OSTERGAARD ACOUSTICAL ASSOCIATES

# EVALUATION OF SITE SOUND EMISSIONS

## PROPOSED SALES DISTRIBUTION CENTER
## Schodack, NY

| | |
|---|---|
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## INTRODUCTION

Ostergaard Acoustical Associates (OAA) was asked to assist with evaluation of potential sound emissions from a proposed sales distribution center in Schodack, NY. The site currently comprises fields and woodland, and stretches from Interstate 90 to Route 9. Plans call for the construction of a sales distribution center in the center of the site with car and trailer parking to the north and south, respectively. Note that throughout this report, the term "cars" collectively refers to any passenger vehicle such as a car, pick-up, or SUV. Access to the facility will be provided via Route 9. Site activity is expected to be 24/7, and this report addresses the on-site noise radiated to residential areas to the north and south.

The purpose of this sound study is to analyze future site sound emissions and consider changes to the project needed to comply with applicable code limits and/or to minimize the acoustical impact and potential for noise complaints.

Research indicates that there is no New York State noise code, however the New York State Department of Environmental Conservation (DEC) does have guidelines for assessing and mitigating noise impacts. There are also local noise codes that apply. Hence, potential sound emissions from the facility were evaluated against the applicable Town of Schodack codes, the DEC guidelines, along with criteria recommended by OAA based on experience. The site will contribute steady sound from rooftop HVAC equipment. However of most concern is intermittent sound from truck and car movements during the nighttime sleeping hours potentially affecting residential receptors to the north and south. OAA also investigated the benefits of various configurations of shielding measures constructed between on-site truck sources and vantage points at residences. These take the form of noise control barrier walls.

Note that all field measurements and acoustical modelling for this professional acoustical evaluation relied on analyses in octave frequency bands. However, in the interest of providing a concise report of findings, results in this report are provided using the most common metric of environmental sound, the A-weighted sound level. The A-weighted sound level is an overall level that uses a frequency weighting that best mimics that of human hearing. Full acoustical data in octave bands for all measurements and modelling are available upon request.

Work by OAA was overseen by Benjamin C. Mueller, P.E., with assistance from OAA Staff Engineer Michael T. Conaway. The representative at Scannell Properties is Daniel Madrigal.

## SITE AND VICINITY

Figure 1 is an aerial image obtained from Google Earth showing the site outlined in red. Figure 1 also shows ambient survey locations, which are discussed in a subsequent section. The site is currently vacant and will be developed to fit the end user's needs. Our understanding of zoning/land uses in the various directions is as follows:

- The site and properties immediately north and south are located in a PD-3, Planned Development District, Zone. The properties across Route 9 are located in a HC, Highway Commercial District, Zone.

- To the north are single family houses fronting on Richwood Drive, Star Terrace, and Julianne Drive.

- South of the site are single family houses fronting on Hillcrest Road and Route 9.

- West and east of the site are Interstate 90 and Route 9, respectively. Across Route 9 are commercial operations, including a storage facility, and vacant properties.

Plans call for the construction of a 1,015,740 $ft^2$ building located centrally on the property. Site access will be from Route 9. Employee vehicle parking will be along the north side of the facility while truck activity will be concentrated at the docks and in the trailer parking area south of the building.

In order to reduce site sound off site, plans call for earthen berms to the north and an 18-foot tall sound wall along the south boundary. The wall will be constructed from pre-cast concrete, timber, or other suitably heavy material. It is approximately 1,790 feet in length and will be located at the top of the embankment. The wall will be akin to traditional highway barriers used nationwide.

Since facility operations can potentially be 24/7, the primary concern with sound emissions is minimizing the acoustical impact/meeting goals at night at residences. This sound study analyzes the sound levels contributed by intermittent on-site vehicle movements as well as rooftop HVAC equipment.


**Figure 1 —** Google Earth image showing the proposed sales distribution center Schodack site and vicinity including residential areas to the north and south. Survey Locations A through M are shown. The site is outlined in red.

## REGULATIONS/GOALS

When developing a site of this type, it is appropriate to consider how sound from the facility will likely be received, especially by noise-sensitive receptors. Sound produced by a typical distribution center includes auto and truck parking lot activity such as idling and vehicle movement, as well as HVAC rooftop equipment. These noise sources should be evaluated and compared to applicable noise code regulations.

Site sound emissions from this facility are regulated by the Town of Schodack noise codes. Chapter 151: Noise has very permissive noise limits and states that a sound level cannot exceed 90 dB(A) over a period of five minutes in any one hour between midnight and 0600 hours. More stringent code language is found under Chapter 219-23A: Zoning, General Standards. This section calls for site sound emissions to not exceed the average intensity occurrence and duration of existing traffic sound levels. In order to quantify this, a thorough sound survey was carried out to document traffic sound in the area.

The NYS Department of Environmental Conservation has a policy "Assessing and Mitigating Noise Impacts" that provides guidance for analyzing and minimizing the acoustical impact applicable to the State Environmental Quality Review Act (SEQRA) review. Guidelines require comparison of the average ambient sound level to proposed site sound emissions, which mimic the local noise code's approach. The DEC states that an increase in ambient sound level by 0-to-3 dB should have no appreciable effect on receptors, an increase of 3-to-6 dB is tolerable but may have potential for an adverse noise impact only in cases where the most noise sensitive of receptors are present. Increases of more than 6 dB require closer scrutiny while increases of 10 dB deserve consideration of avoidance and mitigation measures in most cases.

**Sound Level Survey**

To determine appropriate criteria for both local code limits and DEC guidelines, a thorough ambient sound survey was carried out. Benjamin Mueller visited the site on 14 May 2018 to become familiar with the area and obtain typical traffic sound levels near the site.

Statistical sound pressure levels were documented over periods of 6 minutes at each of the thirteen measurements locations shown in Figure 1. Each measurement location typified the existing ambient sound at a nearby residential receptor.

Daytime and nighttime surveys were carried out to typify traffic noise during these times. All surveys were carried out using the calibrated equipment described in Appendix A. The daytime survey was carried out between 1725 and 1915 hours on 14 May. Weather conditions included partly cloudy skies, little-to-no winds, and a temperature of 75°F. A nighttime survey was carried out later that day between 2235 through 0055 hours on 15 May; weather conditions included cloudy skies, winds of 5 mph, and a temperature of 64°F.

Noise sources noted during the surveys include traffic flow on Interstate 90 and Route 9, aircraft, and sporadic fauna noise. The daytime survey also included intermittent dog barking and lawn maintenance activity at some survey locations to the north.

To analyze environmental acoustical data it is appropriate to scrutinize the sound levels statistically. Sound levels can vary over a considerable range since many sources contribute to sound measured at a location. Transient ambient sources often raise sound levels 20 decibels or more above background sound levels. The following descriptors are most often used to assess data of this type:

> **$L_{90}$** - The sound level exceeded 90 percent of the time during a given measurement period. $L_{90}$ is usually referred to as the background sound level.
>
> **$L_{50}$** - The median level exceeded 50 percent of the time during a measurement period.
>
> **$L_{10}$** - The sound level exceeded 10 percent of the time during a measurement period. $L_{10}$ is a measure of the contribution of intrusive sound sources.
>
> **$L_{eq}$** - The average sound level during the measurement period.
>
> **$L_{min}$ ($L_{max}$)** - The minimum (maximum) sound level during the measurement period.

Tables 1 and 2 provide a summary of the statistical A-weighted sound levels documented during the daytime and nighttime surveys respectively:

**Table 1 — Daytime statistical A-weighted sound levels documented on 14 May 2018, in dB re 20μPa.**

| Location | Start Time (Hours) | $L_{max}$ | $L_{10}$ | $L_{50}$ | $L_{90}$ | $L_{min}$ | $L_{eq}$ |
|---|---|---|---|---|---|---|---|
| A | 1731 | 49 | 47 | 45 | 43 | 42 | 45 |
| B | 1723 | 63 | 46 | 45 | 43 | 42 | 46 |
| C | 1738 | 52 | 49 | 48 | 46 | 44 | 48 |
| D | 1745 | 54 | 50 | 48 | 47 | 45 | 49 |
| E | 1752 | 53 | 50 | 49 | 47 | 45 | 49 |
| F | 1800 | 53 | 49 | 45 | 43 | 42 | 46 |
| G | 1809 | 54 | 52 | 49 | 48 | 45 | 50 |
| H | 1820 | 55 | 51 | 49 | 46 | 44 | 49 |
| I | 1827 | 57 | 54 | 50 | 46 | 45 | 51 |
| J | 1835 | 58 | 56 | 52 | 49 | 48 | 53 |
| K | 1843 | 61 | 57 | 53 | 51 | 47 | 54 |
| L | 1855 | 61 | 57 | 51 | 46 | 44 | 53 |
| M | 1906 | 52 | 49 | 45 | 43 | 40 | 46 |

**Table 2 — Nighttime statistical A-weighted sound levels documented on 14-15 May 2018, in dB re 20μPa.**

| Location | Start Time (Hours) | $L_{max}$ | $L_{10}$ | $L_{50}$ | $L_{90}$ | $L_{min}$ | $L_{eq}$ |
|---|---|---|---|---|---|---|---|
| A | 2401 | 57 | 53 | 48 | 40 | 37 | 49 |
| B | 2354 | 54 | 49 | 43 | 37 | 34 | 45 |
| C | 2347 | 54 | 50 | 46 | 36 | 35 | 47 |
| D | 2338 | 55 | 51 | 45 | 40 | 37 | 47 |
| E | 2330 | 55 | 51 | 45 | 40 | 36 | 47 |
| F | 2321 | 52 | 45 | 42 | 38 | 37 | 43 |
| G | 2313 | 50 | 48 | 43 | 40 | 38 | 45 |
| H | 2304 | 52 | 48 | 45 | 42 | 43 | 45 |
| I | 2256 | 55 | 51 | 46 | 43 | 41 | 48 |
| J | 2248 | 59 | 51 | 44 | 41 | 39 | 47 |
| K | 2239 | 56 | 48 | 45 | 42 | 40 | 46 |
| L | 2445 | 65 | 51 | 42 | 38 | 36 | 50 |
| M | 2425 | 50 | 48 | 43 | 38 | 34 | 44 |

Data are as expected for locations close to major roadways, such as Interstate 90 and Route 9. While there are occasions of traffic lulls during the day and night, traffic presence dominates the average sound levels in the area. Maximum sound levels are typically credited to car and truck passbys on the nearby roads. The exception to this was during the daytime at Locations A and B and during the night at Locations A and L where maximum sound levels were due to other sources, such as an aircraft passby.

It is interesting that Location A exhibited the lowest average sound level during the day. Other locations further from Route 90 exhibited higher average sound levels. Furthermore, Location A average sound levels at night were 4 dB(A) higher in level. It seems likely that the measurement was taken during a lull in local traffic compared to the other data.

**Project Criteria**

Of most interest in the survey data are the average and maximum sound levels because they relate to local code limits and DEC guidelines. The hourly average and maximum sound levels for the day and night periods were compiled for use as project criteria. Using survey notes for correlation, the hourly maximum sound levels presented below are specifically identified as levels due to traffic noise sources during each measurement. Project criteria are provided in Table 3 below.

**Table 3 — Day and night A-weighted hourly $L_{eq}$ and hourly $L_{max}$ project criteria for each location, in dB re 20μPa.**

| | Daytime | | Nighttime | |
|---|---|---|---|---|
| **Location** | **Hourly $L_{eq}$** | **Hourly $L_{max}$** | **Hourly $L_{eq}$** | **Hourly $L_{max}$** |
| A | 45 | 47 | 49 | 55 |
| B | 46 | 47 | 45 | 54 |
| C | 48 | 52 | 47 | 54 |
| D | 49 | 54 | 47 | 55 |
| E | 49 | 53 | 47 | 55 |
| F | 46 | 53 | 43 | 52 |
| G | 50 | 54 | 45 | 50 |
| H | 49 | 55 | 45 | 52 |
| I | 51 | 57 | 48 | 55 |
| J | 53 | 58 | 47 | 59 |
| K | 54 | 61 | 46 | 56 |
| L | 53 | 61 | 50 | 56 |
| M | 46 | 52 | 44 | 50 |

## HOURLY AVERAGE SITE SOUND LEVELS

As discussed previously, site noise will comprise HVAC sound and intermittent vehicle traffic on site. The contribution of each type of source was calculated separately and then combined to be compared to project criteria.

### Rooftop HVAC Equipment Sound

Rooftop HVAC equipment produces noise that is steady in nature, and hence will not vary over time. Based on our experience with other projects, a good approximation for a facility of this size is to assume 60 25-ton HVAC units distributed on the rooftop of the facility. The sound power level for each of these was assumed to be 93 dB(A) re 1 picowatt based on typical manufacturer's sound data.

Acoustical modelling software, specifically CadnaA, was used to create and analyze sound level contours for the site. The model takes into account relevant parameters between the noise source and receptor positions of interest to predict how sound will propagate. In addition to distance attenuation, the model accounts for the effects of terrain, various types of ground cover, shielding by structures, and reflections from buildings.

The noise from the 60 rooftop units was included in the HVAC sound model. The noise sources were placed 4 feet above the rooftop, and sound was projected to ear height positions at nearby observers. Figure 2 shows the results graphically and tabulates the summed A-weighted sound levels at thirteen discrete locations that are in the vicinity of ambient survey locations. Buildings are shown in white and the proposed sound wall is shown in light blue. The property line is outlined in red.

The results show that with all 60 rooftop units operating, maximum HVAC sound levels off site to the north and south are in the 38-to-45 dB(A) range.

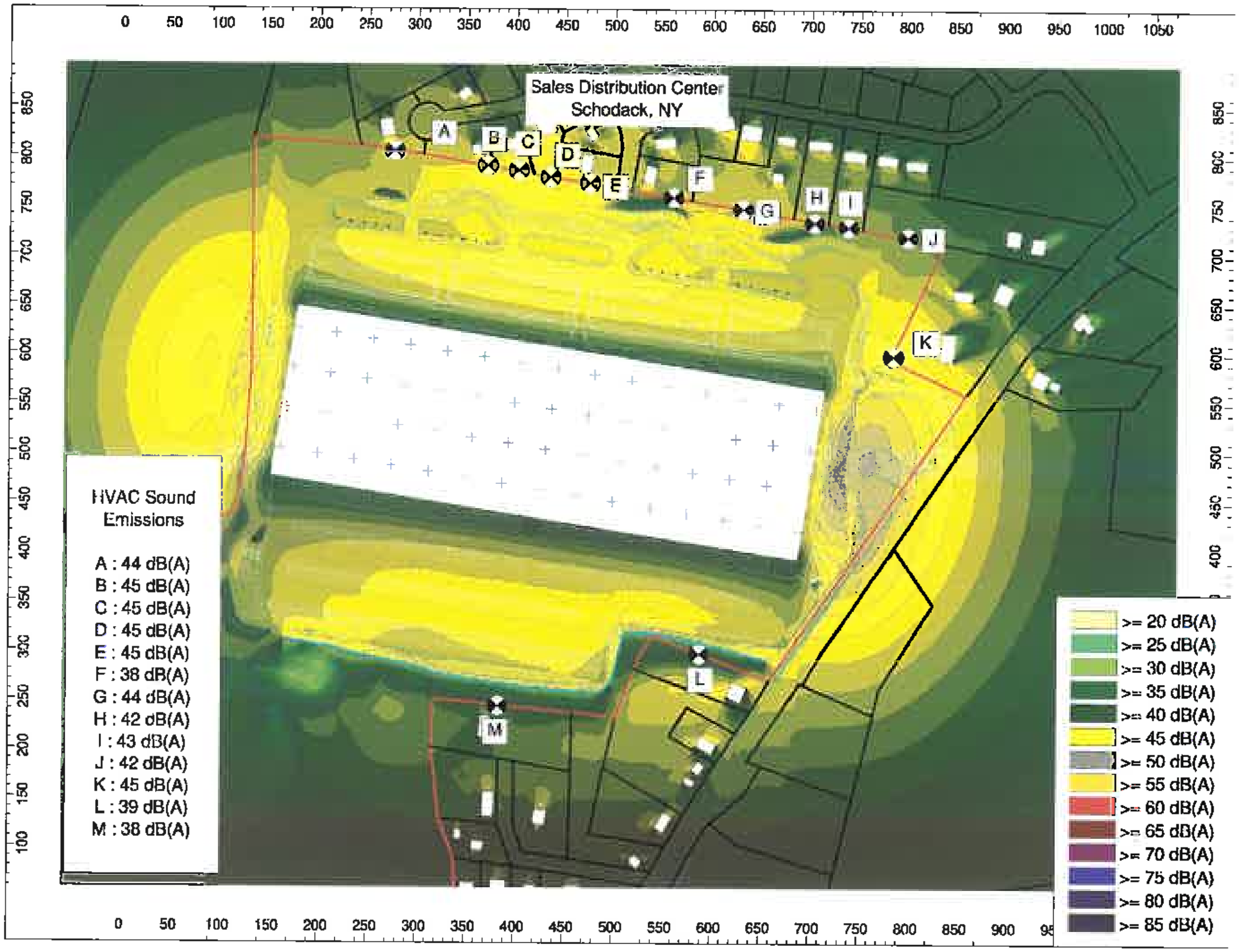


**Figure 2 — A-weighted sound emission contours, 5 feet above grade, for sound from rooftop HVAC equipment. Each of the 60 rooftop units shown with a + sign. Buildings shown in white; site property line outlined in red. A-weighted sound emissions tabulated at 5 feet above grade for all locations.**

**Site Traffic Sound**

The Federal Highway Administration (FHWA) Traffic Noise Model (TNM) Version 2.5 was used to evaluate hourly average sound levels caused by peak traffic flows expected on site. There are different peak flows for day and night. The TNM takes into account vehicle count, speed, distance, and ground covering. Models were created assuming all traffic passed as close to receptors as possible. Cars were modeled at 20 mph while trucks were modeled at 10 mph. Ground cover was assumed to be hard soil. Daytime peak activity is expected to occur between 1730 and 1830 hours where 1017 cars and 26 trucks are estimated over that hour. The greatest count for auto and truck nighttime peak activity and will occur in the early morning hours where 573 cars and 6 trucks are estimated in a given hour. Car activity was modeled at Locations A through K to the north while truck activity was modeled at Locations L and M to the south. The TNM also takes into account the proposed 18-foot tall wall to the south. Results from the model are discussed in the next section.

**Cumulative Hourly Average Site Sound Emissions**

It is the combined contribution of HVAC sound and hourly average on-site traffic sound that is important to compare to project criteria. Tables 4 and 5 provide the day and night cumulative hourly average site sound emissions for each location, compared to the corresponding day and night project criteria, respectively. The difference between site sound emissions and ambient conditions is provided; any increase is highlighted. A negative difference means that expected site sound emissions would be lower than existing ambient sound levels while a positive difference indicates site sound emissions would be higher than existing average ambient sound levels. These results include the benefit of the 18-foot tall wall.

**Table 4 — Daytime cumulative hourly average A-weighted site sound emissions, in dB re 20μPa.**

| Location | Measured 1 hour Leq | Peak TNM 1 hour Leq | Maximum HVAC | Cumulative HVAC and TNM | Difference |
|---|---|---|---|---|---|
| A | 45 | 47 | 44 | 49 | 4 |
| B | 46 | 47 | 45 | 49 | 3 |
| C | 48 | 47 | 45 | 49 | 1 |
| D | 49 | 47 | 45 | 49 | 0 |
| E | 49 | 47 | 45 | 49 | 0 |
| F | 46 | 47 | 38 | 48 | 2 |
| G | 50 | 47 | 44 | 49 | -1 |
| H | 49 | 47 | 42 | 48 | -1 |
| I | 51 | 47 | 43 | 48 | -3 |
| J | 53 | 47 | 42 | 48 | -5 |
| K | 54 | 51 | 45 | 52 | -2 |
| L | 53 | 46 | 35 | 46 | -7 |
| M | 46 | 46 | 37 | 47 | 1 |

**Table 5 — Nighttime cumulative hourly average A-weighted site sound emissions, in dB re 20μPa.**

| Location | Measured 1 hour Leq | Peak TNM 1 hour Leq | Maximum HVAC | Cumulative HVAC and TNM | Difference |
|---|---|---|---|---|---|
| A | 49 | 44 | 44 | 47 | -2 |
| B | 45 | 44 | 45 | 48 | 3 |
| C | 47 | 44 | 45 | 48 | 1 |
| D | 47 | 44 | 45 | 48 | 1 |
| E | 47 | 44 | 45 | 48 | 1 |
| F | 43 | 44 | 38 | 45 | 2 |
| G | 45 | 44 | 44 | 47 | 2 |
| H | 45 | 44 | 42 | 46 | 1 |
| I | 48 | 44 | 43 | 47 | -1 |
| J | 47 | 44 | 42 | 46 | -1 |
| K | 46 | 47 | 45 | 49 | 3 |
| L | 50 | 39 | 35 | 40 | -10 |
| M | 44 | 39 | 37 | 41 | -3 |

Results from this analysis show that, at most locations, there is little to no impact to existing ambient conditions. For locations where there is an impact it is primarily an increase in 1-to-4 dB(A). An increase of 3 or less is unnoticeable and considered to have no appreciable effect on the surroundings. Location A shows the greatest increase, 4 dB(A), during the daytime. This increase is still minimal and falls under the tolerable category of the DEC guidelines. This increase may not be realized, since daytime ambient data seemed unusually low compared to other locations. Regardless, this increase shown is not anticipated to have a negative impact on the surroundings. With no negative impact, these findings also show that site sound emissions comply with Schodack Chapter 219-23A.

## MAXIMUM SITE SOUND LEVELS

Maximum site sound levels should also be scrutinized. Maximum sound levels must comply with the Schodack noise code limit of 90 dB(A) for durations of no more than 5 minutes and should be compared with maximum ambient sound levels documented in the area to evaluate any impact.

To evaluate maximum site sound emissions, an acoustical model was developed with representative sources modeled at their maximum sound level. Heavy truck activity can routinely contribute maximum sound levels of about 79 dB(A) at 50 feet, at a source height of 8 feet above grade. This includes movements, coupling/decoupling, and back-up alarms. Personal vehicles, such as cars and light trucks expected in the north parking lot, traveling at low speeds are better typified by maximum sound levels of 59 dB(A) at 50 feet. These noise sources are about 3 ½ feet above grade. Assuming the worst-case peak hourly traffic counts for cars and trucks, up to 17 cars per minute may be present. Trucks are more infrequent and are expected to be less than one per minute during peak times. To be conservative, three heavy truck movements were included in the model. Vehicles were distributed across the site. These data were included with the HVAC model shown in Figure 2. Also included in the model, is the acoustical benefit of the 18-foot sound wall.

Results from this worst case scenario, with all 60 rooftop units, 17 cars, and three heavy trucks all simultaneously contributing their maximum sound levels, are shown in Figure 3. Maximum sound levels range from 43-to-57 dB(A) with the highest sound level documented where heavy trucks are closest to receptors. Tables 6 and 7 compare documented daytime and nighttime maximum traffic sound levels with model results. Increases are highlighted.

**Table 6 — Daytime maximum traffic sound levels compared to maximum site sound emissions, A-weighted sound pressure levels in dB re 20μPa.**

| Location | Measured Daytime Traffic Maximum | Modelled Maximum | Difference |
|---|---|---|---|
| A | 47 | 48 | 1 |
| B | 47 | 49 | 2 |
| C | 52 | 49 | -3 |
| D | 54 | 48 | -6 |
| E | 53 | 48 | -5 |
| F | 53 | 43 | -10 |
| G | 54 | 46 | -8 |
| H | 55 | 45 | -10 |
| I | 57 | 45 | -12 |
| J | 58 | 45 | -13 |
| K | 61 | 49 | -12 |
| L | 61 | 57 | -4 |
| M | 52 | 53 | 1 |

**Table 7 — Nighttime maximum traffic sound levels compared to maximum site sound emissions, A-weighted sound pressure levels in dB re 20$\mu$Pa.**

| Location | Measured Nighttime Traffic Maximum | Modelled Maximum | Difference |
|---|---|---|---|
| A | 55 | 48 | -7 |
| B | 54 | 49 | -5 |
| C | 54 | 49 | -5 |
| D | 55 | 48 | -7 |
| E | 55 | 48 | -7 |
| F | 52 | 43 | -9 |
| G | 50 | 46 | -4 |
| H | 52 | 45 | -7 |
| I | 55 | 45 | -10 |
| J | 59 | 45 | -14 |
| K | 56 | 49 | -7 |
| L | 56 | 57 | 1 |
| M | 50 | 53 | 3 |

Results show that anticipated maximum site sound levels are typically well below existing maximum ambient sound levels. Where there is an increase compared to existing conditions the sound level increases are 3 dB(A) or lower, which will result in no acoustical impact. Maximum sound emissions at all locations comply with the Schodack Chapter 151 code limit of 90 dB(A) by a wide margin. The proposed earth berm, building, and sound wall all provide sufficient screening and attenuation to mitigate site sound emissions at nearby receptors.

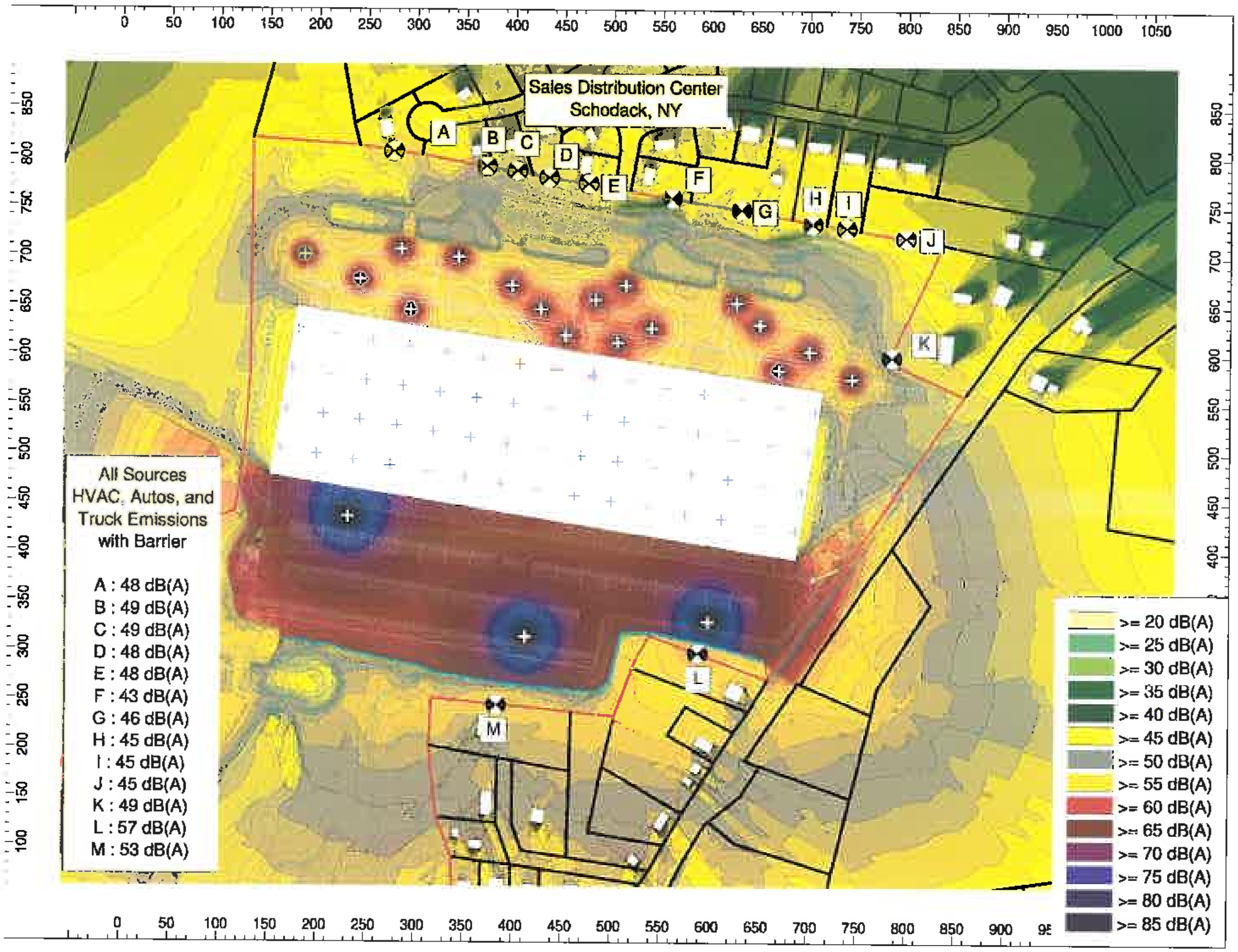


**Figure 3 — A-weighted sound level contours expected all sources: 60 HVAC units (blue +), 17 car and 3 truck movements (white +). A-weighted sound emissions contours and locations shown at 5 feet above grade. Property line outlined in red.**

## ADDITIONAL CONSIDERATIONS

Although construction conditions are temporary in nature it is worth discussing considerations to minimize the acoustical impact of this activity. The building is centrally located and at least 400 feet from dwellings. Construction of the actual building is not an acoustical concern, however earth moving equipment used during the civil construction phase of the project could be much closer to receptors. Construction equipment such as bulldozers, front end loaders, and dump trucks can typically produce maximum sound levels of 80 dB(A) at 50 feet. To minimize receptor exposure to construction noise during this phase, consider the following construction mitigation measures:

- ❑ Limit all heavy equipment operation to daytime hours, and only on weekdays if possible, during non-sensitive hours. Follow allowable town construction hours if available.

- ❑ If possible, limit the number of equipment operating near one receptor at a given time. Avoid exposing any one receptor to high sound levels for an extended period of time.

- ❑ Place stationary equipment such as generators, compressors, and office trailers away from receptors.

- ❑ Avoid having construction parking or laydown areas nearby receptors.

- ❑ Specific noise issues can be individually evaluated for tailored noise mitigation recommendations should traditional methods above not be sufficient.

## RECOMMENDATIONS

1. Proceed with an 18-foot noise control barrier about 1,790 feet in overall length to provide shielding along the site south property lines as shown in light blue in Figures 2 and 3. Note that to be effective, the acoustical barrier needs to meet the following requirements:

   - The barrier needs to be solid, without openings, and be of sufficient surface weight to force sound to travel over or around the barrier and not leak through it. A recommended minimum surface weight for the barrier is 7 $lbs/ft^2$.

   - Appropriate materials of construction for the barrier include $^5/_8$-inch thick sheet steel piling, precast or poured-in-place concrete, acoustical metal panels, timber, or other hybrid system specifically manufactured for the purpose.

   - The barrier, being solid, must be designed to resist wind load. Hence it is a structure that requires engineered footings, the design of which will need to be overseen by structural professionals.

2. Install earthen berms to the north at the modelled height or greater. They noticeably reduce the sound of cars in the north parking lot to many off-site receptors.

3. To minimize potential complaints from back-up alarms, plan to equip switcher engines and as many other on-site trucks as feasible with smart, ambient sensing, multi-frequency back-up alarms. These are available from a variety of manufacturers such as Ecco, specifically Model EA9724. These devices reduce annoyance generated from constant level, pure tone back-up alarms. The reduction in annoyance is accomplished in two ways:

   - A broadband sound is less intrusive and annoying than a pure tone sound since, at a distance, it can blend in easier with other ambient sounds.

   - The smart, ambient-sensing feature allows back-up alarms to operate safely and effectively at far lower sound levels than typical brute-force, constant level devices. The smart alarms sample ambient noise and adjust the warning signal to be 5-to-10 dB higher than the ambient, therefore reducing levels nearby and off-site.

4. Proceed with HVAC equipment plans keeping in mind acoustical performance to ensure modelled results are realized.

## CONCLUSION

The sales distribution center site planned for Schodack, NY currently consists of vacant wooded land situated adjacent to heavily traveled roadways, Interstate 90 and Route 9. The construction of a sales distribution center would bring car and truck activity close to noise-sensitive receptors which is a potential acoustical concern.

Plans call for a centrally placed building, substantial earthen berms to the north, and a sound wall to the south to shield site activity from the surrounding residences. Analyses show that these features will sufficiently mitigate on-site HVAC and vehicle noise to have no discernable effect on the surroundings since increases will not be higher than 6 dB(A) over the existing ambient sound levels. Maximum site sound emissions will be significantly below Schodack Chapter 151 noise code limit of 90 dB(A).

Implementation of the proposed shielding and using smart, multi-frequency back-up alarms for on-site trucks and switchers will put the site in the best position to reduce the acoustical impact of the site. Given the results of this analysis and the prevailing activity on Interstate 90 and Route 9, on-site noise is expected to have little-to-no acoustical impact per DEC guidelines and will fully comply with Schodack Code Chapter 151 and Chapter 219-23A.

## APPENDIX A

## DATA ACQUISITION AND ANALYSIS SYSTEM

The measurement system used to obtain acoustical data consisted of a Bruel & Kjaer random-incidence condenser microphone 4189, used in conjunction with a preamplifier, Bruel & Kjaer Model ZC 0032, and a precision sound level meter and octave band analyzer, Bruel & Kjaer Model 2270. A windscreen was used on the microphone to reduce wind noise.

All measurements were acquired over 6-minute intervals. For each measurement, the analyzer was instructed to store the octave band spectrum in each second, for 360 seconds. The data were saved to internal memory for later analysis in the lab.

The entire system was calibrated before and after the measurements by means of a sound pressure level calibrator. The calibrator used was a Bruel & Kjaer Model 4231, calibrated by an outside calibration service within the last year. The calibration is traceable to the National Institute of Standards and Technology. Overall, the data reported here can be considered accurate to the nearest decibel.

In the laboratory a computer was used to recall and print the statistical octave band and A-weighted sound levels from the data provided by the analyzer. The software was written by Bruel & Kjaer.