September 14, 2026

DSA Acoustical Engineers, Inc.

15399 SW Burgundy Street
Tigard, OR 97224

City of Tualatin
Tualatin City Council
18880 SW Martinazzi Avenue
Tualatin, OR 97062

Attn: Mayor Bubenik and City Councilors

From: DSA Acoustical Engineers, Inc.

Kerrie G. Standlee, P.E.
Principal

Re: City Council Appeal of Lam Research Building B Addition
Project #: 104261

Introduction

At the request of Mr. Brett Hamilton of 11430 SW Kalispell Street in Tualatin, Oregon, DSA Acoustical Engineers, Inc. (DSA) conducted a review of the record associated with the Lam Research application for an approval to expand Building B at their Tualatin research facility located along Tualatin Road. DSA was specifically asked to make the review to determine if there should be any concern with the amount of noise that would radiate from the overall research facility after the addition of equipment proposed with the expanded Building B.

This report presents the results of the review conducted by DSA and some additional sound measurements made in the neighborhood north of the Lan Research facility.

Summary of Findings

Based on the review of materials found in the Lam Research application file as well as the results of sound measurements made by DSA, DSA finds:

- Previous analyses of the current sound radiating from the Lam Research facility inaccurately described the sound radiating into the residential neighborhood north of the facility under all environmental conditions.

- The use of sound levels measured 500 to 1000 feet away from major noise sources at the Lam Research facility under a single set of environmental conditions has likely resulted in an under prediction of the future noise level that will be present at times in the neighborhood with the addition of the TUX buildings and the Building B expansion equipment.

- Existing Lam Research noise levels radiating to residential receivers north of the facility exceed the City of Tualatin noise ordinance limit under some environmental conditions.

- Future Lam Research noise levels radiating to residential receivers north of the facility will exceed the City of Tualatin noise ordinance limit and potentially the Oregon DEQ noise control limits for industrial and commercial noise sources under some environmental conditions.

Information Presented in Past Noise Assessment Reports

CGA Lam Research 2025 Site Noise Survey Report

CGA's September 9, 2025, report presented the results of sound level measurements made by the firm along the north side of Tualatin Road in the vicinity of the Lam Research facility. The report said measurements were made between 10 p.m. and midnight at times when traffic would not influence the measured sound level. It provided some information regarding the weather conditions during the measurement period such as temperature and wind speed, but it did not provide any information concerning the direction of wind during the measurement period.

The report presented statistical sound levels (L_{01}, L_{10}, L_{50} and L_{90}) measured at six locations along with the L_{eq} sound level associated with each measurement. The report did not provide information on the maximum sound level measured at each location and it appears the reason was due to a misunderstanding of the fact that the Tualatin noise ordinance is a "maximum" instantaneous noise level ordinance and not a time-weighted noise level ordinance such as the Oregon DEQ noise regulations or other noise ordinances that might be used in California, where CGA is located.

The data presented in the CGA report showed the sound level measured by CGA in 2025 was basically right at the boundary of the Oregon DEQ hourly L_{50} noise limit of 50 dBA at some locations and exceeded the Tualatin maximum noise level limit of 50 dBA at some locations (the L_{01} sound level of 50 dBA shown in the report for some locations means the sound level exceeded 50 dBA for 1% of the time). The report stated that the measured sound levels at all locations were influenced by cricket sound, but it did not specifically quantify the amount caused by crickets or the amount caused by the Lam Research facility. Therefore, the data does not provide enough information to reach the conclusion that the Lam Research facility noise complied with all applicable limits.

CGA Lam TUX Expansion Environmental Noise Model Report

A CGA September 10, 2025, report presents the noise levels predicted to radiate to residential receivers from equipment associated with three new buildings proposed at the Lam Research facility (building T, U and X known as the TUX expansion project). The report states that no existing sources, or other sources that may be planned for TUX, or other sources associated with other planned developments are included in the predictive model. Noise from traffic, construction, and other transient noise is also not included in the model.

The CGA report says the noise modeling was conducted per ISO 9613-2 for calculating noise propagation from industrial sources but there was no data provided regarding the reference sound level data included for each of the sources included in the model and there was no mention if the noise model included down-wind conditions as normally used to predict worst-case conditions. Without that information it is impossible to assess the accuracy of the predicted sound levels.

The September 10, 2025, CGA report includes a figure that shows the predicted "total overall noise levels" with the September 9, 2025, Site Noise Survey report data (with cricket noise) added to the new equipment predicted noise levels. It does not include a figure showing the predicted total Lam Research facility noise without the cricket noise. The report does not specifically state if the predicted noise levels are the maximum noise levels or one of the statistical noise levels shown in the September 9, 2025, Site Noise Survey report but it is noted that the levels presented in the figure shown a 3 dB increase in the L_{50} level shown for Location 1, a 2 dB increase in the L_{50} level shown for Location 2, a 1 dB increase in the L_{50} level shown for Location 3, and no increase in the L_{50} levels shown for Locations 4, 5, or 6. If the total overall noise levels at each location was simply an addition of the new equipment noise and the measured L_{50} noise levels at each location, the noise level at Location 4, 5 and 6 should be 1 dB higher than that shown in the figure. In other words, the level at Location 4 would be 50 dBA, the level at Location 5 would be 51 dBA and the level at Location 6 would be 48 dBA.

Finally, it should be stated that future "worst-case" noise levels, which is what the ISO 9613-2 standard modeling is intended to predict, should not be predicted by adding ISO 9613-2 predicted noise levels to one-time measured noise levels when the environmental conditions present during the noise measurement period may not be the same as that assumed with the noise modeling. The more accurate approach that should be used to predict future "worst-case" noise levels associated with a set of noise sources is to model all of the noise sources, both existing and future sources using the noise model. Without that approach, it is like adding apples and oranges.

CGA Lam Building B Addition Environmental Noise Model Report

A CGA September 4, 2026, report presents the noise levels predicted to radiate to residential receivers from equipment associated with the TUX expansion project, Building X, Building U and yard, Building H, Future Gas Yard and the Building B Addition. The report states that no existing sources are included in the ISO 9613-2 compliant predictive

model but that the results of the September 2025 sound survey measurements are added to the noise model predicted levels. Noise from traffic, construction, and other transient noise is also not included in the model.

One of the first observations made during the review of this report is that the predicted noise levels radiating to noise sensitive receptors from all the proposed new equipment at Lam Research is lower at CGA measurement Location 1 and 2 than it was in the September 10, 2025, report when less equipment was included in the model. No explanation is given as to the reason for the reduction in the predicted levels at those locations. It is noted that the predicted noise level is higher than that shown in the September 10, 2025, report at Location 4, 5 and 6, but there again is no explanation as to what caused those increases. As stated earlier in this report, without the inclusion of reference sound level data in setting up the noise model, it is impossible to assess the accuracy of the data presented in the September 4, 2026, report.

The September 4, 2026, report includes a figure that shows the predicted noise levels that will radiate to residences along Tualatin Road from all the new Lam Research equipment plus the noise that currently radiates from the facility. The figure states that the reported levels are based on the noise levels measured on September 4, 2025, with the sound of crickets removed from the data. The report does not show how much of the September 4, 2025, noise level data is a result of crickets and how much is a result of Lam Research noise. Again, without that information, one cannot assess the results of the predicted overall noise levels and, as stated earlier in this report, adding predicted noise levels to noise levels measured with different environmental conditions is not an accurate way to predict future noise levels.

DSA Measured Noise Levels

Because there has been controversy over the past few years as to the amount of noise that radiates from the Lam Research facility to the neighborhood to the north, DSA decided to conducted sound measurements along the Tualatin Road in the vicinity of the Lam Research, Because neighbors are convinced that the Lam Research facility noise is greatest when the wind is from the south, when the temperature is cool and when the relative humidity is higher, DSA selected to conduct measurements on the night of September 12, 2026, when the environmental conditions were expected to be close to those conditions.

To further reduce the potential for traffic to have an influence on the measurement results, it was decided that measurements would be made between 2 a.m. and 4 a.m. on September 13, 2026 when traffic is usually the lowest and when cricket noise is typically reduced. The environmental conditions present during measurements were:

Temperature: 57 degrees F
Relative Humidity: 80%
Wind: 1-4 mph from the south

DSA's sound level measurements were made at 5 sites shown in Figure 1. The measurements were made with a Larson Davis Sound Track LxT1, ANSI Class 1 sound level meter. The meter has the ability to be programmed to continuously monitor the sound

present at the meter and determine and store statistical sound level information as well as the L_{eq}, L_{min} and L_{max} level observed during the measurement. The meter was programmed to determine the L_{01}, L_{10}, L_{50} and L_{90} sound levels for each measurement period. The measurements generally lasted from between 1 and 3 minutes, mainly to ensure that no traffic noise would influence the measurement results. The measurements were made with the meter set to monitor using the "fast" meter response time as instructed in the Oregon DEQ sound measurement procedures manual (NPCS-1). The calibration of the meter was made with a Larson Davis CAL 200 sound level calibrator prior to the measurements.

The results of the measurements at the five measurement sites are shown in Table 1.

Table 1
Background Noise Levels Measured Sunday Morning September 13, 2026

Site	Time	Sound Pressure Level (dBA)					
		L_{max}	L_{01}	L_{10}	L_{50}	L_{90}	L_{min}
1	02:40	49.9	48.0	47.1	46.8	46.4	45.9
2	03:17	49.7	49.0	48.5	48.0	47.6	47.0
3	03:01	54.3	50.1	49.5	48.9	48.1	47.3
4	03:21	50.4	49.8	49.3	48.7	48.2	47.5
5	02:56	48.0	45.1	44.4	42.9	41.8	41.0

Table 2 shows the octave band sound pressure levels measured at each of the five locations.

Table 2
Median Octave Band Sound Pressure Levels Measured on September 13, 2026

Site	**Octave Band Center Frequencies (Hz)**								
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
1	57.9	58.9	54.1	45.6	40.9	40.0	38.7	38.6	27.3
2	57.9	56.1	55.4	47.2	42.4	41.4	40.6	39.6	27.4
3	57.7	57.3	55.9	47.4	44.3	42.8	41	39.4	27.4
4	56.6	56	54.9	48.2	44.2	43.5	40.7	37.9	24.1
5	49	50.4	49	45.6	41.2	38.3	20.4	25.1	26.2

As can be seen in Table 2, there is no pronounced rise in the sound in the 2000hz and 4000hz octave band levels like that seen in the CGA September 2025 data. The sound in those octave band frequencies was noted to be caused by equipment located in the gas yard and not crickets. This agrees with observations because the sound from crickets was not audible during the measurements.

Based on the results shown in Table 2, it can be concluded that the sound levels shown in Table 1 are totally the result of sound radiating from the Lam Research facility. If these levels are compared with the levels presented in the CGA September 9, 2025, report, it can be seen that they are basically equal to the total levels presented in that report. For instance, the L_{50} level of 48 dBA measured at DSA Site 2 was measured at approximately the same location of the 48 dBA measured at Location 3 in the CGA report. The approximately 49 dBA level measured at DSA Site 3 can be compared to the 49 dBA level measured at the same place as Location 4 in the CGA report. And the approximate 49 dBA level measured at DSA Site 4 can be compared to the 50 dBA level measured at Location 5 in the CGA report. According to the CGA report, the levels presented at those locations were dominated by cricket noise and as a result, they concluded the Lam Research sound was less than the measured levels.

Because CGA concluded that their measured sound levels were dominated by cricket noise and not Lam Research noise, the total noise levels shown in the September 4, 2026, CGA report are lower than what would have been found if the DSA existing noise levels were included in their calculation. Based on the results of reverse analysis of their numbers, it is concluded that the total Lam Research noise levels shown in their September 4, 2026, report would be 1 to 2 dB higher than the levels shown in the report. As a result, the predicted levels at some if the locations could exceed both the Oregon DEQ noise regulation L_{50} noise limits and/or the City of Tualatin noise ordinance limits.

Conclusion

Based on the results of noise levels measured by DSA under the conditions that tend to coincide with “worst-case” conditions for residents located north of the Lam Research facility, the noise radiating currently and in the future from the Lam Research facility will exceed the City of Tualatin maximum allowable noise ordinance limits unless additional noise reduction measures are put into place.

Based on the results of the analysis made by DSA, the future noise radiating from the Lam Research facility to several residences north of the site will exceed the Oregon DEQ noise control regulations for industrial and commercial sources unless additional noise reduction measures are put into place.

Because the studies conducted for the Lam Research facility appear to have not considered the effects of all environmental conditions, it is recommended to the Council that a final decision regarding the Lam Research TUB – Building “B” Addition appeal be delayed until the applicant has an opportunity to consider the information presented in this report.


Lam Research Noise
Measurement Sites
Legend
Lam Research
Site
Site 5
Site 1
Site 2
Site 3
Site 4
Jurgens Park Senior Living
SW Tualatin Rd
SW Kalispell St
SW 112th Ave
SW 111th Ave
SW 109th Ave
SW 108th Ave
Lam Research Building F
Lam Research - Building A
Google Earth
Image © 2026 Vexcel Imaging US, Inc.
800 ft
N

KERRIE G. STANDLEE, P.E.

PRINCIPAL ENGINEER

Mr. Standlee is the Principal engineer responsible for management, technical direction and acoustical work on projects undertaken by the firm. His experience includes work in architectural acoustics design, architectural noise control, industrial noise control, environmental noise assessment and control, and transportation noise control.

PROFESSIONAL EXPERIENCE

Mr. Standlee has worked in the field of acoustic design and noise control since 1975. He has participated in many architectural acoustic design projects throughout his career where he was responsible for the selection and review of acoustical designs and acoustical products. He has provided services on projects related to the design of performing arts facilities, high school auditoriums, college lecture halls, music practice rooms, band halls, K12 school classrooms, gymnasiums, libraries, churches, swimming pool facilities and other architectural structures to ensure the acoustic environments meet the desired conditions.

Mr. Standlee has been responsible for the design of partitions to control sound in architecturally related projects. He has learned the importance of construction details in the control of sound as well as careful inspection of on-site construction to assure that design goals are met. He has worked on many architectural projects where special designs were recommended to reduce the transmission of noise and assure the desired acoustical environment is achieved in acoustically critical spaces.

Mr. Standlee has provided noise control consultation to industrial clients including natural gas transmission, pulp and paper, timber, food processing, metal fabrication, chemical and rock extraction and crushing companies. He has been responsible for evaluating worker noise exposure and selecting measures to reduce that exposure to meet federal and state regulations. He has been responsible for the measurement, evaluation and control of industrial noise radiating to the outdoor environment to meet governmental regulations.

Mr. Standlee has directed noise studies involving transportation sources such as automobile, truck, train, boats and aircraft. He has been responsible for the measurement and prediction of noise associated with racing at facilities in the Northwest including motocross race tracks, oval race tracks and sprint boat race tracks.

EDUCATION

B.S. in Architectural Engineering, University of Texas at Austin
M.S. in Engineering - Acoustics and Vibrations, University of Texas at Austin

PROFESSIONAL CERTIFICATION, AFFILIATIONS AND ACTIVITIES

Registered Professional Acoustical Engineer in the State of Oregon
National Council of Acoustical Consultants
Acoustical Society of America (Full Member)
Institute of Noise Control Engineering (Board-Certified Member)