

MEMO



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To: Elliott Faxstein – Director of Special Projects, Long Meadow Ranch

From: Carter Howard

SUBJECT: Farmstead at Long Meadow Ranch
Exterior Noise Analysis

This memo provides results of the noise study of existing mechanical and electrical equipment at Farmstead at Long Meadow Ranch (738 Main St, St Helena, CA 94574) and recommended treatment for limiting noise intrusion on residential properties east of Farmstead to comply with regulations defined in the 1993 St. Helena General Plan.

EXISTING CONDITIONS

To document existing conditions, two noise surveys were performed at Farmstead on 6/7/18 and 6/28/18. Noise output from exterior equipment was measured close to the equipment and at the east property line. The highest measured level at the east property line was 63 dBA and the loudest equipment was exhaust fan EXF-1 serving the barn/catering kitchen and Trane® packaged air-conditioning unit AC-1 serving the main restaurant building. Figure 1 on the next page identifies the equipment observed at Farmstead.

A 3-dimensional computer model of the site and equipment was constructed using SoundPLAN®. This model then was calibrated to match the measurements made during our noise surveys and subsequently used to predict noise levels from individual equipment and cumulative noise levels, both at the east property line and at neighboring residential facades. Table 1 on the next page shows these predictions ordered from highest to lowest noise level at the east property line. Additionally, a color contour map of the existing noise levels is attached in Appendix A.

Figure 1 – Equipment at Farmstead



TABLE 1 – Existing Noise Levels

Equipment	Highest noise level at property line (dBA)	Noise level at residential facades (dBA)
Barn Exhaust Fan (EXF-1)	60	45
Trane Packaged Unit (AC-1)	58	33
Restaurant MAU	47	31
Barn Exhaust Fan (EXF-2)	46	32
Small AC unit above AC-1	46	35
Solar Panel Electrical Box	45	23
Mushroom Exhaust Fans (EF-1 thru 5)	44	31
Barn MAU	41	24
Carrier Condensing Units	40	27
Electrical Transformer	37	14
All Equipment (Total)	62	46

The equipment contributing the most noise at the property line are EXF-1 and AC-1, and at the neighboring residential facade primarily EXF-1.

REGULATORY SETTING

The 1993 St. Helena General Plan (Chapter 8, Table 8-5) defines the impact of intrusive noise on residential receivers as significant if the intrusive noise exceeds the A-weighted average (dBA-Leq) ambient noise level without the intrusive noise by more than 5 dBA. This criteria applies at “the nearest receiver property line or at the nearest affected exterior location which is deemed appropriate”. The General Plan also defines noise level corrections for tonal or impulsive noises, but Farmstead’s equipment runs produces continuous, broad-band noise without significant tonal or impulsive qualities as defined by the General Plan, therefore these corrections would not apply in this case. Table 8-5 from the General Plan is attached in Appendix C for reference.

Average noise levels to the east of Farmstead are typically between 45 and 50 dBA during Farmstead’s hours of operation. This is corroborated by the noise study prepared by Illingworth & Rodkin (dated 9/8/16), which reports that hourly average noise levels 300ft from Farmstead’s eastern property line typically do not drop below 45 dBA during the day (7am-10pm).

Given that average noise levels east of Farmstead are typically no less than 45 dBA during Farmstead’s hours of operation, the regulatory limit defined by the 1993 St. Helena General Plan would be 50 dBA at Farmstead’s eastern property line. On this basis, we have based our efforts for noise control on limiting Farmstead’s equipment noise to below 50 dBA at the eastern property line.

RECOMMENDATIONS

Using SoundPLAN®, we recommend the following treatment for limiting noise intrusion on residential properties to the east of Farmstead:

1. A 3ft long sound attenuator in the exhaust outlet duct of AC-1.
2. A 4-sided barrier around EXF-1, 3ft taller than the top of the unit’s discharge duct.
3. A 3-sided barrier around the Small AC unit above AC-1, 1ft taller than the unit.
4. Replacing the existing property line fence with an 8ft tall solid sound barrier.

Predicted noise levels with this treatment are presented in Table 2 below, assessed at the neighbor’s side of the eastern property line and at the neighboring residential facades. Existing noise levels in the same locations are also included in Table 2 for reference.

TABLE 2 – Noise Levels with Treatments

Condition	Treatments				Noise Levels	
	EXF-1	AC-1	Small AC unit above AC-1	Property Line Barrier	Neighbor's side of the eastern property line (dBA)	Residential facades (dBA)
Existing	None	None	None	None	60*	46
Treated	Barrier 3ft taller than unit	3ft-long sound attenuator	Barrier 1ft taller than unit	8ft tall	44	38

*Note that the highest levels on the neighbor's side of the property line are 2dB less than predicted levels *at* the property line. This is due to minor shielding from the existing property line fence.

Color contour maps of each condition are attached in Appendix A for reference. Note that these maps show levels 5ft above the ground (approx. head-height).

To implement these treatments appropriately, adhere to the following guidelines:

Property Line Barrier

- Minimum surface weight of 3psf
- No gaps or cracks across the entire surface
- Continuous closure/seal to the ground
- If using a wooden barrier, consider designs with planks/panels overlapping such that future gaps will not appear as the wood shrinks over time.
- Extend barrier along the east property line as shown in Figure 2 below.

EXF-1 Barrier

- 4-sided barrier around EXF-1 (see Figure 2 below)
- Minimum surface weight of 3psf
- No gaps or cracks across the entire surface
- Solid bottom panel below unit sealed to vertical panels (no gaps, min. 3psf)
- Consider prefabricated noise barriers such as IAC Noishield® (see attached cutsheet, Appendix B)

Small AC unit above AC-1 Barrier

- 3-sided barrier around the small AC unit (see Figure 2 below)
- Extend the short sides of the barrier to the end of the unit
- Minimum surface weight of 3psf
- No gaps or cracks across the entire surface
- Solid bottom panel below unit sealed to vertical panels (no gaps, min. 3psf)
- Consider prefabricated noise barriers, such as IAC Noishield® (cutsheet provided in Appendix B).

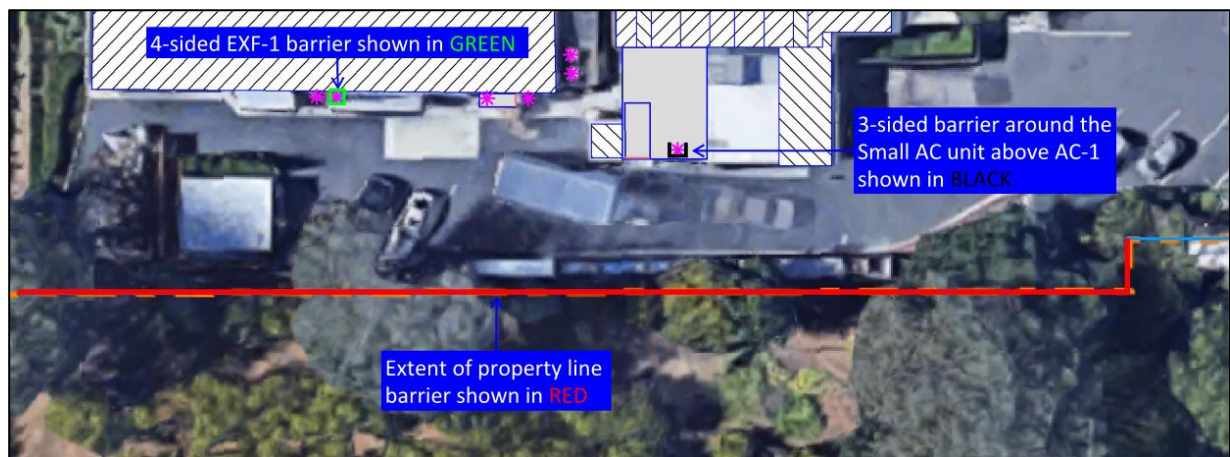
AC-1 Exhaust Sound Attenuator

- Select 3 feet long sound attenuator and size for air velocities 500fpm

- Allow minimum 3ft of straight duct after the elbow to minimize pressure drop and regenerated noise.
- Select a sound attenuator with the following minimum insertion loss values (consider reputable manufacturers such as Vibro-Acoustics and IAC):

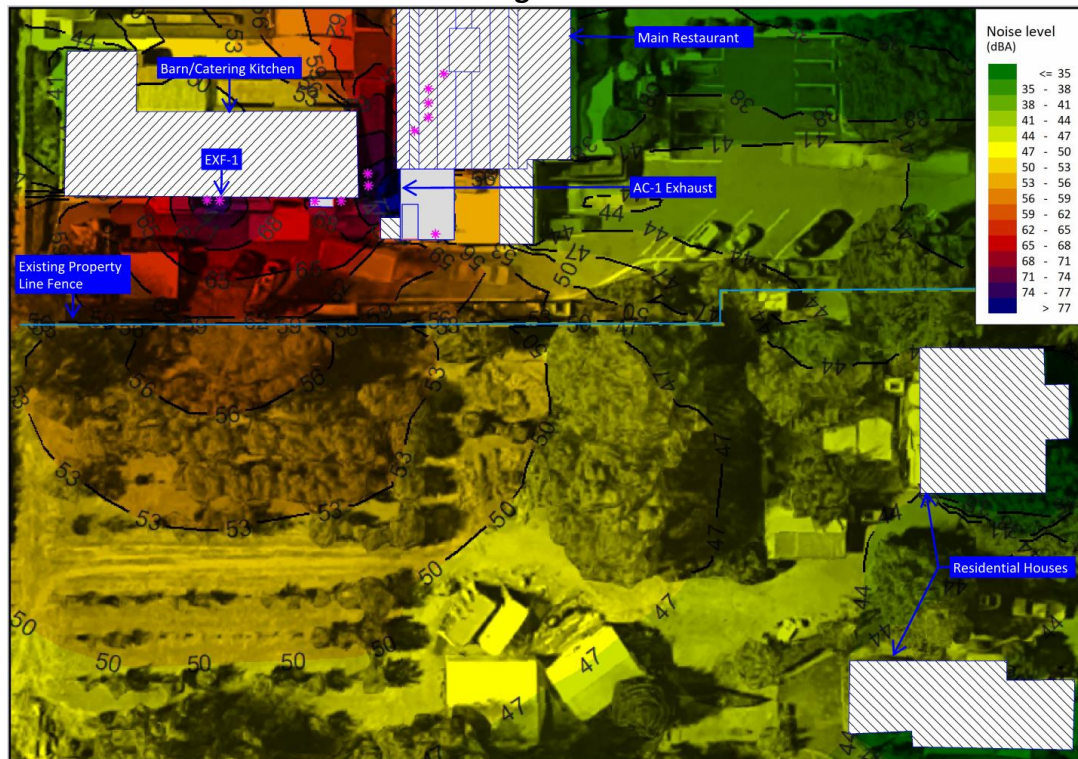
Minimum Attenuator Insertion Loss (dB) per Octave Band (Hz)					
125	250	500	1000	2000	4000
12	19	23	29	23	15

FIGURE 2 – Barrier Treatments

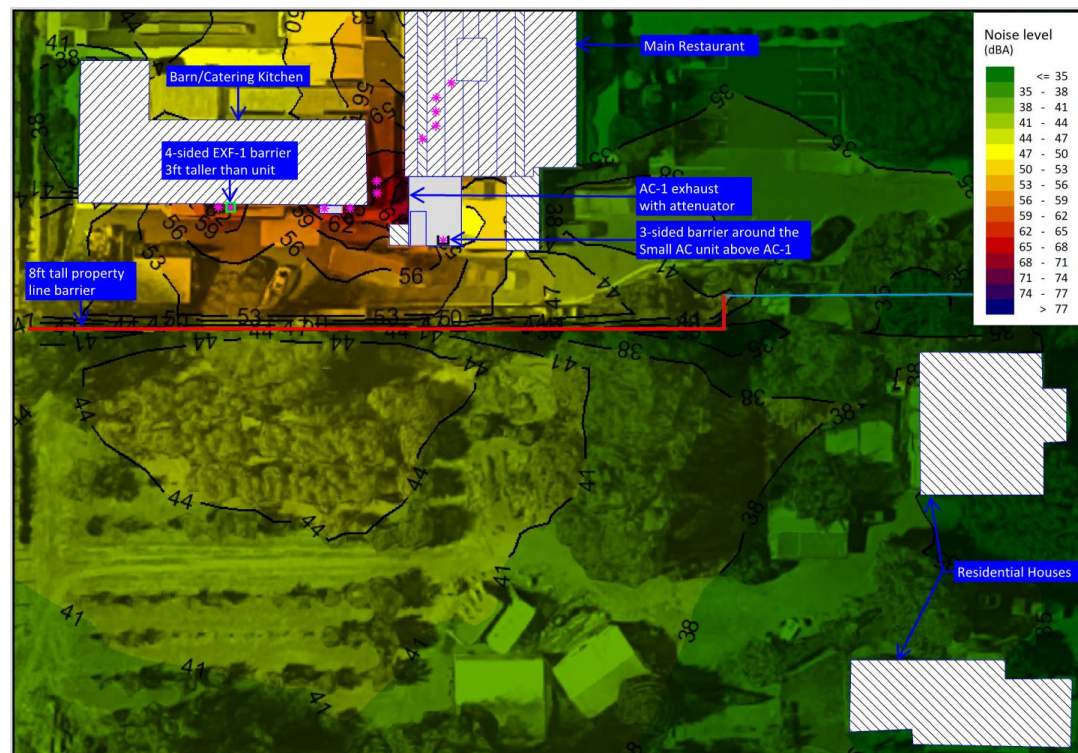


**APPENDIX A
NOISE MAPS**

Existing Condition



Treated Condition



APPENDIX B
IAC Noishield® Sound Barriers Cutsheet



IAC Noishield® Sound Barriers protect communities against noise such as air conditioners, pumps, compressors, fans, transformers, customer drive-thru's, salvage yards, condensers, car washes and traffic-rail-aircraft.

Freestanding Barriers-Noishield® Types: FS and SFS Barriers: sound absorptive on one and two side respectively - optimize sound transmission loss and sound absorbing properties in a durable and attractive wall system harmony with the community.

- Excellent low-frequency absorption for heavy equipment
- Laboratory-rated sound absorption on one or both sides, low weight, rugged construction.
- Ideal for round or roof structure mounting
- Withstands wind velocities of 110 mph (177km/hr) - designs for specific wind loads are available

Ground Mount/Roof Mount/Structure Mount: IAC NoishieldR Barriers are engineered from the foundation up for structural and acoustical integrity and economical installation. Low weight modules stack between posts to achieve required wall heights. Noishield® Barriers can be installed with horizontal or vertical reveals to satisfy aesthetic and architectural considerations.

Finishes: Noishield® Barriers are finished with a tough, thermosetting, polyester powder coating which is not damaged by the harsh cleaning chemicals used to remove spray paint graffiti. A wide variety of standard colors allow complementary decorative schemes and attractive designs to reduce apparent wall height as perceived by the community.

Tested for accelerated weathering per ASTM G23 for 2,400 hours with chalking not less than No. 8 rating (ASTM D659) and color changes less than 5 NBS units (ASTM D2244).

Salt spray tested for checking, blistering, loss of adhesion, or evidence of corrosion per ASTM B117 for more than 4,000

Acoustic Performances:

1/3 Octave Band Center Frequency, Hz.	125	250	500	1K	2K	4K	8K	STC
SOUND TRANSMISSION LOSS DATA, dB								
FS/S and SFS/S	21	34	40	33	32	26	37	30

SOUND ABSORPTION COEFFICIENTS

	125	250	500	1K	2K	4K	8K	NRC
FS/S, FS/A and FSt/S	1.12	1.12	1.10	1.01	0.89	0.76	0.57	1.05
SFS/S and SFS/A	0.49	1.04	1.14	1.05	0.96	0.95	0.87	1.05



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IAC NOISHIELD® SOUND BARRIERS

APPENDIX C
1993 St. Helena General Plan – Table 8-5
“Standard and Adjustments for Determining Noise Impact of Intrusive Noise for Residential Receptors”

TABLE 8-5: STANDARD AND ADJUSTMENTS FOR DETERMINING IMPACT OF INTRUSIVE NOISE FOR RESIDENTIAL RECEPTORS

STANDARD

The L_{eq} over a 10 minute period of time at the relevant time of day (or night) of maximum potential impact shall be the noise level descriptor used to determine the impact of intrusive, continuous or intermittent noise. The L_{eq} of the noise source of concern shall be compared with a similar L_{eq} of the ambient noise alone at the same time. Measurements are to be taken at the nearest receiver property line or at the nearest affected exterior location which is deemed appropriate. The ambient noise level shall be a measure of the composite of noises which occur normally at the given location.

Once the L_{eq} of the potentially intrusive source is determined, it shall be corrected as indicated below.

If, after the corrections are made, the potentially intrusive noise source would cause the exterior noise levels at the receiver position to exceed the measured ambient noise levels by more than 5 dBA, mitigation measures shall be developed to reduce the projected noise increase to be less than 5 dBA above ambient levels.

In addition to the above, the maximum noise level (L_{max}) of any impulsive noise shall not exceed the ambient by more than 10 dBA.

Corrections for Intrusive or Intermittent Noise

<u>Type of Correction</u>	<u>Circumstances of Correction</u>	<u>Correction¹</u>
Seasonal	Summer or year around operation	0 dBA
	Winter Only (or windows always closed)	-5 dBA
Tone or Impulse Characteristics	No Pure Tone or Impulsive Character	0 dBA
	Pure Tones ² Present	+5 dBA
	Impulsive Tones ³	+5 dBA

Notes:

¹ Correction to be added to the measured or predicted 10 minute L_{eq} of the potentially intrusive noise source.

² Tonal element exists when the 1/3 octave noise level of the tone is 5 dB greater than the average level of the two adjacent 1/3 octave noise bands.

³ Repetitions of noise with a period of less than 2 seconds or for a series of events with a duration less than 2 seconds.