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10 February 202

Mr. Brian Kutz
Hillwood Enterprises, L.P.
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Allentown, PA 18104

Re: Sound Study Update – Code Compliance Support Information
Proposed Hudson Logistics Center
Hudson, New Hampshire
OAA File 4228A

Dear Mr. Kutz:

We understand that the Town of Hudson Planning Board and their professionals have requested more detailed supporting information to show that the site will fully comply with all noise code limits under the Hudson noise ordinance. Ostergaard Acoustical Associates (OAA) has prepared this letter report to resolve these concerns and provide supplemental data to support the application.

As you are aware, all buildings on site will have different use. To put the different buildings' uses into perspective from an acoustical aspect, it is helpful to closer examine how the southern buildings will operate, as these buildings are closest to residences. The following bullets highlight important and distinct features:

- Building B will see about half of the traffic that is shown for Building A, even though they are similar in size. Truck traffic for Buildings B and C will be comparable despite their size difference.
- Delivery operations in Building B will occur in the northwest portion of the building, away from residences.
- For Building B, western docks will comprise $\frac{3}{4}$ of the façade while eastern docks will comprise only $\frac{1}{2}$ of facade. The docks will be located centrally on the building, which in turn centralizes the majority of site activity and keeps it away from residences.
- Activity farthest south will primarily comprise parking trailers and will be a small part of what is going on across the site.
- Maximum sound levels due to trucks were shown to be 51 dB(A) in our 1 December 2020 acoustical report. It is helpful to note that single truck events are shown to contribute sound

levels around 45 dB(A) at receptors, far below this number. It is the summation of *all* sources that result in the 51 dB(A) level. This is a conservative approach to evaluating site activity.

This letter report refines this conservative approach and presents a more realistic scenario of how these intermittent noise sources will occur in the community.

The Town's noise code uses multiple metrics to sufficiently cover potential noise issues that may occur. These are referenced as Noise Limit 1-through-10 in Section 249-4 of the Town code. Each "Noise Limit" addresses a specific aspect of sound. For example, Noise Limit 2 uses an hourly average, Noise Limit 3 uses maximum level, and Noise Limit 4 uses a 90th percentile statistic based on the ambient. To date the project team has been trying to take a conservative approach to the sound study by presenting maximum sound levels and comparing them to the Town's various statistically based codes. HVAC sound produced by the site is steady in nature, hence does not generally vary over time as it response to temperature conditions. Evaluating the maximum sound of HVAC equipment is appropriate here and representative of site operations. Truck noise, on the other hand, is extremely dynamic and mobile. While it is simplest to portray truck activity using maximum levels, this is being overly conservative with respect to Noise Limits 2 and 4. In actuality, when viewed over time in a statistical manner, all onsite truck sound levels fully comply with all Town code limits. A summary of the code section and explanation of compliance is as follows:

Noise Limit 1: This is a general provision which prohibits noise pollution as defined in Section 249-2 of the Hudson Noise Code.

Response: We logically assume that compliance with all sections of the Noise Code will result in compliance with Noise Limit 1.

Noise Limit 2 – This provision limits continuous sound from a site to not exceed an average sound level over the period of one hour. At residential receptors, site sound is not to exceed 55 dB(A) during the daytime and 50 dB(A) during the nighttime.

Response: OAA has provided a detailed acoustical analysis report to the board dated 1 December 2020. This report documents project findings using acoustical modelling and concludes that maximum sound levels at residential receptors is not expected to exceed 51 dB(A). To more realistically understand how a facility like this operates, it is appropriate to show this activity over the one-hour time period of Noise Limit 2. Figure 1 below shows a time history graph of sound levels documented over a 10-minute period at an active distribution facility, which has similar sound sources to the proposed project.

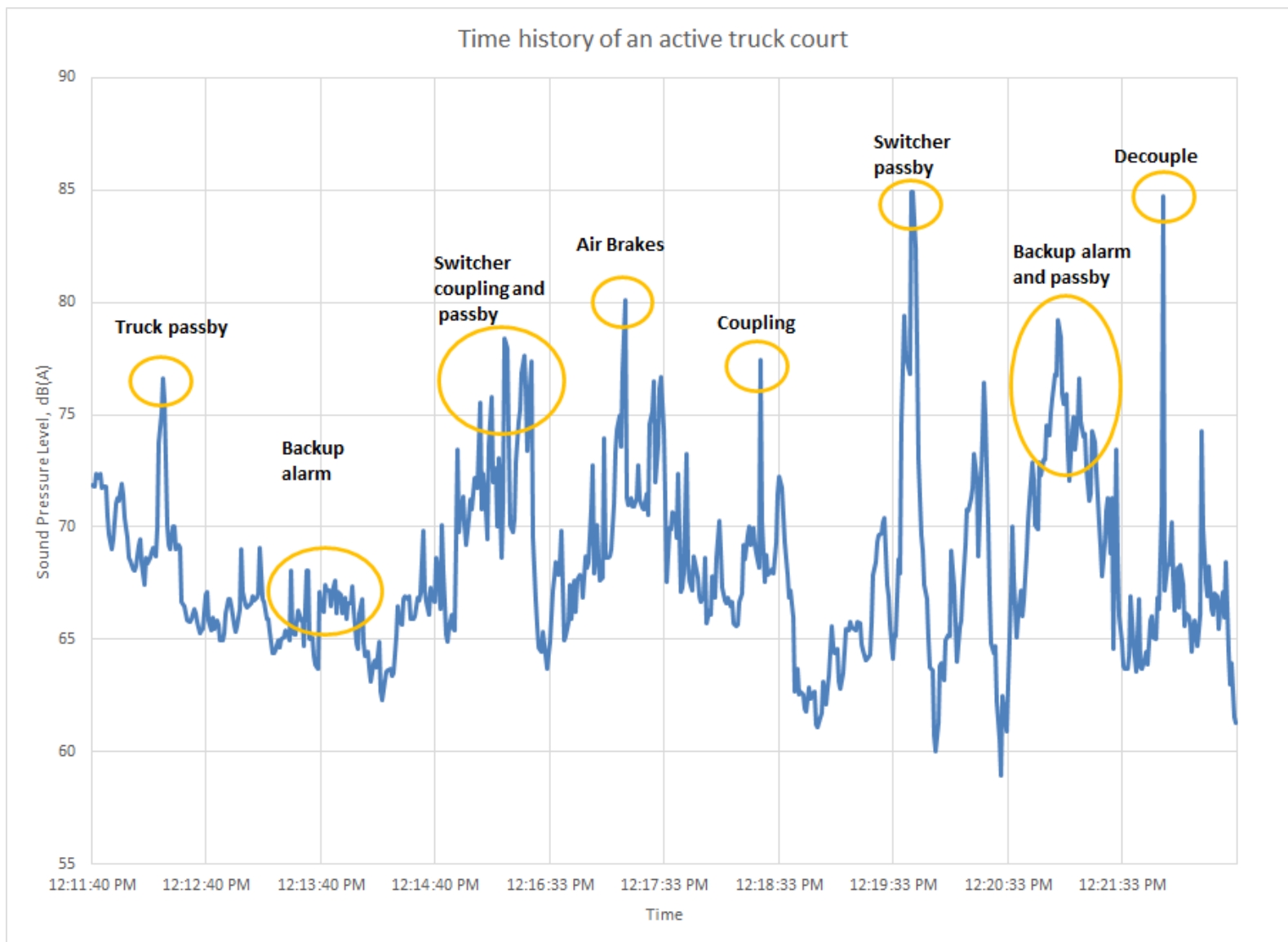


Figure 1 — Time history graph of sound pressure levels for an active truck court, acquired by OAA.

Noise sources varied in distance from the measurement location and ranged in distances of 30-to-150 feet from the microphone. Data shown are of the same magnitude of sound sources modelled in our report. The data in Figure 1 can also be represented statistically. To adjust this time history to apply it to the Hudson Logistics Center project, these data were normalized to adjust the maximum of 85 dB(A) to match the modelled maximum of 51 dB(A). Note that again this is conservative as individual truck maximums in the model do not exceed the mid-40’s at receptors and the modelled 51 dB(A) is a result of several simultaneous activities, which is unlikely. In a simplified way, this approximates what the site contributions would be at nearby residences over a busy 10-minute period. The statistical results of Figure 1, along with the normalization adjustment for these data to simulate statistical sound levels at residences to the south of this project are shown in Table 1. The same statistical metrics were used in the December 2020 report and are discussed in more detail in that report.

Table 1 — Statistical A-weighted results of the 10-minute measurement shown in Figure 1. Data are then normalized to match modelled maximum sound levels at residences south of the site. All results are in A-weighted values in dB re 20 μPa.

	L_{min}	L₉₀	L_{eq}	L₅	L_{max}
Figure 1 statistical results	60	64	71	76	85
Normalized to match maximum of 51 dB(A)	-34	-34	-34	-34	-34
Estimated statistical results at houses to the south	26	30	37	42	51

Assuming that this level of activity continues in a similar manner over the course of an hour, Table 1 data are also representative of hourly statistics. Results show that the site can experience multiple maximum sound levels of 51 dB(A), estimated here to be about 12 in one hour. This more refined analysis shows that average hourly sound levels (L_{eq}) at residences to the south will be 37 dB(A), which complies with Noise Limit 2 by a wide margin.

Noise Limit 3: Limits impulsive sound level limits at residences to no more than 62 dB(C) when measured with a fast response.

Response: It is important to note that this provision uses a different weighting as well as a different measurement response. Data throughout our reports discuss sound using an A-weighted scale and slow response, which mimics how the human ear hears. Noise Limit 3 requires looking at sound using a C-weighted scale and fast response, which will present the same data in a different manner and will appear to be much higher in level. OAA has taken sound data for a typical coupling/decoupling from a separate measurement, analyzed those data using the fast response, and

projected the event to the nearest residential receptor. Data were measured 15 feet from a coupling action. Table 2 summarizes these calculations which result in a worst-case FAST sound level of 62 dB(C) which fully complies with Noise Limit 3. This same event would result in 46 dB(A) if analyzed using the SLOW response.

Table 2 — Maximum sound pressure levels measured under FAST response of an impulsive coupling event measured at 15 feet. Data are extrapolated to nearest residence to south using attenuation provided by distance and the proposed earthen berm. Spectra are unweighted and overall levels are provided as C-weighted and A-weighted. All data are in dB re 20μPa.

	32	63	125	250	500	1k	2k	4k	8k	C*	A^
Sound pressure level of coupling event, fast response, 15 feet	93	91	98	97	95	92	88	87	79	103	97
Adjustment for distance and air absorption, 550 feet	-31	-31	-31	-31	-32	-32	-33	-34	-38		
Noise reduction provided by earth berm and fence, per sound model	-6	-7	-8	-10	-12	-15	-19	-26	-26		
Resulting sound level at nearest southern residence	53	52	58	56	51	45	36	26	12	62	52

*denotes the C-weighted sound level; ^ denotes the A-weighted sound level

Noise Limit 4: Site sound is not allowed to increase the background noise level by more than 10 dB(A).

Response: In our December 2020 report, OAA concluded that background sound levels in the area were nominally 41 dB(A) during the nighttime hours. The town’s consultant, HMMH, recommend using some periods of daytime hours that were less likely to be contaminated by seasonal insects. Revised results were as low as 37 dB(A). Regardless, normalized results in Table 1 show that average hourly background sound levels from the site will be around 30 dB(A) due to motor vehicle activity.

HVAC analyses discussed in the December 2020 report indicate that site HVAC would hover around 40 dB(A), and hence would dominate the hourly site sound background sound level. Site sound levels are expected to increase existing background sound levels by about 3 dB(A) at nearby receptors, meeting this limit. Even looking at the L₅ results in Table 1 show compliance with Noise Limit 4 by 5 dB(A).

Noise Limit 5: This requires that no pure tone conditions exist at residential receptors. Pure tones are defined as when the sound pressure level in any one octave band exceeds adjacent bands by 3 dB or more.

Response: A more detailed tonal analysis showing full compliance was provided in OAA's 13 July 2020 acoustical letter report on Page 3.

Noise Limit 6: This states that where the ambient sound levels exceed average hourly limits given in Noise Limit 2, then the noise limit to meet shall be 3 dB higher than the existing ambient sound level.

Response: This is not applicable to this project as existing ambient sound levels do not exceed Noise Limit 2 criteria.

Noise Limit 7: Requires that snow travelling vehicles, trail bikes and off-highway recreational vehicles comply with provisions of RSA 215-A:12

Response: This provision is not applicable to this project.

Noise Limit 8: Motorboats and powered water vessels must comply with RSA 270:37.

Response: This provision is not applicable to this project.

Noise Limit 9: Construction must occur within allowable hours and shall comply with Noise Limits 2 and 3.

Response: The project will follow provided construction hours and noise limits. While a specific construction noise analysis has not been done, experience shows that construction equipment is generally on the same order of magnitude as the heavy trucks analyzed in this project. Hence full compliance with Noise Limits 2 and 3 is expected. Note there may be temporary high sound levels when constructing the earthen berm; once completed, activity north of the berm will receive full attenuation from this mitigation feature.

Noise Limit 10: This prohibits using vehicle horns except as a warning, idling of trucks on residential premises or town roads for more than 10 minutes, and discharging exhaust unless through a muffler.

Response: The site will fully comply with these restrictions.

Lastly, to help illustrate future sound emissions, several graphs were put together. Figure 2 is the time history results from the long-term monitor deployed at Location 2 along the southern property line and discussed in the December 2020 report. Levels vary from 34-to-65 dB(A). The influence of nighttime insects is shown to be more pronounced over the weekend. Of particular interest in Figure 2 is highlighted Sections A and B. These sections show periods with a lull in nighttime ambient noise activity and the lowest sound level measured over the survey period, respectively.

Figure 3 shows a one-hour (12:00 AM to 1:00 AM) time history segment for Section A, zoomed in to show more detail. Also shown in Figure 3 is a conservative approximation of time history of site sound contribution based on Figure 1. Since Figure 1 only represents a 10-minute period, it was replicated 6 times to fill in the one-hour segment in Figure 3. Existing ambient sound is shown in blue while future site sound is shown in orange.

Similarly, Figure 4 shows a one-hour (11:10 AM to 12:10 PM) time history segment for Section B, also zoomed in for more detail. Again, the existing ambient sound is shown in blue and the future site sound is shown in orange.

Figures 3 and 4 illustrate that, for the most part, motor vehicle sound on site will produce sound levels at or below the existing ambient sound level. There will be instances where site sound is above ambient sound levels and will be audible, but it will be no different than existing intermittent sounds in the area. It should be noted that this graph assumes 12 maximum sound level events in one hour; actual maximums are expected to be far lower in number as site sound will be spread out across the entire site and not concentrated in the southern portion of the site. Regardless, the graphs highlight how site sound will be similar to existing conditions and, as a result, will have no negative acoustical impact on the area.

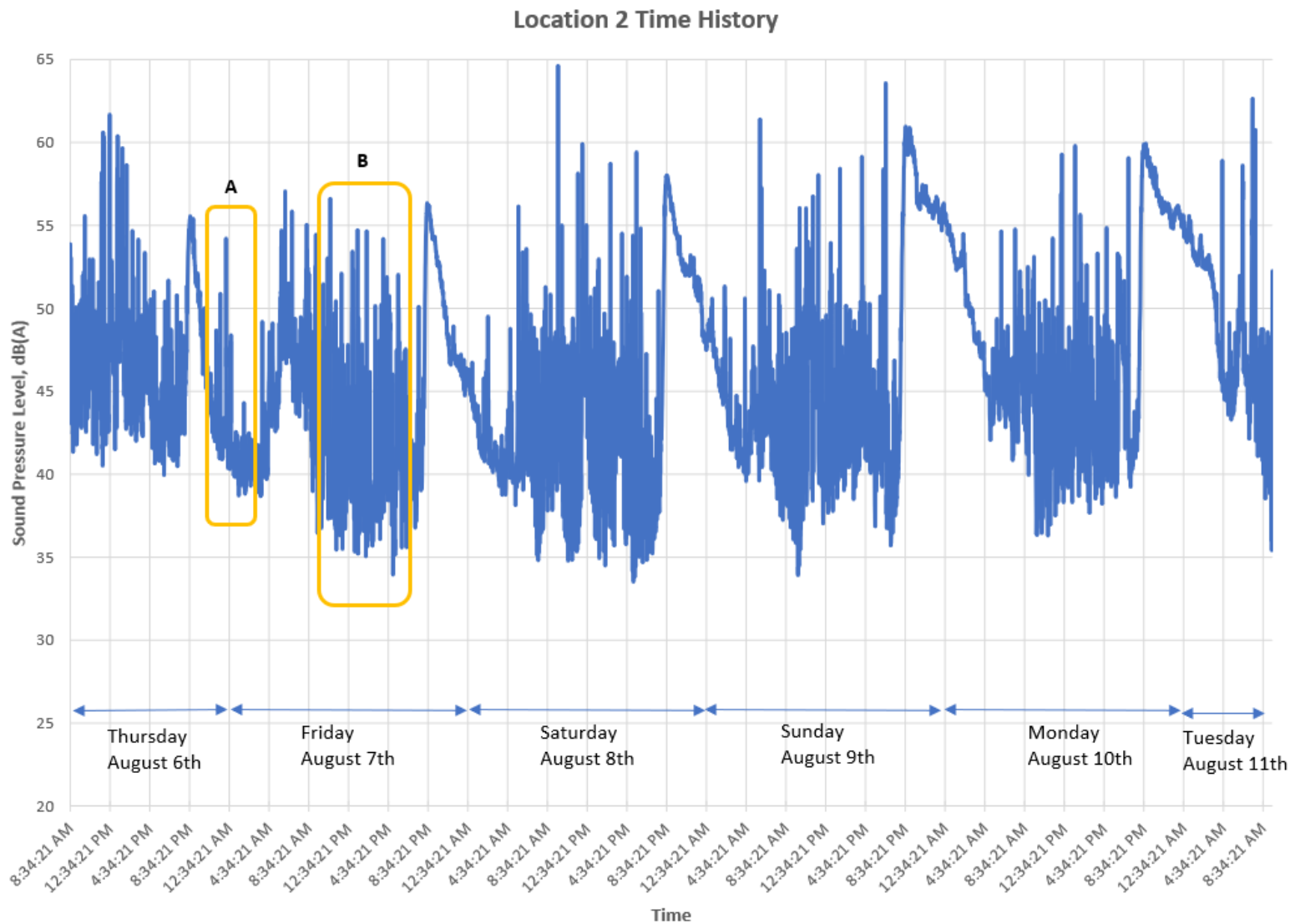


Figure 2 — Time history measurements at Location 2 from the August sound survey documented in the December 2020 report.

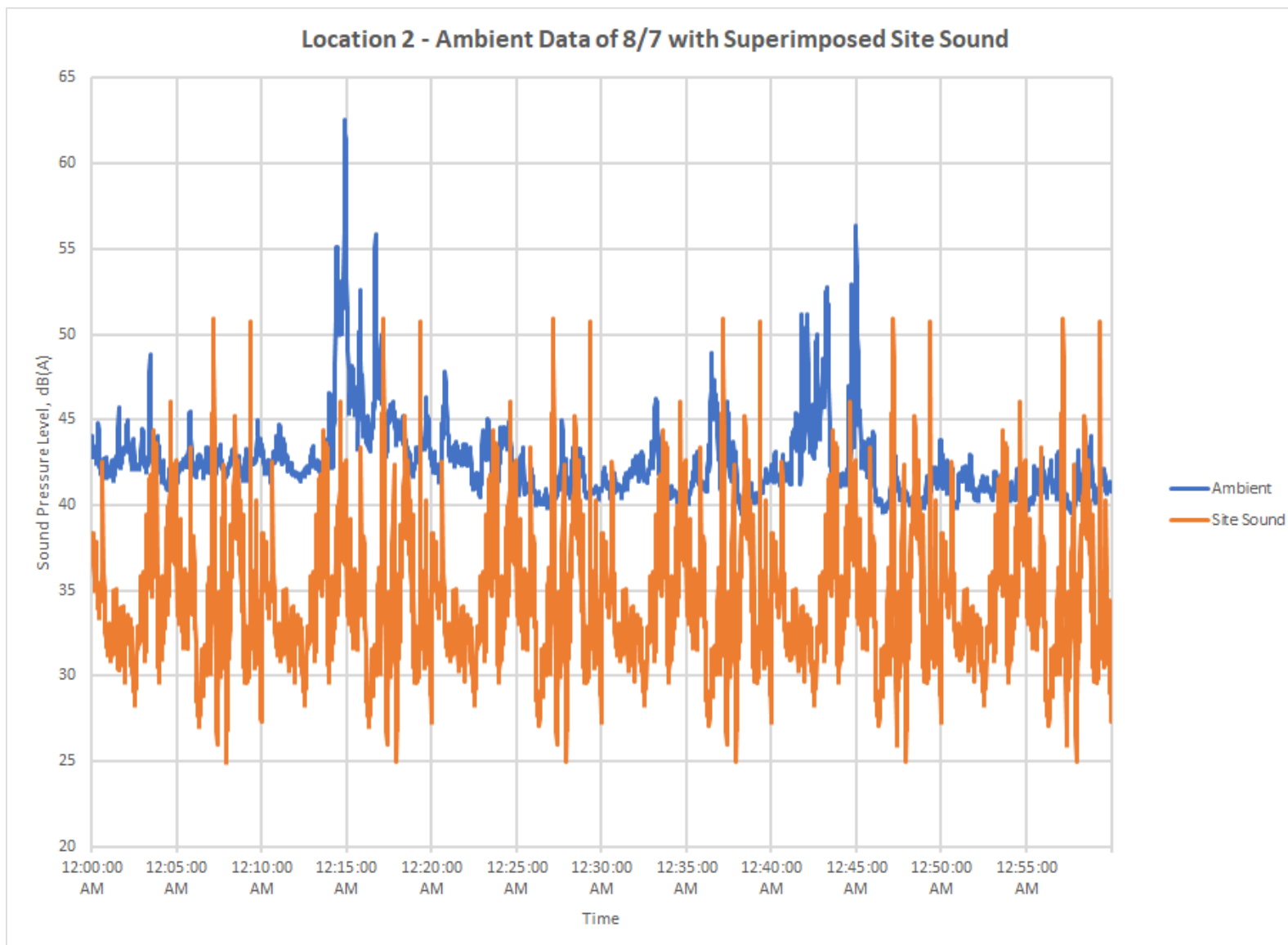


Figure 3 — A one hour period of Section A from Figure 2. Future heavy truck site sound emissions superimposed over measured ambient data.

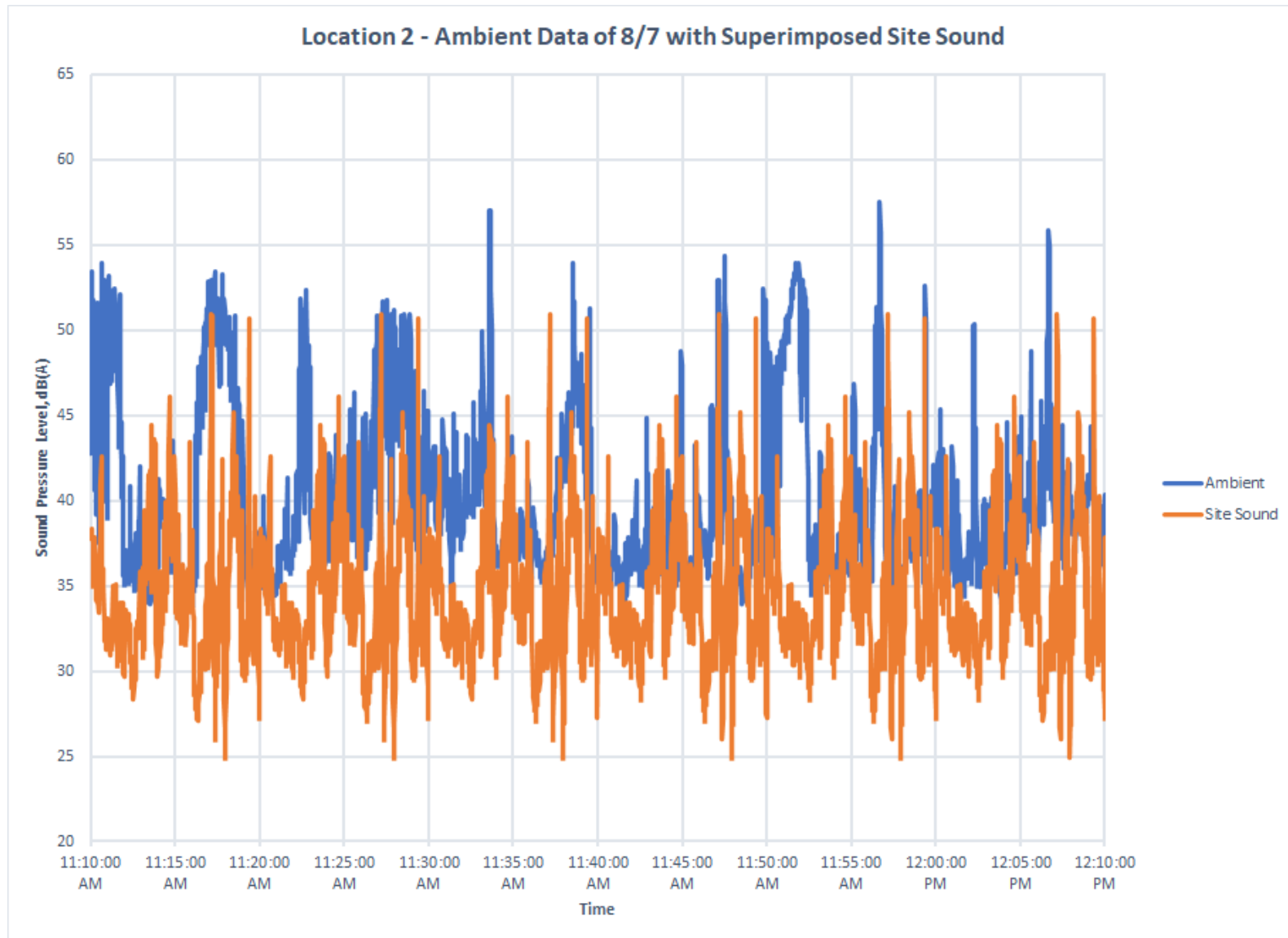


Figure 4 — A one-hour period of Section B from Figure 2. Future heavy truck site sound emissions superimposed over measured ambient data.

I trust that the above information is helpful. Please circulate this report with the Town and their professionals.

Regards,

OSTERGAARD ACOUSTICAL ASSOCIATES



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BCM:amc