7	70.8	69.0	69.6	67.4	66.1
Pool	Leq,d	44.1														44.1													

Smoke Tree Resort

Contribution level - Situation 2: Outdoor SP

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Source	Source group	Source ty	Tr. lane	Leq,d dB(A)	A dB	
Receiver Receiver 1 FI G Lr,lim dB(A) Leq,d 49.3 dB(A)						
Loading Dock	Default industrial noise	Point		29.8	0.0	
Lounge	Default industrial noise	Point		35.9	0.0	
	Default industrial noise	Point		44.0	0.0	
Pool	Default industrial noise	Point		18.0	0.0	
PA System	Default industrial noise	Point		47.2	0.0	
Event Lawn/Crowd Audience	Default industrial noise	Point		33.0	0.0	
Receiver Receiver 2 FI G Lr,lim dB(A) Leq,d 55.4 dB(A)						
Loading Dock	Default industrial noise	Point		28.0	0.0	
Lounge	Default industrial noise	Point		37.7	0.0	
	Default industrial noise	Point		33.0	0.0	
Pool	Default industrial noise	Point		31.7	0.0	
PA System	Default industrial noise	Point		54.4	0.0	
Event Lawn/Crowd Audience	Default industrial noise	Point		48.1	0.0	
Receiver Receiver 3 FI G Lr,lim dB(A) Leq,d 45.8 dB(A)						
Loading Dock	Default industrial noise	Point		20.4	0.0	
Lounge	Default industrial noise	Point		31.4	0.0	
	Default industrial noise	Point		21.7	0.0	
Pool	Default industrial noise	Point		22.9	0.0	
PA System	Default industrial noise	Point		43.7	0.0	
Event Lawn/Crowd Audience	Default industrial noise	Point		41.1	0.0	
Receiver Receiver 4 FI G Lr,lim dB(A) Leq,d 56.4 dB(A)						
Loading Dock	Default industrial noise	Point		55.5	0.0	
Lounge	Default industrial noise	Point		18.0	0.0	
	Default industrial noise	Point		25.6	0.0	
Pool	Default industrial noise	Point		16.1	0.0	
PA System	Default industrial noise	Point		45.9	0.0	
Event Lawn/Crowd Audience	Default industrial noise	Point		46.1	0.0	
Receiver Receiver 5 FI G Lr,lim dB(A) Leq,d 43.4 dB(A)						
Loading Dock	Default industrial noise	Point		29.3	0.0	
Lounge	Default industrial noise	Point		28.7	0.0	
	Default industrial noise	Point		33.4	0.0	
Pool	Default industrial noise	Point		15.1	0.0	
PA System	Default industrial noise	Point		42.1	0.0	
Event Lawn/Crowd Audience	Default industrial noise	Point		32.9	0.0	
Receiver Receiver 6 FI G Lr,lim dB(A) Leq,d 91.5 dB(A)						
Loading Dock	Default industrial noise	Point		35.7	0.0	
Lounge	Default industrial noise	Point		45.7	0.0	
	Default industrial noise	Point		47.0	0.0	
Pool	Default industrial noise	Point		44.1	0.0	
PA System	Default industrial noise	Point		91.4	0.0	
Event Lawn/Crowd Audience	Default industrial noise	Point		67.4	0.0	

Smoke Tree Resort
Octave spectra of the sources in dB(A) - Situation 3: Outdoor SP

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Name	Source type	I or A m,m²	Li dB(A)	R'w dB	L'w dB(A)	Lw dB(A)	KI dB	KT dB	LwMax dB(A)	DO-Wall dB	Time histogram	Emission spectrum	500Hz dB(A)	
Event Lawn/Crowd Audience	Point				88.6	88.6	0.0	0.0		0	100%/24h		88.6	
Lounge	Point				84.5	84.5	0.0	0.0		0	100%/24h		84.5	
Patio	Point				84.0	84.0	0.0	0.0		0	100%/24h		84.0	
Pool	Point				84.0	84.0	0.0	0.0		0	100%/24h		84.0	

Smoke Tree Resort Contribution level - Situation 3: Outdoor SP

9

Source	Source group	Source ty	Tr. lane	Leq,d dB(A)	A dB	
Receiver Receiver 1 FI G Lr,lim dB(A) Leq,d 44.7 dB(A)						
Lounge	Default industrial noise	Point		35.9	0.0	
Patio	Default industrial noise	Point		44.0	0.0	
Pool	Default industrial noise	Point		18.0	0.0	
Event Lawn/Crowd Audience	Default industrial noise	Point		27.3	0.0	
Receiver Receiver 2 FI G Lr,lim dB(A) Leq,d 44.8 dB(A)						
Lounge	Default industrial noise	Point		38.5	0.0	
Patio	Default industrial noise	Point		32.3	0.0	
Pool	Default industrial noise	Point		30.7	0.0	
Event Lawn/Crowd Audience	Default industrial noise	Point		43.0	0.0	
Receiver Receiver 3 FI G Lr,lim dB(A) Leq,d 37.1 dB(A)						
Lounge	Default industrial noise	Point		31.4	0.0	
Patio	Default industrial noise	Point		21.7	0.0	
Pool	Default industrial noise	Point		22.9	0.0	
Event Lawn/Crowd Audience	Default industrial noise	Point		35.3	0.0	
Receiver Receiver 4 FI G Lr,lim dB(A) Leq,d 39.3 dB(A)						
Lounge	Default industrial noise	Point		18.0	0.0	
Patio	Default industrial noise	Point		25.6	0.0	
Pool	Default industrial noise	Point		16.1	0.0	
Event Lawn/Crowd Audience	Default industrial noise	Point		39.0	0.0	
Receiver Receiver 5 FI G Lr,lim dB(A) Leq,d 35.4 dB(A)						
Lounge	Default industrial noise	Point		28.7	0.0	
Patio	Default industrial noise	Point		33.4	0.0	
Pool	Default industrial noise	Point		15.1	0.0	
Event Lawn/Crowd Audience	Default industrial noise	Point		26.8	0.0	

Smoke Tree Resort

Contribution spectra - Situation 3: Outdoor SP

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Source	Time slice	Sum	400Hz	500Hz	630Hz	
		dB(A)	dB(A)	dB(A)	dB(A)	
Receiver Receiver 1 FI G Lr,lim dB(A) Leq,d 44.7 dB(A)						
Event Lawn/Crowd Audience	Leq,d	27.3	22.6	22.6	22.6	
Lounge	Leq,d	35.9	31.1	31.1	31.1	
Patio	Leq,d	44.0	39.2	39.2	39.2	
Pool	Leq,d	18.0	13.3	13.3	13.3	
Receiver Receiver 2 FI G Lr,lim dB(A) Leq,d 44.8 dB(A)						
Event Lawn/Crowd Audience	Leq,d	43.0	38.2	38.2	38.2	
Lounge	Leq,d	38.5	33.7	33.7	33.7	
Patio	Leq,d	32.3	27.6	27.6	27.6	
Pool	Leq,d	30.7	25.9	25.9	25.9	
Receiver Receiver 3 FI G Lr,lim dB(A) Leq,d 37.1 dB(A)						
Event Lawn/Crowd Audience	Leq,d	35.3	30.5	30.5	30.5	
Lounge	Leq,d	31.4	26.7	26.7	26.7	
Patio	Leq,d	21.7	16.9	16.9	16.9	
Pool	Leq,d	22.9	18.2	18.2	18.2	
Receiver Receiver 4 FI G Lr,lim dB(A) Leq,d 39.3 dB(A)						
Event Lawn/Crowd Audience	Leq,d	39.0	34.3	34.3	34.3	
Lounge	Leq,d	18.0	13.2	13.2	13.2	
Patio	Leq,d	25.6	20.8	20.8	20.8	
Pool	Leq,d	16.1	11.3	11.3	11.3	
Receiver Receiver 5 FI G Lr,lim dB(A) Leq,d 35.4 dB(A)						
Event Lawn/Crowd Audience	Leq,d	26.8	22.0	22.0	22.0	
Lounge	Leq,d	28.7	24.0	24.0	24.0	
Patio	Leq,d	33.4	28.7	28.7	28.7	
Pool	Leq,d	15.1	10.4	10.4	10.4	

MD Acoustics LLC 4960 S. Gilbert Rd Chandler, AZ 85249 Phone: 602 774 1950

Appendix E

Reference Data

Event Noise Methodology

Typical sound levels for a range of activities comparable to what might occur at Special Events of sizes similar to those allowed by the proposed Zoning Text Amendment are shown below in Table 9-10. Such data includes a combination of noise measurement results conducted by Bollard Acoustical Consultants, Inc. in recent years, as well as published sound level data for persons conversing at various levels.⁶

Table 9-10 Typical Sound Levels for Special Events	
Event or Activity	Typical Noise Level at 50 feet (dBA L_{eq})
Amplified speech/music at louder event (i.e. 200 person wedding reception)	75
Amplified speech/music at smaller event (i.e. 100 person reception)	72
Amplified speech only (no amplified music)	65
Non-amplified music (i.e. acoustic ensemble)	60
Non-amplified music (single acoustic guitar)	56
Raised conversations (100 people)	60
Raised conversations (50 people)	57
<i>Source: Bollard Acoustical Consultants, Inc., 2019.</i>	

Noise levels generated during special events occurring at three existing Placer County wineries were monitored in September and October of 2017, and March of 2018. Although the numbers of attendees at the events varied throughout the course of each event, event attendance reportedly exceeded 50 people and amplified music was present during each of the events. The measured average noise level during the events was 55 dB L_{eq} at the reference measurement distance of 200 feet from the approximate acoustic center of the event areas. Measured instantaneous maximum noise levels during the same events were 10 to 15 dB higher than the measured average noise levels, but the distances to the source of the maximum noise levels is more uncertain because the location of instantaneous maximum noise level sources cannot be exactly pinpointed.

The measured special event noise levels, which were all within compliance with the County Noise Ordinance standards at the nearest noise-sensitive property lines, correspond to approximately 67 dB L_{eq} at a reference distance of 50 feet. The test results indicate that the measured special event noise levels were approximately 5 to 8 dB lower than the reference sound levels shown in Table 9-10 for amplified music. This difference may have been caused in part by additional sound absorption by intervening vineyards or variations in amplifier settings. To provide reasonably conservative estimates of the potential noise generation of special events, the reference noise level data contained in Table 9-10 was applied to this analysis.

Sound radiating away from a fixed location decreases at a rate of approximately 6 dB for each doubling of distance from the noise source. Thus, for a sound source (i.e. amplified music), that generates a median noise level of 75 dB at a distance of 50 feet from the speakers, the sound level at a distance of 100 feet from that same source would be 6 dB lower, or 69 dB. At a distance of

⁶ Harris, Cyril M. *Handbook of Acoustical Measurements and Noise Control*. 1998.

200 feet from the speakers (a doubling of distance from the 100-foot location), the expected sound level would be 12 dB lower, or approximately 63 dB. This 6 dB per doubling of distance attenuation rate assumes a direct line of sight between the noise source and receiver (i.e. no shielding by intervening buildings, topography, or vegetation), and does not include further decreases in sound which occur over distance with atmospheric absorption of sound. The 6 dB per doubling of distance attenuation rate was used to provide a conservative estimate of the distances to the critical noise contours for the various types of sound sources identified in Table 9-10. In addition, an offset of -1.5 dB per thousand feet from the noise sources is required to account for atmospheric absorption.

According to the ambient noise level data contained in Table 9-4, daytime average ambient conditions in the rural areas of Placer County averaged approximately 50 dB L_{eq} . Thus, satisfaction with the County's 55 dB L_{eq} Noise Ordinance daytime threshold, and 50 dB L_{eq} daytime threshold for events within the Auburn/Bowman Community Plan area, would ensure that the noise level increase associated with winery and farm brewery events would be approximately 5 dB or less, which is consistent with the Noise Ordinance threshold. However, because the noise source in question consists of speech and/or music, a -5 dB penalty is applied to the County noise standard. As a result, the critical daytime noise threshold for speech or music generated during events would be 50 dB L_{eq} during daytime hours (45 dB L_{eq} for the Auburn/Bowman Community Plan area).

During evening hours (7:00 PM to 10:00 PM), average measured ambient conditions were approximately 45 dB L_{eq} . After upward adjustment by 5 dB for the allowable increase and downward adjustment by 5 dB because the noise source consists of speech or music, this analysis concludes that the appropriate evening sound level threshold for special events would be 45 dB L_{eq} at nearby sensitive areas, including uses within the Auburn/Bowman Community Plan area. The 5 dB threshold is identified as the limit for non-transportation noise level increases in the Section 9.36.060.A.1 of the Placer County Code. The distances to the 45 and 50 dB L_{eq} noise contours are identified in Table 9-11 below.

Table 9-11		
Distances Required to Attenuate Event Noise		
Event/Activity	Distance to Contour (feet)	
	50 dB L_{eq}	45 dB L_{eq}
Amplified speech/music at louder event (i.e. wedding reception)	750	1,225
Amplified speech/music at quieter event (i.e. wine industry dinner)	550	925
Amplified speech only (no amplified music)	275	450
Non-amplified music (i.e. acoustic ensemble)	150	275
Non-amplified music (single acoustic guitar)	100	175
Raised conversations (100 people)	150	275
Raised conversations (50 people)	125	200
Note: The distances presented above do not include any additional attenuation which would result from shielding by intervening topography, structures, or vegetation.		
Source: <i>Bollard Acoustical Consultants, Inc., 2019.</i>		

Project: 04551801 McDowell Golf
Site Location: 10690 E. Sheena Drive, Scottsdale, AZ 85255
Date: 9/7/2018
Field Tech/Engineer: Samuel Hord
Source/System: 2 speaker system

Site Observations:

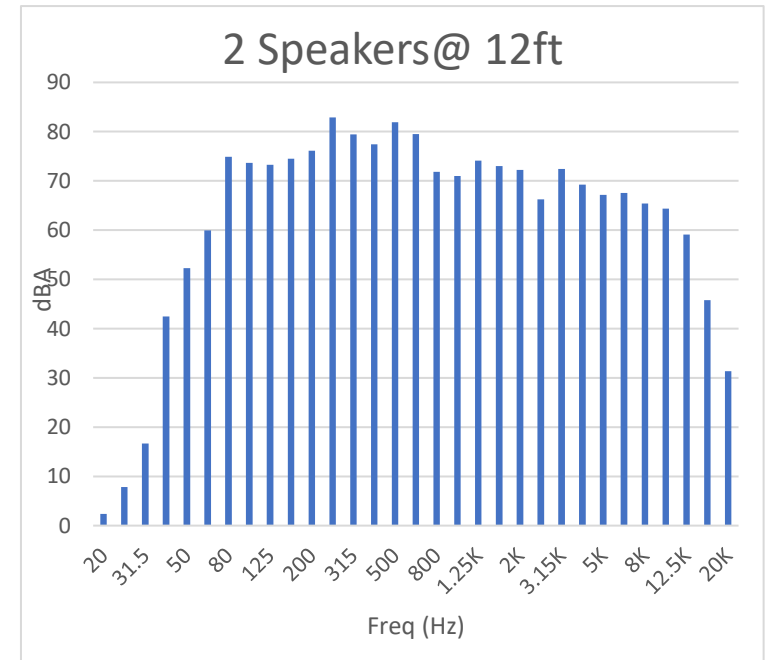
Meter placed 12 feet from two Thump 15 Speakers, testing of sound ordinance compliance. Five minutes of wedding music medley.

Location: Event Area
Sound Meter: LD **SN:** 3716
Settings: A-weighted, fast, 1-sec, 5-min duration
Meteorological Cond.: N/A

Table 1: Summary Measurement Data

Source	System	Leq	3rd Octave Band Data (dBA) - Leq																														
			20	25	32	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1K	1.25K	1.6K	2K	2.5K	3.15K	4K	5K	6.3K	8K	10K	12.5K	16K	20K
12 feet from 2 Speaker	Loud Speaker	89.4	2	8	17	42	52	60	75	74	73	75	76	83	79	77	82	80	72	71	74	73	72	66	72	69	67	68	65	64	59	46	31

Figure 1: Two 15" Thump Speakers



Project: N/A
Site Location: MD Acoustics and Labs 170 S. William Dillard Dr. Suite 103
Date: 8/11/2020
Field Tech/Engineer: Shon Baldwin
Source/System: Semi Truck

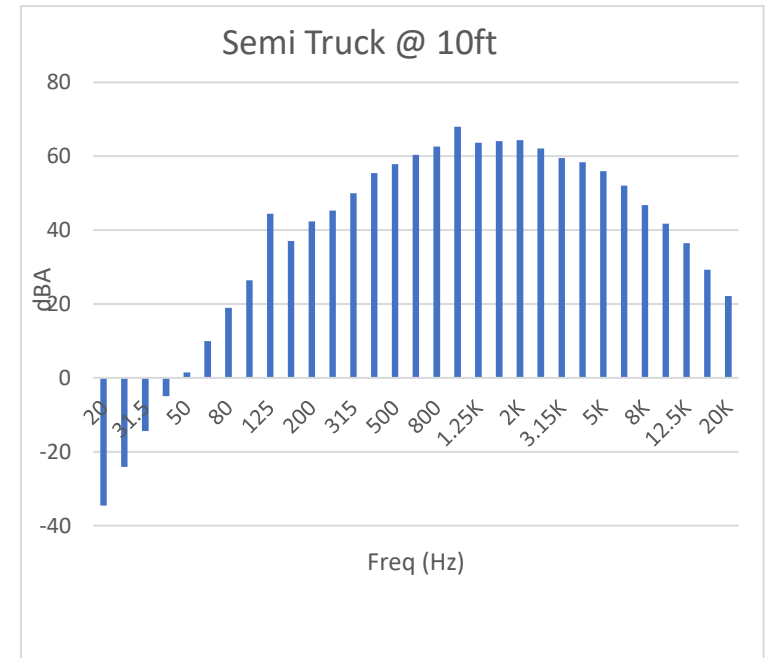
Site Observations:
Meter placed at 10-feet from side of truck

Location: Loading dock
Sound Meter: NTi XL2 **SN:** A2A-16164-EO
Settings: Z-weighted, fast, 1-sec, 10-sec duration
Meteorological Cond.: N/A

Table 1: Summary Measurement Data

Source	System	Leq	3rd Octave Band Data (dBA) - LAFmax																														
			20	25	32	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1K	1.25K	1.6K	2K	2.5K	3.15K	4K	5K	6.3K	8K	10K	12.5K	16K	20K
10 feet from semi truck	Semi Truck	73.4	-35	-24	-14	-5	1	10	19	26	44	37	42	45	50	55	58	60	63	68	64	64	64	62	60	58	56	52	47	42	36	29	22

Figure 1: Semi Truck





Town of Paradise Valley
Paul E. Michaud
Planning Manager
6401 E Lincoln Drive
Paradise Valley, AZ 85253

September 22, 2020

Dear Mr. Michaud,

ACS has been asked to review MD Acoustics' revised Noise Study (dated 9/15/20) for The Smoke Tree Resort (Paradise Valley, AZ).

Noise Level Modeling Software

MD Acoustics used SoundPlan Acoustic Modeling Software (SP) to predict the potential noise impact to the nearby properties to determine compliance with the Town of Paradise Valley's noise ordinance. SoundPlan is an industry standard modeling program that uses industry standard formulas. This program should provide accurate noise projections (provided the input data/assumptions are correct).

Determination of Compliance

The input data/assumptions used for this modeling are reasonable and based on actual measurements or studies. Based on these assumptions, the study determined compliance with the Town's noise level limits at the north, south, and west property lines.

Non-Compliance

The projected noise level complies with the Town's daytime limit at the east property line but exceeded the Town's nighttime and Sunday/Holiday limit by almost 10 decibels. However, an office building is to the west and likely not occupied during these days/times. Additionally, it appears this exceedance is primarily (if not exclusively) caused by delivery trucks. These events would be periodic and likely not occur during the nighttime and Sunday/Holidays.

Assessment at the Use's Property Line

The Town's Noise Ordinance states that the noise level limits apply to the projected noise "from one property into another." It is my understanding that the Town applies this limit at the use's property line. This is common for many municipalities. However, it is my opinion that noise limits should be applied at the receive property. For this project, assessment at the receive property would reduce the projected noise level to the west by approximately 2 decibels – providing some margin of error/safety.

Reference Levels Could be Understated for Some Events

Although reasonable, the reference source noise levels used for this study could be exceeded by some typical events. This would likely cause an exceedance of the Town's noise limits (particularly since the determination on compliance was with no (or an imperceptible) margin of error/safety – projected noise levels at the west property line were only 0-1 decibel below the limit). However, it is my understanding that these events will be monitored, and remedies implemented if the levels exceed compliance.

Reference Levels are not Maximum Levels

The source noise levels used are not the maximum noise levels measured during the reference studies. An Leq source noise level was used. This level does not represent the maximum noise level as required by the Town's noise ordinance. The Leq measurement is a weighted-average (or "equivalent") noise level over a period of time. The maximum noise levels will be higher than the Leq levels for these events. It is highly likely that the maximum noise levels will exceed the Town's noise limit even for events whose Leq levels are below the noise limit. However, the times the maximum noise level will exceed the Leq level will likely be for short durations throughout the event. Again, it is my understanding that these events will be monitored, and remedies implemented if the levels exceed compliance.

Summary

The noise levels were projected using industry standard software and were based on reasonable assumptions. The results concluded a noise ordinance violation for the east property line during the nighttime and Sundays/Holidays. However, the impacted office building would likely not be occupied during these days/times. Additionally, the delivery trucks would likely not occur during the nighttime and Sunday/Holidays.

The results concluded compliance at the other locations, but these results are not guarantees of compliance. It is highly likely that the Town's noise level limits will be exceeded for at least some periods of time for at least some events. However, it is my understanding that these events will be monitored, and remedies implemented if the levels exceed compliance.

Please let me know if you have any questions or need additional information.

Respectfully,



Tony Sola

Acoustical Consulting Services