APPENDIX K – NOISE STUDY ANALYSIS

OSTERGAARD ACOUSTICAL ASSOCIATES

EVALUATION OF SITE SOUND EMISSIONS

PROPOSED SALES DISTRIBUTION CENTER
Schodack, New York

Prepared for: **Scannel Properties**

Prepared by: **John T. Baldassano, Jr.**
jbaldassano@acousticalconsultant.com

Reviewed by: **Benjamin C. Mueller, P.E.**
bmueller@acousticalconsultant.com

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1460 US Highway 9 North Suite 209
Woodbridge, NJ 07095
Voice 973-731-7002
Fax 973-731-6680
acousticalconsultant.com

OSTERGAARD ACOUSTICAL ASSOCIATES
1460 US Highway 9 North Suite 209
Woodbridge, NJ 07095
Voice 973-731-7002
Fax 973-731-6680
acousticalconsultant.com

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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 undeveloped wooded land that stretches from Interstate-90 to Route 9. Plans call for the construction of a rectangular distribution facility in the center of the site surrounded by car and trailer parking areas. The site is anticipated to operate around the clock ; of greatest interest is activity occurring during the nighttime hours, potentially affecting nearby noise sensitive receptors. The purpose of this sound study is to analyze future site sound emissions and to determine if mitigation measures are 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 Schodack codes, the DEC guidelines, and criteria recommended by OAA based on experience.

The site will contribute steady sound from rooftop HVAC equipment and intermittent sound from motor vehicle activity, particularly truck activity. Personnel vehicles are also active on site but only prominent during shift changes. Personnel vehicles are also substantially lower in sound level and, hence, are generally not a concern. Residential receptors are the focus of this study. Commercial and industrial receptors are not particularly noise sensitive, and often do not operate at night.

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. Full acoustical data in octave bands for any aspect of this project are available upon request.

Work by OAA was overseen by Benjamin C. Mueller, P.E., with assistance from OAA Staff Consultant John T. Baldassano, Jr. The representative at Scannell Properties coordinating the project 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 located within the PD-3, Planned Development, zone and will be developed to fit the end user's needs. Our understanding of zoning/land uses in the various directions is as follows:

- ❑ Abutting the site to the north is Schodack Valley Road with undeveloped land in the RMF, Multifamily Residential, and the HC, Highway Commercial, zones beyond. A mobile home community and single-family residences are farther north, approximately 550 feet away. These noise sensitive receptors are also in the RMF zone and significantly shielded from on-site activity by a large berm north of Schodack Valley Road.

- ❑ Non-noise sensitive commercial uses front on U.S. Route 9 to the east. Uses on the east side of U.S. Route 9 are in the HC zone while uses on the west side are within the PD-3 zone.

- ❑ South of the site is undeveloped wooded land with a single-family residential development fronting on Julianne Drive beyond. Farther south, beyond these residences is a larger logistics facility. All properties in this direction are also within the PD-3 zone.

- ❑ West of the site is standalone residence in the PD-3 zone and Interstate 90. Across the Interstate are additional residences and undeveloped land; these residences are separated from the site by the Interstate, which is elevated, and hence are not a concern acoustically. Topography due to the Interstate was not available and hence emissions to the west are considered to be conservative.

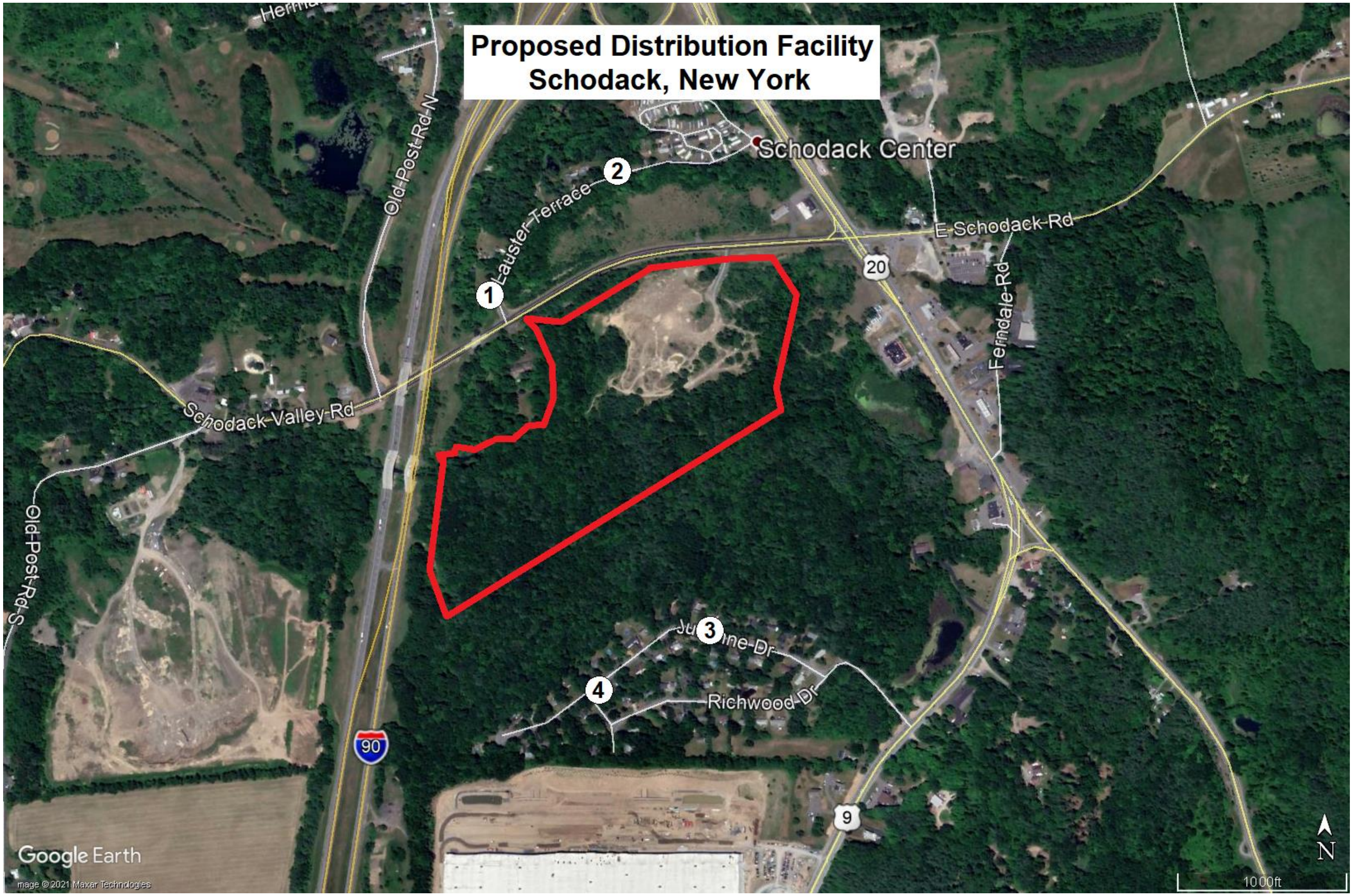

Figure 1 — Google Earth image showing the proposed sales distribution center site and vicinity in Schodack, NY. The site property line is approximately outlined in red. Ambient sound survey Locations also shown.

Plans call for the construction of a 277,975 ft^2 building located centrally on the property. Site access will be provided from three driveways via Schodack Valley Road to the north. Personnel vehicles will access the site via the central driveway and travel directly to and from a segregated lot northeast of the building. Trucks will enter the site from eastern driveway and then travel to check in at the inbound guard house east of the building before continuing to the loading docks along the southeast, southwest, and northwest building facades. After unloading, trucks will continue clockwise around the building to the outbound guard house in the central-northern portion of the site. After checking out, trucks will exit the site via the western driveway. Trailer parking is provided outboard of the docks and in a lot southwest of the building.

In coordination between OAA and the design team, plans call for a 15-foot-tall sound wall along the south corner of the truck yard to reduce sound emissions offsite. The wall will be constructed from an acoustically robust material similar to pre-cast concrete, timber, or other suitably heavy material. It is approximately 590 feet in length.

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.

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 personnel vehicle 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 existing traffic sound in the area. Additionally, noise from vehicles on public and private roads must also adhere to applicable state laws.

New York State Vehicle and Traffic (VAT) Law states that all motor vehicles must have a muffler and must be below specific sound limits at a distance of 50 feet. Specifically, vehicles over 10,000 pounds must not exceed 86 dB(A) at speeds of 35 mph or less nor exceed 90 dB(A) at speeds above 35 mph. There are also limits for lighter weight vehicles and motorcycles. Overall, these State limits are generally easy to meet with modern, well-maintained vehicles. The New York State Department of Environmental Conservation (DEC) 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 to determine the extent of any potential acoustical impact, if any. The DEC states that an increase in ambient sound level by 0-to-3 dB should have no appreciable effect on receptors and 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. There are no Rensselaer County noise codes that could be found.

Sound Level Survey

To determine appropriate criteria for local and DEC guidelines, an ambient sound survey was carried out to document traffic sound in the area. Staff Consultant John T. Baldassano Jr. visited the site on 17 March 2021 to become familiar with the area and obtain typical traffic sound levels near the site. Statistical sound pressure levels were documented over periods of 10 minutes at each of the four measurement locations shown in Figure 1. Each measurement location was selected to characterize the ambient of an area of nearby existing receptors. Location 1 typifies residences nearest to Schodack Valley Road, Location 2 typifies those residences to the north along Lauster Terrace and Horseshoe Drive, and Locations 3 and 4 typify residences fronting on Julianne Drive to the south.

Morning, afternoon, and nighttime surveys were carried out to typify traffic noise during these periods. All surveys were carried out using the calibrated equipment described in Appendix A. The morning survey was carried out between 1000 and 1130 hours, the afternoon survey was carried out later between 1350 and 1500 hours, and the nighttime survey was carried out several hours later between 2145 and 2250 hours. Weather conditions for all three survey periods included cloudy skies, winds of less than 3 mph, and temperatures ranging from 35-to-

45°F. It is assumed that all measurements are representative of typical hourly ambient conditions.

Noise sources noted during the surveys include intermittent local traffic passbys and distant steady traffic flow on Interstate-90, and intermittent fauna noise. Traffic flow on Interstate-90 was prominent throughout all measurement periods and at all Locations. Local car passbys were infrequent, but observed at most measurement Locations during the daytime and at Location 4 during the nighttime measurement. Birds were especially active at Location 3 during the daytime surveys and a barking dog walked by with its owner at Location 4 during the morning survey.

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, 2, and 3 provide a summary of the statistical A-weighted sound levels documented during the morning, afternoon, and nighttime surveys, respectively.

Table 1 — Morning statistical A-weighted sound levels documented on 17 March 2021, in dB re 20μPa.

Location	Start Time (Hours)	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}	L_{eq}
1	1009	74	66	61	56	52	63
2	1025	67	53	50	48	45	52
3	1056	76	48	43	41	39	53
4	1112	81	59	41	39	37	62

Table 2 — Afternoon statistical A-weighted sound levels documented on 17 March 2021, in dB re 20μPa.

Location	Start Time (Hours)	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}	L_{eq}
1	1355	71	66	61	56	52	62
2	1414	67	53	50	48	45	52
3	1431	54	47	45	43	41	45
4	1446	55	43	41	39	38	43

Table 3 — Nighttime statistical A-weighted sound levels documented on 17 March 2021, in dB re 20μPa.

Location	Start Time (Hours)	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}	L_{eq}
1	2147	68	62	55	49	44	58
2	2203	54	50	46	42	40	47
3	2221	48	45	43	42	40	44
4	2235	48	42	40	39	36	41

Data are as expected for locations nearby active roadways such as Interstate-90 and Route 9. While there are occasions of traffic lulls, traffic presence from the Interstate dominates the acoustical environment in the area. Maximum sound levels were credited to car and truck passbys on nearby local roads during the morning survey at Locations 2 and 3, during the afternoon survey at Locations 1 and 2, and at the nighttime survey at Location 4. Maximum sound levels were attributed to distant traffic flow on the nearby interstate or other major roadways during the morning survey at Location 1 and the remaining Locations during the nighttime survey. At Location 4, during the morning survey, maximum sound levels were attributed to a barking dog while maximum sound levels at Locations 3 and 4 during the afternoon survey were respectively attributed to chirping birds and a distant tree branch snapping.

Morning, afternoon, and nighttime sound levels followed predictable patterns. As expected, sound levels documented across all metrics were only slightly lower during the nighttime than the daytime surveys. This can be attributed to slightly less traffic flow on local roads and Interstate-90. Location 1 was also generally loudest and Location 4 was generally quietest which can be attributed proximity and direct line of sight, or lack thereof, to Interstate-90. It is also interesting to note that the L_{90} remained fairly steady across all three measurement periods at Locations 3 and 4. At most measurement Locations/periods the L_{10} and L_{eq} are generally in agreement with each other, indicating that average ambient sound levels are primarily driven by intermittent noise. Maximum sound levels were generally highest during the morning surveys and at measurements containing local traffic passbys. Measurements where the maximum sound levels are attributed to distant traffic have slightly lower maximum sound levels. The highest average sound levels were documented at Location 1, while the lowest average sound levels were documented at Location 4. During the night, background sound levels for most areas hover in the low 40's on an A-weighted scale. The exception was Location 1 where background sound levels approached 50 dB(A).

Project Criteria

Of most interest in the sound survey data are the average and maximum sound levels because they relate to local code limits and DEC guidelines. Average sound levels are appropriate to compare to steady-state noise sources such as HVAC whereas maximum sound levels are helpful to compare to transient noise sources such as vehicle activity. Project criteria are provided in Table 4 below. To be conservative, the lowest hourly average and maximum sound levels across all measurement periods were compiled for use as project criteria. As expected, these lowest data occur during the night survey. Using survey notes for correlation, the hourly maximum sound levels presented in Table 4 are specifically identified as levels due to traffic noise sources at each Location. Nominally, site HVAC sound should not exceed the hourly average sound levels while intermittent truck maximum sound levels should be in line with existing hourly maximum sound levels.

Table 4 — Lowest A-weighted hourly L_{eq} and hourly L_{max} project criteria for each Location, in dB re 20μPa.

Location	Hourly L_{eq}	Hourly L_{max}
1	58	68
2	47	54
3	44	48
4	41	48

ACOUSTICAL MODEL

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 modelling software provides A-weighted sound emission contours (in 1 dB increments) for an ear-height elevation typical of a standing observer, 5 feet above grade. All calculations were carried out in octave frequency bands.

Receptor Locations in the model correlate to ambient sound survey measurement Locations shown in Table 5. Locations B and C are in the direction of receptors in the vicinity of survey Location 1; Location D correlates to Location 2; Locations E and F are representative of Location 3; and Locations G through I are representative of Location 4. All Locations are at the nearest residential façade where receptors are located during the nighttime hours. Locations B, F, and G typify upper story receptors at 15 feet above grade while the remaining Locations are at 8 feet above grade, to typify single-story receptors. Offsite elevation details were estimated using available historical topographic maps.

Table 5 — Acoustical model receptor Locations and the correlated ambient sound survey measurement locations.

Acoustical Model Receptor Location	Ambient Survey Measurement Location
B	1
C	1
D	2
E	3
F	3
G	4
H	4
I	4

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 one ton of cooling per 400 ft^2 of building area evenly distributed across the rooftop of the facility. This equates to roughly twenty-eight (28) 25-ton HVAC units in total. 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. The 28 rooftop units were included in the HVAC acoustical model, placed 4 feet above the roof and evenly distributed across the rooftop. Sound from the sources was projected to nearby receptors. Figure 2 shows the results graphically and tabulates the summed A-weighted sound levels at the eight discrete locations that are in the vicinity of the nearest receptors. Buildings are shown in white and HVAC noise sources are shown as blue "+"s. The property line is outlined in red. The proposed sound wall is shown in light blue.

The results show that with all rooftop units operating, HVAC sound levels off site are in the 31-to-40 dB(A) range at the nearest residential receptors and meet the project goal. HVAC sound level are aligned with background sound levels in the area indicating they will be difficult to hear at off-site vantages.

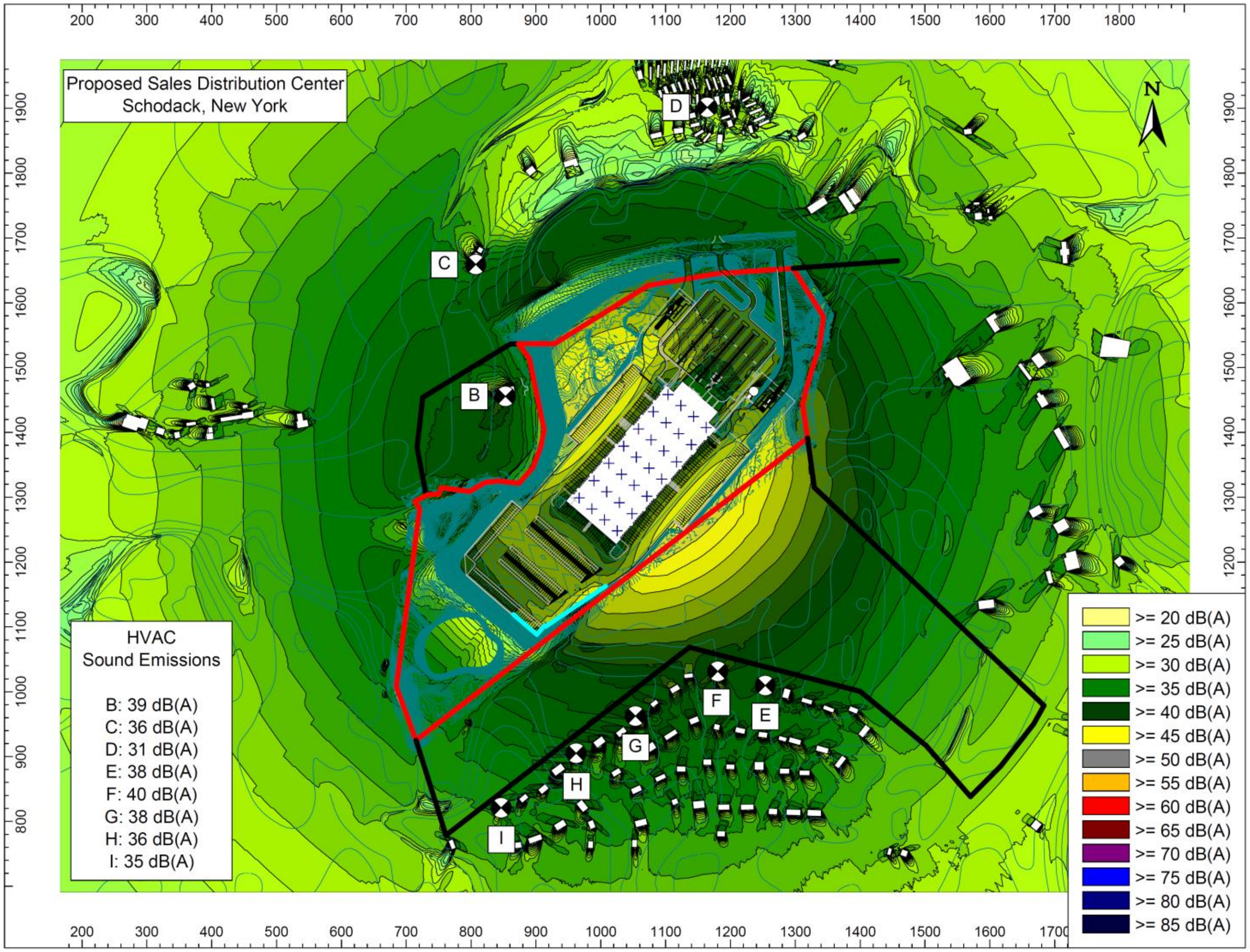

Figure 2 — A-weighted sound emission contours, 5 feet above grade, for sound from rooftop HVAC equipment. Each of the 28 rooftop units shown with a blue "+" sign. Buildings shown in white and site property line outlined in red. Sound wall shown in light blue. Sound emissions tabulated at 15 feet above grade for Locations B, F, and G. All other Locations are 8 feet above grade.

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. Traffic activity varies each hour but was analyzed for a worst-case condition by evaluating the highest total truck arrivals, which is estimated to be 20 line-haul trucks and 20 box trucks. 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 not specifically modeled as the dedicated personnel lot is far from all residential receptors. All trucks were modeled at 10 mph. Ground cover was assumed to be hard soil. Activity was modeled at Locations B through I as shown in Figure 2. The TNM also takes into account the proposed 15-foot-tall wall to the south for Locations G, H, and I. 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. Table 6 provides cumulative hourly average site sound emissions for each location, compared to the corresponding project criteria. 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 15-foot tall wall.

Table 6 — Cumulative hourly average A-weighted site sound emissions, in dB re 20μPa. Columns D and E added using decibel arithmetic; Column F subtraction is linear.

Location	Measured 1 hour Leq (A)	Peak TNM 1 hour Leq (B)	Maximum HVAC (C)	Cumulative HVAC and TNM (D=B+C)	New Future Level (E=A+D)	Change (F=E-A)
B	58	51	39	51	59	1
C	58	45	36	46	58	0
D	47	44	31	44	49	2
E	44	46	38	47	49	5
F	44	48	40	49	50	6
G	41	41	38	43	45	4
H	41	40	36	41	44	3
I	41	38	35	40	43	2

Results from this analysis show that at all locations, there is no negative acoustical impact to existing ambient conditions. Average sound levels will increase by margins of 0-to-6 dB at locations around the site. An increase of 3 or less is unnoticeable and considered to have no appreciable effect on the surroundings. Location E, F, and G show increases of 4-to-6 dB. This increase is still minimal and falls under the tolerable category of the DEC guidelines. 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 the lowest documented maximum ambient sound levels 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. OAA has had the opportunity to visit various logistics facilities over the years to survey and document the sounds of truck activity.

The distribution center will have over-the-road line-haul trucks, box trucks, and terminal tractors (yard tractors) active on site. Line-haul trucks deliver trailers from off-site whereas terminal tractors do not leave the site and move trailers between the docks and parking areas. Terminal tractors are responsible for the majority of back-up movements on-site. From an acoustical aspect, terminal tractors and line-haul trucks are acoustically equivalent. Box trucks are medium duty trucks and slightly lower in in level than a line-haul truck.

Line-haul truck noise in a typical dock area can routinely produce maximum sound levels of 79 dB(A) at 50 feet. This sound level was determined by looking at a wide variety of truck activity, such as truck movement, air brakes, back-up alarms, and coupling/decoupling, and distilling it to a single conservative maximum level and spectrum for use in acoustical studies such as this. A driving line-haul truck exhibits slightly lower maximum sound levels of 74 dB(A) at 50 feet. A box truck generally exhibits maximum sound levels of 70 dB(A). The height of all truck sources is modelled at a conservative height of 8 feet above grade. OAA has found that using these maximum sound levels at this height ensures a conservative approach to evaluating truck sound. When specific individual activities are modelled at their actual height and sound level, results are typically lower in level than predicted below. For example, many of the high sound level activities, such as back-up alarms and air brakes, occur at a height of 4 feet above grade, not 8 feet. This is a critical detail when evaluating the effectiveness of a sound barrier or berm and when considering intervening topography. It is also important to recognize that all truck noise is dynamic in nature. Maximum sound levels only occur for a short duration and are not representative of the constant sound level produced by on-site trucks.

Truck activity varies throughout the day but can be upwards of 40 trucks entering and exiting per hour. This is generally split between line-haul trucks and box trucks. This amounts to seven trucks every ten minutes. To be conservative, four concurrent heavy truck yard activity events were included in the model, as well as four box trucks driving on site. Vehicles were distributed across the site and added to the HVAC model shown in Figure 2. Also included in the model, is the acoustical benefit of the 15-foot sound wall. Results are shown in Figure 3.

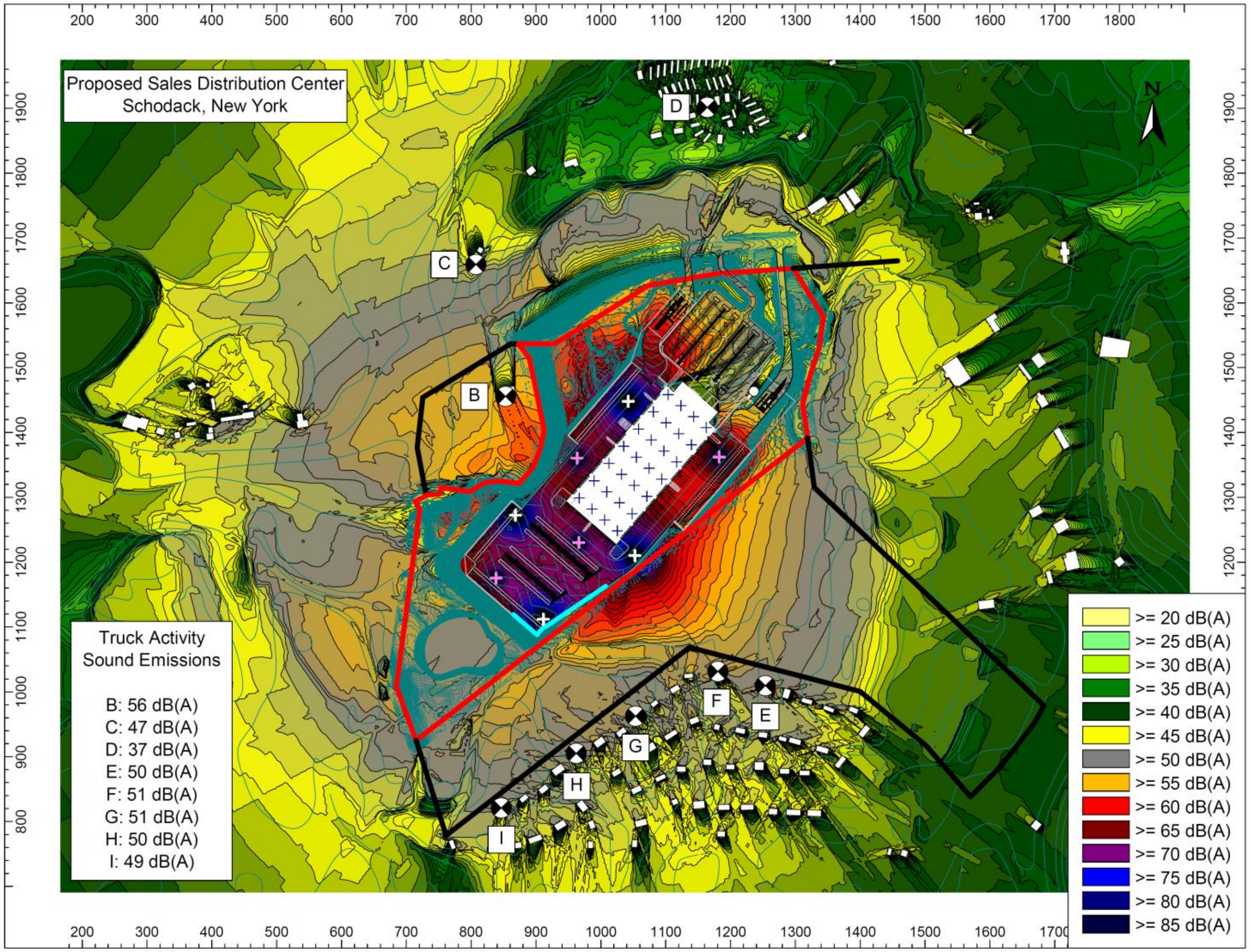

Figure 3 — A-weighted sound emission contours, 5 feet above grade, for sound from rooftop HVAC equipment and heavy truck activity. HVAC rooftop units shown with a blue "+" sign. Four heavy truck activity events shown with a white "+" sign, four box trucks driving shown with a pink "+" sign. Buildings shown in white and site property line outlined in red. Sound wall shown in light blue. Sound emissions tabulated at 15 feet above grade for Locations B, F, and G. All other Locations are 8 feet above grade.

Results from this worst-case scenario, with all 28 rooftop units and eight trucks all simultaneously contributing their maximum sound levels, show maximum sound levels range from 36-to-55 dB(A). It is important to note that site activity will rarely, if ever, synchronize in this manner. Additionally, safe practices prevent the operation of more than one truck in a particular area at the same time. Table 7 compares the lowest documented maximum traffic sound levels with model results. Increases are highlighted.

Table 7 — Lowest maximum traffic sound levels compared to maximum site sound emissions, A-weighted sound pressure levels in dB re 20μPa.

Location	Lowest Measured Traffic Maximum	Modelled Maximum	Difference
B	68	56	-12
C	68	47	-21
D	54	37	-17
E	48	50	2
F	48	51	3
G	48	51	3
H	48	49	1
I	48	49	1

Results show that anticipated maximum site sound levels are typically well below existing maximum ambient sound levels at northern receptors and are generally in line with existing ambient conditions to the south. Increase compared to existing conditions are slight and on the order of 1-to-3 dB(A), which will result in no acoustical impact per DEC guidelines. Maximum sound emissions at all locations comply with the Schodack Chapter 151 code limit of 90 dB(A) by wide margins. The proposed sound wall will provide sufficient screening and attenuation to mitigate site sound emissions at nearby southern receptors.

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 500 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. Levels of this magnitude are similar to heavy truck activity and as a result, construction activity will result in similar sound emissions to those shown in Figure 3. To minimize receptor exposure to construction noise during this phase, consider the following construction mitigation measures:

- ❑ Follow allowable town construction hours if available. General practices typically limit all heavy equipment operation to daytime hours.
- ❑ 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 a 15-foot sound wall about 590 feet in overall length to provide shielding along the site south corner of the truck yard as shown in light blue in Figures 2 and 3. Note that to be effective, the sound wall needs to meet the following requirements:

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

   - Appropriate materials of construction for the wall 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 wall, 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. As terminal tractors are under direct control of the site and are responsible for the majority of back-up movements on site, to minimize any potential complaints from back-up alarms, plan to equip terminal tractors 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.

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

CONCLUSION

The sales distribution center planned for Schodack, NY currently consists of undeveloped wooded land situated adjacent to heavily traveled roadways, Interstate-90 and Route 9. There are sporadic residences in the area and a residential neighborhood south of the site. The construction of this facility would bring truck activity close to noise-sensitive receptors which is a potential acoustical concern.

Plans call for a centrally placed building and a sound wall to the south to shield on-site activity from the surrounding residences. Analyses show that the proposed layout, sound wall, and off-site topography will sufficiently mitigate on-site HVAC and vehicle noise to have no discernable effect on the surroundings since increases will not be higher than 3 dB(A) over the existing ambient sound levels. HVAC sound on its own will mirror existing nighttime background sound levels in the area and be difficult to hear off site. Maximum site sound emissions will be significantly below Schodack Chapter 151 noise code limit of 90 dB(A).

Implementation of the proposed sound wall and using smart, multi-frequency back-up alarms for on-site switchers will put the site in the best position to minimize any 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 10-minute intervals. For each measurement, the analyzer was instructed to store the octave band spectrum in each second, for 600 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.