OSTERGAARD ACOUSTICAL ASSOCIATES

EVALUATION OF SITE SOUND EMISSIONS

PROPOSED INDUSTRIAL PARK
Village of Suffern, New York

Revision 1

Prepared for: **Brookfield Properties**

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

Reviewed by: **Michael T. Conaway, P.E.**
mconaway@acousticalconsultant.com

Date: **14 December 2022**

OAA File: **4517A**

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

TABLE OF CONTENTS

INTRODUCTION

Ostergaard Acoustical Associates (OAA) was asked to assist with the evaluation of potential sound emissions from a proposed speculative industrial park planned for construction in the Village of Suffern, Rockland County, New York. The site is a former Novartis Pharmaceutical Campus just south of Interstate-287. Plans call for the demolition of all existing structures to accommodate the construction of the industrial park facility, comprised of three warehouse buildings. The site is particularly suitable for this location from an acoustical aspect given the proximity to the Interstate and other distribution and industrial facilities to the east. There are residential receptors in the vicinity: beyond Interstate-287 to the north and along Lafayette Avenue (Route 59) to the south.

While none of the proposed buildings have specific tenants, this report takes a conservative approach and assumes the potential to operate at all hours of the day and night. This report addresses the on-site sound radiated from this project to off-site nearby potentially noise-sensitive residential receptors.

The purpose of this sound study is to analyze future site sound emissions for comparison with applicable code limits and to evaluate the potential for noise complaints. Site sound emissions from the site were evaluated against applicable Village of Suffern noise codes. 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. Sound produced by the site will comprise steady sound from rooftop HVAC equipment as well as intermittent sound from truck and car[1] movements.

Work by OAA was overseen by Benjamin C. Mueller, P.E., with assistance from OAA Senior Engineer Michael T. Conaway, P.E. The representatives at Brookfield Properties coordinating this project are Lisa Lyng and William Passik.

SITE AND VICINITY

Figure 1 is an aerial image obtained from Google Earth showing the site outlined in red. Also shown in Figure 1 are sound survey locations, which are discussed later in this report. The project is primarily located on Section 55.22, Block 1, Lot 1, which accommodates a defunct Novartis Pharmaceutical Campus. This property, and an adjacent parcel, Section 55.06, Block 1, Lot 1 in Montebello, are collectively referred to as the "site" in this report. The Montebello parcel

[1] Note that throughout this report, the term "car" collectively refers to personal passenger vehicles including automobiles, vans, pick-ups, or SUVs. The term "truck" refers to heavy trucks such as over-the-road or line-haul trucks.

accommodates a connection roadway that accesses the development. A small parcel associated with the site is south of the adjacent railroad. This parcel is generally not discussed as no development is proposed here at this time. Based on a review of the Village of Suffern zoning map, the parcel being developed is in the PLI, Planned Light Industrial, district. Properties in the Village of Suffern surround this parcel on three sides. Receptors located in the Village of Montebello are to the northeast, east, and southeast. In general, zoning districts aligns with use. Our understanding of land uses in the area is as follows:

- Abutting the site to the north is Interstate-287 with multi-family residential uses beyond in the R-7.5, One-Family Residence, district. Of note is that there is a substantial concrete highway noise barrier between the residences and the Interstate.

- East of the site is Hemion Road with a variety of other logistics facilities farther east. South of these logistics facilities are multi-family residences and commercial uses fronting on Lafayette Avenue. To the northeast is the Suffern Middle School, approximately 2,000 feet away from the project building. These receptors are all located withing the Village of Montebello.

- Bordering the site to the south is a railroad right-of-way. South of the railroad are a variety of uses fronting on Lafayette Avenue including a library, multi-family residences and a religious facility. These uses are in either in a PO, Professional Office, or MR, Multi-Family Residence, districts. A hospital, college, and single-family neighborhoods are farther south, and all located within Residential districts. Southern receptors abutting the eastern part of the site are in Montebello; all others are in Suffern.

- West of the site is a former quarry and industrial use. This land has since been vacated and now accommodates a large body of water as a result of the excavations. Suffern residences are about 2,000 feet away from the site in this direction and are far away enough not be an acoustical concern.

Figure 1 — Google Earth image showing the proposed industrial park site and vicinity in the Village of Suffern, NY. The site property line is outlined in red. Ambient sound survey Locations 1 and 2 also shown.

Plans call for the demolition of the existing campus and construction of three rectangular buildings located in the central portion of the site. The new site will utilize the same access points as the pharmaceutical campus, with access to the north via Old Mill Road and through the eastern parcel to Hemion Road. The northernmost building is Building 1 which is approximately 963,100 ft^2. Buildings 2 and 3 are in the southern portion of the site and are 170,500 and 103,600 ft^2, respectively. Heavy truck docks are located along the west and east facades of Building 1, and the west facades of Buildings 2 and 3; these positions are acoustically beneficial as they do not directly face residential receptors. Personnel vehicle parking is along the north and south sides of Building 1 and east sides of Buildings 2 and 3. Two 15-foot noise walls are proposed at Buildings 2 and 3 to screen residential receptors to the south.

Specific traffic counts depend on the end user tenants. While the end users of the site are not currently known, this sound study utilizes the same database as the traffic study. The Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition, gives a detailed look at quantities and hourly distribution of cars and trucks for sites such as what is proposed. These data are constantly updated based on existing facilities. Specifically, the traffic study uses ITE Land Use Code 150 and assumes 532 daily truck trips, or an average of 22 truck trips per hour. Typical industrial parks operate 24/7 with much of the activity during the daytime hours; nighttime operations are generally used to prepare for the next day. For example, the ITE hourly truck distribution calls for just over 70% of all truck trips to occur between the daytime hours of 9:00 a.m. to 5:00 p.m. Despite this, the study includes an assessment of intermittent maximum sound levels that might occur during the nighttime hours as this is generally when residential receptors are most sensitive and ambient sound levels are lower.

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 facility such as this is characterized by motor vehicle activity, such as idling and vehicle movement, as well as steady HVAC equipment. Although there will be cars on site, they are common to the area and are not expected to be an acoustical concern; hence, cars are not a main focus of this sound study. The steady sound produced by HVAC equipment and heavy truck activity were evaluated and compared to applicable noise code limits as well as acoustical goals based on professional experience. As a general practice, when motor vehicles are on site, they are considered part of a site's sound emissions; when vehicles are on public roads, they are not.

Site sound emissions are regulated by the Village of Suffern Chapter 175: Noise. This chapter promotes the comfort and repose of all residences and discusses noise in a qualitative manner. No sound limits are provided in this ordinance however noise disturbances are prohibited from a variety of activities such as nighttime construction activity, loading and unloading, and using horns for an unreasonable period of time. Heavy construction equipment operations that create a noise disturbance are prohibited except between 7:00 a.m. to 8:00 p.m. on weekdays. Construction activity that causes noise disturbances is prohibited except between 8:00 a.m. to 8:00 p.m. on weekdays and 10:00 a.m. to 8:00 p.m. on Saturdays. In Article IV ¶266-16: Performance Standards, sound limits are given in octave frequency bands across the audible spectrum. Of note is that these performance standards do not apply to noises not directly under the control of the property user, daytime construction activities, noises of safety or warning devices, or transient noises of moving sources such as automobiles, trucks, airplanes, and railroads. Chapter 209: Quarrying and Blasting discuss noise limits and procedures for blasting. The code provides allowable hours, requires notification to the Village 24 hours in advance, and limits blasting sound to not exceeding 120 dB(A) at nearby receptors.

Adjacent to the project site to the east are receptors in the Village of Montebello. Montebello codes are not applicable to this project given development is occurring on the Suffern parcel but were reviewed for familiarity and consideration. Montebello discusses noise in Chapter 118: Noise. Similar to Suffern, noise is primarily discussed in a qualitative manner. Loading and unloading is prohibited within a residential district or within 300 feet from a hotel or motel between 10:00 pm and 6:00 a.m. Domestic power tools are prohibited from 10:00 p.m. to 8:00 a.m. in residential areas. Construction noise is also limited to between sunset and 8:00 a.m. on weekdays or at any time on Sundays or legal holidays. Construction noise should generally not exceed 60 dB(A) across a real property boundary. Explosives are not permitted to create unreasonable noise across a real property boundary.

New York State Vehicle and Traffic (VAT) Law states that all motor vehicles must have a muffler and must be below specific sound limits when measured at a distance of 50 feet from the source. 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 compare the average ambient sound level to proposed site sound emissions to determine the extent of any potential acoustical impact. 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. The term "the most noise sensitive of receptors" is not defined but assumed to reference the small percent of the population who are exceptionally sensitive to noise. Increases of more than 6 dB require closer scrutiny while increases of 10 dB deserve consideration of avoidance and mitigation measures in most cases. No relevant quantitative Rockland County codes regarding noise could be found.

To comply with DEC guidelines, the site must show that site sound does not substantially deviate from existing ambient sound levels in the area. Specifically, average site sound should not exceed existing average ambient sound conditions by more than 6 dB to avoid any negative acoustical impact to the area.

Sound Level Survey

To determine appropriate criteria for comparison to DEC guidelines, an ambient sound survey was carried out to document existing sound in the area. Two measurement locations were selected to characterize the ambient of specific areas of nearby existing receptors. Location 1 was placed on site, in the southern portion, to typify residential areas to the south. Location 2 was placed farther east, set back from Hemion Road, to quantify the extent of local traffic on public roadways. No survey location was selected to the north since these residences are very close to Interstate-87 and shielded by a highway noise barrier. OAA staff deployed the monitors on the afternoon of 16 March 2022 and retrieved them on the morning of 22 March. OAA uses ANSI S12.9 "Quantities and Procedures for Description and Measurement of Environmental Sound" as a guideline for all outdoor sound surveys; all measurements conform to this standard to the extent feasible.

For each Location, a Rion NL-52 sound level meter was placed within a weather enclosure with the microphone attached to an adjacent tripod. A windscreen was used on the microphone. Monitors were instructed to record detailed octave band time history data at one-second intervals and hourly statistics for the duration of the survey. Monitors recorded data until memory was full, or batteries were depleted. In the end, just over four days of sound data were recorded from 12:00 p.m. on 16 March through 7:00 a.m. on 21 March. All sound levels meters were calibrated before and after deployment using a Bruel and Kjaer Model 4231 sound level calibrator, which is calibrated by an outside calibration service annually. It was observed upon deployment and retrieval of the monitors that the acoustical environment was dominated by steady distant traffic flow including both automobiles and heavy trucks. Intermittent fauna noise was present at both measurement locations. Local traffic flow was especially prominent at Location 2.

Weather conditions were appropriate during the survey based on a review of historical data obtained from the nearest weather station at Teterboro Airport. Temperatures ranged from 38-to-72°F throughout the survey with little-to-no precipitation. There were occasions of high winds for certain hourly periods. Worth mentioning is that while the weather station may record high wind speeds at times, these are generally not realized at the height of the microphones; no contamination of survey data was observed from wind gusts.

Acquisition of ambient sound data over the course of the measurement period results in a large amount of data. As a result, it is helpful to review data as hourly statistics to assist with observing ambient sound level trends. Important statistics include the average sound level (L_{eq}), which is the metric the DEC guidelines use, and the background sound level (L_{90}), or level that occurs over 90 percent of the time. The background sound level is best used to evaluate continuous noise sources such as project HVAC sound. The L_{10}, or level that occurs over 10 percent of the time, indicates the extent of intermittent noise sources in the area, such as dog barks, surges in traffic noise, or aircraft passbys. The L_{10} is often used to evaluate intermittent motor vehicle noise from the proposed project. The L_{50} is the median sound level. The DEIS Scoping Outline requested the L_1 statistic be provided; OAA does not typically document that statistic so the L_5, which is similar, was included instead. The purpose of this survey was to understand the existing acoustical conditions for comparison to project emissions. These data are important for use in establishing specific project noise goals to ensure no negative acoustical impact.

A summary of the statistical sound levels recorded and averaged over the entire period of the survey is provided in the following table:

Location	L_{max}	L_5	L_{10}	L_{eq}	L_{50}	L_{90}	L_{min}
1	61	51	50	48	47	45	43
2	83	70	67	63	58	53	46

Time history data obtained during the survey are provided graphically at 1-minuite average sound levels in the Appendix. Survey results reveal the following:

- Average sound levels (L_{eq}) were as expected given the proximity to the Interstate and active local roads. Location 1 saw average sound levels that generally hovered in the mid-to-upper 40s on an A-weighted scale for much of the survey. For Location 2, which was closer to active roadways, average sound levels were generally above 60 dB(A) for most daytime hours; during the night average sound levels dropped to about 55 dB(A).

- The lowest hourly background sound levels (L_{90}) generally occurred for a one-hour period between 1:00 a.m. and 4:00 a.m. each night. Lulls hovered around 40 dB(A) at both Locations during this period. Average background sound levels of 45 dB(A) or above clearly indicate the steady presence of distant Interstate traffic at all hours of the day.

- The L_{10} on the other hand, was significantly different at each Location. Location 1 saw average intermittent sounds around 50 dB(A) and did not vary much given that this Location is remote from active roadways. Levels regularly reached the mid-to-upper 50s on an A-weighted scale. Location 2 saw a more diverse swing in intermittent sound levels from 70 dB(A) during the day down to 60 dB(A) during the night. For both Locations, L_{10} sound levels were just a few decibels higher than documented average sound levels, indicating that high level events in the area occur regularly. A review of maximum sound levels during the survey shows hourly maximum sound levels documented at Location 1 frequently exceeded 60 dB(A), even during the night hours. For Location 2, maximum sound levels never dropped below 70 dB(A).

Project Noise Goals

The Village of Suffern outlines the intent of the noise code but does not provide quantitative limits to be used in an acoustical analysis such as this. Limits given in the performance standards reference a metric not used by modern sound level meters. Despite this, the limits do not apply to motor vehicles. Given the above, the State DEC guidelines were used to develop project noise goals at nearby residential receptors.

Of most interest in the ambient sound survey data are the average sound levels as they directly correspond to DEC guidelines. Per DEC guidelines, the appropriate target is for average site sound levels to not exceed 6 dB above the measured average ambient sound levels to ensure no negative acoustical impact. For receptors set back from the well-travelled roads, such as the rear façade of residences to the south, the DEC target would be 54 dB(A). At residences along public street corridors typified by Location 2 data, site sound should not exceed an average sound level of 69 dB(A). To be conservative, the lower DEC goal was applied to all residential receptors.

Since HVAC sound is steady in nature, its average sound level does not vary much over time. To be below the DEC target goal OAA recommends that HVAC sound not exceed 50 dB(A) at residential receptors. Doing so will afford a margin of safety, result in sound levels comparable to existing average sound levels, and therefore not have any negative acoustical impact. When evaluating temporary maximums from on-site motor vehicle activity, a more permissive levels is acceptable since short duration excursions will still meet hour average sound levels. For occasional high-level sounds, OAA recommends that on-site truck activity strive to not exceed 55 dB(A) at off-site residential receptors to blend in with existing sound in the area. Survey data indicates that at Location 1, receptors in the area are already accustomed to sporadic maximum sound levels approaching 60 dB(A). Motor vehicles should fully comply with all regulations for motor vehicle sound, however given the VAT code limits are relative to the vehicle, and not the receptor, they are not particularly useful for evaluating acoustical impacts. Meeting these project goals will ensure that over the course of an hour, site sound does not exceed DEC target levels.

A brief discussion is warranted on construction noise and blasting. These activities are short in duration but can produce sound high in level. OAA agrees with the applicable noise ordinances which limit construction to daytime hours when ambient is high in level and sensitivity is low. All construction noise codes will be followed, and additional mitigation techniques are provided near the end of the report. Blasting is not forecast to be needed for this project. However, should it be deemed necessary, all applicable codes will be followed, and proper notice will be given. Given the temporary nature of construction and blasting and allowable construction noise code hours will be followed, no short or long term negative acoustical impacts are expected from this activity.

EXPECTED SOUND EMISSIONS

Acoustical modelling software, specifically CadnaA, was used to create and analyze site sound emissions 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. Using ISO Standard 9613, the model accurately predicts distance attenuation as well as the attenuation effects of terrain, various types of ground cover, shielding by structures, and reflections from buildings. In the model buildings are white and the site property line is outlined in red. Two 15-foot-tall sound walls are proposed at the southern end of truck courts at Building 2 and 3. These are shown in light blue in the model. The sound wall at Building 2 is about 130 feet long; the Building 3 wall is about 375 feet long. Also included in the model is a 2,500-foot length of the highway barrier, shown in pink and raised to at a conservative height of 10-feet. North is pointing up in all figures.

The acoustical model shows the results graphically as A-weighted sound level contours, in 1 dB increments, and tabulates the summed A-weighted sound levels at thirteen discrete locations at nearby residences and other potentially sensitive receptors. Sound level contours are at ear height, 5-feet above grade. Location A is not used and reserved for future use. Modelled Locations of interest and their associated heights are shown in Table 1 as follows:

Table 1 – Modelled receptors of interest with their Location letter and modelled height.

Location	Receptor	Height (ft)
B	Brooklands Avenue Residences	15
C	Knolls at Ramapough Residences	15
D	Ramapo Cirque Residences	25
E	Suffern Middle School	25
F	Montebello Crossing	35
G	Tagaste Monastery	35
H	Good Samaritan Hospital	35
I	Suffern Free Library	20
J	Hillcrest Road Residences	15
K	Esther Gitlow Towers	45
L	Salvation Army College of Officer Training	35
M	Yvette & Louis Tekel Senior Residence	45
N	Antrim Pointe Apartments	45

From our professional experience, while code language is typically cited to apply "at or within" the property line of a receptor, noise is most commonly assessed and enforced at the location of repose. Inaccessible or uninhabited portions of the property are generally not scrutinized. For this study, sound was scrutinized at the facades of residences or other sensitive receptors where inhabitants are sleeping during the night hours.

Rooftop HVAC Sound

Rooftop HVAC equipment produces noise that is nominally steady in nature, and hence will not vary significantly over time. HVAC details are not available at this time in the design stage. As a result, OAA routinely uses conservative estimations to model worst-case HVAC sound emissions. Any changes to what was modelled will be evaluated as the design continues to develop. Based on OAA's experience with other similar projects, a conservative approximation for a warehouse is to assume 1 ton of cooling per 725 square feet of building. This equates to about fifty-four (54) 25-ton HVAC units for Building 1, ten units for Building 2, and six units for Building 3. These units were evenly spread out on the rooftop of each facility and the sound power level for each of these was assumed to be 93 dB(A) re 1 picowatt based on manufacturers' data and professional experience. Note that this assumes warehouse space will be heated and cooled; this overestimates HVAC requirements as most warehouses are only heated.

The noise from the rooftop units was included in the HVAC sound model. HVAC noise sources are shown as blue "+"s. Noise sources were placed 4 feet above the rooftop, and sound was projected off site. Figure 2 shows the results graphically and tabulates the summed A-weighted sound levels at the nearby Locations of interest. The results show that, with all rooftop units operating, HVAC sound levels at off-site receptors ranges from 36-to-49 dB(A) at nearby receptors. HVAC sound at all receptors meets the project noise goal and is aligned with the existing average sound levels at Location 1, which is remote from active roadways.

This analysis shows that there is little concern about HVAC sound. HVAC sound is sufficiently controlled via distance and roof shielding effects so that noise meets the nighttime project goal of 50 dB(A) at all residential receptors. "Roof shielding effects" refers to the fact that the roof acts as an acoustical barrier to rooftop equipment for vantage points closer to the ground as the roof edge screens the rooftop equipment from view. Roof shielding effects are not a factor for upper story receptor vantage points that may be higher than the HVAC equipment. Note that for these model results to be realized, acoustical performance of HVAC equipment must be aligned with what was modelled.

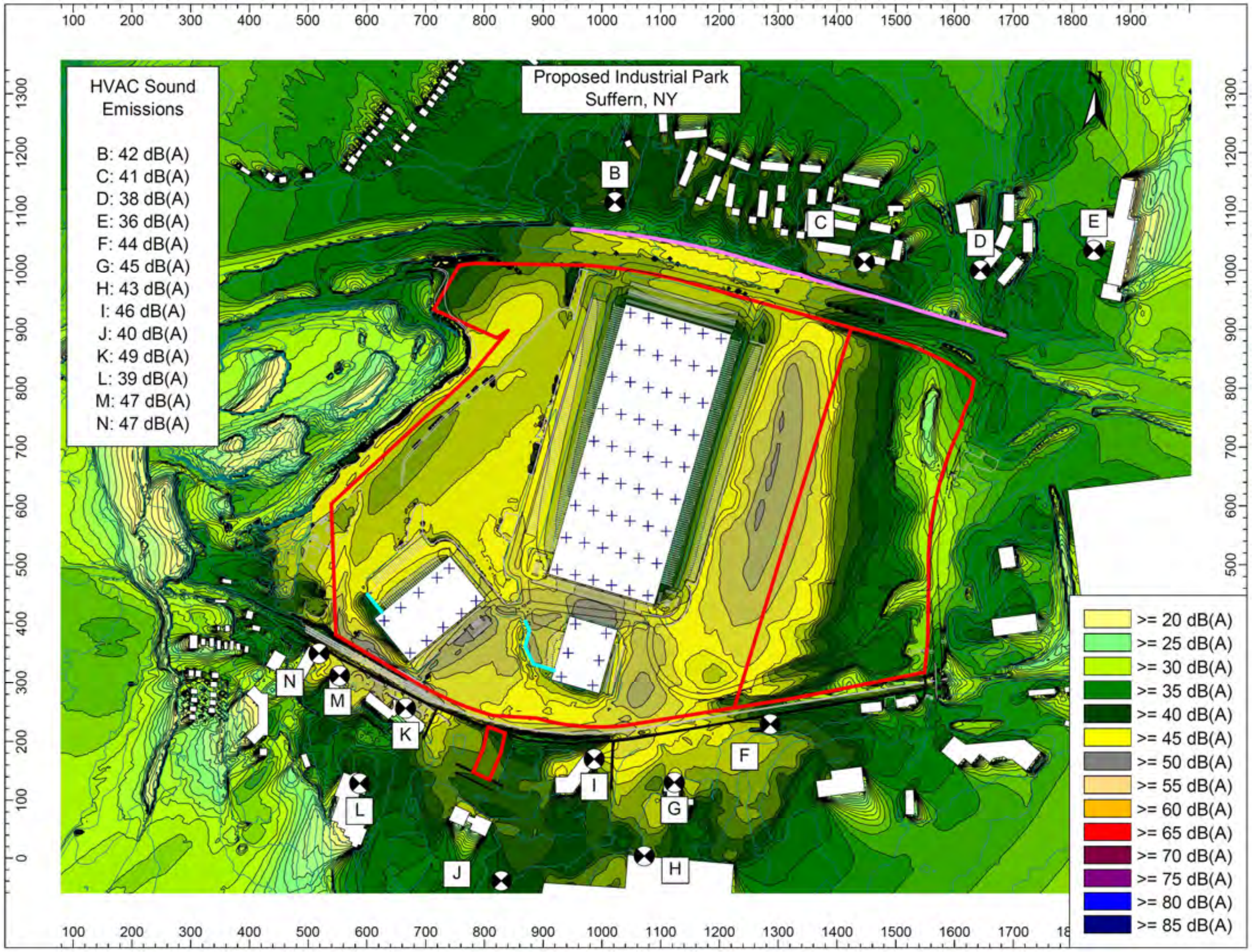


Figure 2 — A-weighted sound emission contours, 5 feet above grade, from rooftop HVAC equipment. Each unit shown with a blue + sign. Buildings shown in white, site property line outlined in red. All Locations typify upper story receptors of interest. See Table 1 for Location description and modelled height.

Truck Activity

OAA has had the opportunity to visit various logistics facilities and industrial parks over the years to survey and document the sounds of truck activity. In addition to experience, truck operations are modelled based on information provided by ITE Standards, which are also used by traffic engineers to accurately and realistically forecast potential traffic concerns. The industrial park will have over-the-road line-haul trucks and potentially have terminal tractors (yard tractors) active on site. From an acoustical aspect, terminal tractors and line-haul trucks are acoustically equivalent. This project is not proposed as a refrigerated warehouse use at this time. Such a use would require specialized HVAC equipment and would likely include trucks with refrigerated trailers. This sound study was carried out based on standard warehouse operation with standard, non-refrigerated trailers.

Truck noise in a typical dock area can routinely produce maximum sound levels of 79 dB(A) when measured at a distance of 50 feet from the source. 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 truck exhibits slightly lower maximum sound levels of 74 dB(A) when measured 50 feet from the source. The height of a truck source for all truck activity 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 within the truck court. 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 offsite 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.

While there will certainly be multiple trucks onsite at any given time, it is generally appropriate to evaluate maximum sound from an individual truck. Several factors support this. Because maximum levels are dynamic and short in duration, it is unlikely that multiple truck sound level maximums will occur at exactly the same time and location. In addition, safe practices restrict more than one truck from operating in proximity to each other in the same vicinity. Hence, off-site maximum sound levels will be driven by individual truck sources. In the unlikely event that two truck sources would contribute the same level in the same location at the exact same time, maximum emissions would only be 3 dB higher due to the logarithmic nature of sound pressure level addition

Despite this, to be conservative, OAA has modelled five different trucks producing their maximum sound level at the same time, at various on-site locations that are nearest to receptors. Truck locations were located away from sound barriers at a location where sound emissions were worst-case. Five trucks contributing yard activity are shown as white "+"s and each modelled with a sound pressure level of 79 dB(A) at 50 feet. HVAC noise sources were also included in the model to represent worst-case conditions, and are shown as blue "+"s. Figure 3 shows the resulting worst-case site sound emissions contributed by truck activity.

To address concerns about multiple trucks on site across a given hour, OAA modelled average sound levels from driving trucks around the project site. A review of the traffic study showed that based on the Land Use Code 150 (Warehouse), a total of 532 truck trips were expected daily to this site. This averages to 22 truck trips each hour, which is equivalent to 11 trucks per hour. Based on the truck distribution table included at the end of the traffic study, this count is a conservative number to use during the nighttime hours and understated for activity during the daytime hours. Ultimately, the average trips per hour is appropriate to use when comparing to DEC criteria. No negative acoustical impact is expected from higher truck trip counts during the daytime hours as ambient sound levels are generally higher and receptor sensitivity is lower during this period. The results of modelling 22 trucks driving around the site are shown in Figure 4. In CadnaA, a road source was looped around the site using Standard RLS-90, which is a widely recognized standard for evaluating traffic noise. Input data comprised 22 trucks in an hour period, with 100% being heavy vehicles. Road speed was set to 15 miles per hour and the road surface was set to smooth pavement.

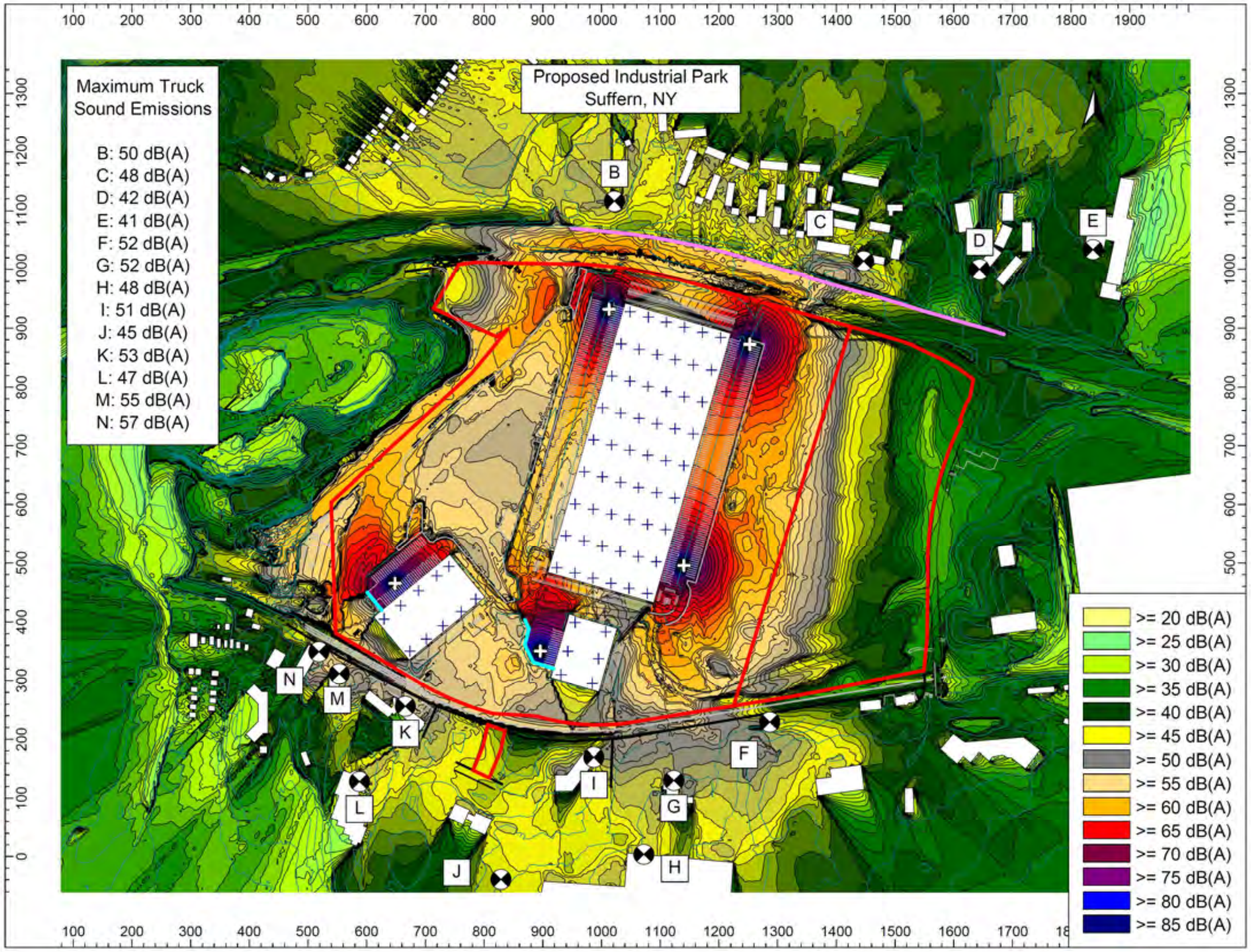


Figure 3 — Maximum A-weighted sound level contours 5 feet above grade expected for on-site truck activity (white "+"). Rooftop units shown with a blue + sign. Buildings shown in white, site property line outlined in red. All Locations typify upper story receptors of interest. See Table 1 for Location description and modelled height.

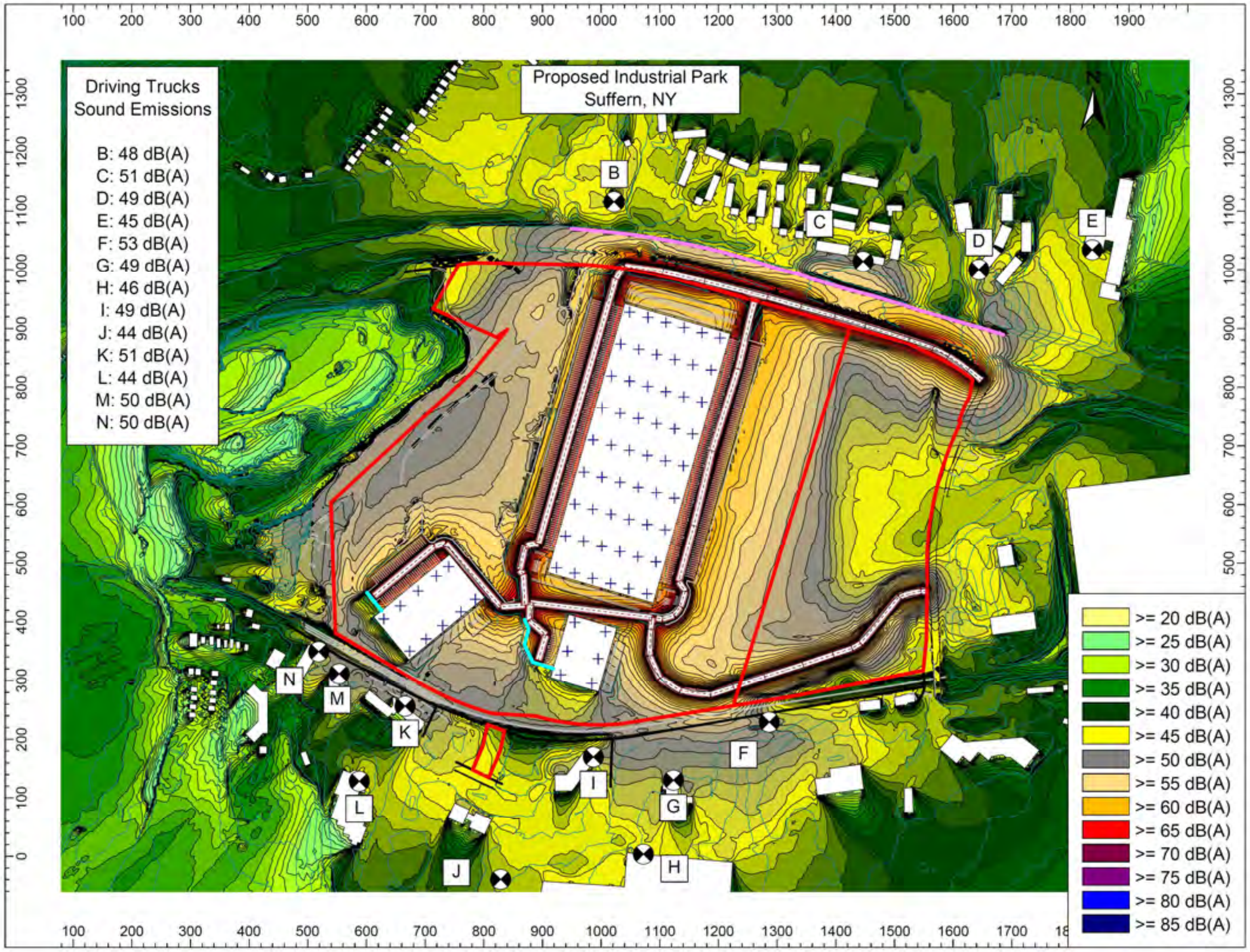


Figure 4 — Average A-weighted sound level contours 5 feet above grade expected for 22 truck trips per hour. Rooftop units shown with a blue + sign. Buildings shown in white, site property line outlined in red. All Locations typify upper story receptors of interest. See Table 1 for Location description and modelled height

A review of the maximum sound levels in Figure 3 shows that intermittent on-site heavy truck sound emissions will be in the 41-to-57 dB(A) range. For Locations B through L, maximum off-site sound levels fall in the 41-to-53 dB(A) range and are within a 5 dB of the existing average sound level of 48 dB(A). Locations M and N show the potential for intermittent maximum sound levels as high as 55-to-57 dB(A) range. The traffic study shows that, for Land Use Code 150, truck trip counts for the entire site drops into the single digits for most hours of the night, which minimizes the occurrence of such maximum sound levels. In addition, off-site truck maximum sound levels of the magnitude shown are well below existing maximum sound levels that occur in the area, including those at night. Overall, maximum sound emissions meet the intent of the 55 dB(A) project noise goal at all receptors; these events are short in duration, infrequent, and as a result are not anticipated to result in any noise complaints should they occur during the nighttime hours.

Note that the proposed sound barriers were designed to minimize sound emissions from the truck yard. Before designing these barriers, worst-case truck yard emissions of 61 dB(A) were modelled at receptors from truck positions in the southernmost yard. The introduction of the sound barrier resulted in the dramatic reduction of sound emissions at these positions, by up to 9 dB. As a result of this attenuation, this report has presented “new” worst-case truck positions more distant from the wall where the sound barrier is less effective. The results in Figure 3 above show these updated positions. Truck events closer to the sound barrier would result in sound levels lower than what is shown in Figure 3.

Scrutinizing the results of Figure 4 shows that average truck activity across the site results in sound levels in the 44-to-53 dB(A) range. These results, which includes both HVAC and average truck activity, are able to be added to the existing average ambient sound levels surveyed at Location 1. Results can then be used to compared to DEC project goals. These results are shown in Table 2.

Table 2 – Summation of existing average ambient sound level to future average site sound levels from HVAC and driving truck activity (Figure 4) and evaluation of any change.

Location	Existing Average Ambient Sound Level, dB(A)	Site Sound Emissions (Fig. 4), dB(A)	Future Average Sound Levels, dB(A)	Change from Existing to Future
B	48	48	51	3
C	48	51	53	5
D	48	49	52	4
E	48	45	50	2
F	48	53	54	6
G	48	49	52	4
H	48	46	50	2
I	48	49	52	4
J	48	44	49	1
K	48	51	53	5
L	48	44	49	1
M	48	50	52	4
N	48	50	52	4

Table 2 shows that the potential change in sound levels from existing conditions to future conditions result in no increase above 6 dB. DEC guidelines state that changes of 6 or below will not have any negative impact on the area. Worth discussing is that Locations B through E show potential increases of 2-to-5 dB. These increases are not expected to be realized in the presence of Interstate-287 traffic flow; using Location 1 ambient data is conservative at these receptors as it does not capture the higher ambient sound levels for receptors closer to the Interstate.

Lastly, while off-site truck routes are not regulated by code, they were reviewed to evaluate their potential for acoustical impact. All trucks will use Laffayette Avenue to access the site via Hemion Road. It is logical to assume that most trucks will come from the east where Interstate access is available. These roadways are heavily travelled and hence receptors along these off-site routes are accustomed to occasional short duration high sound levels from motor vehicle passbys. This statement is supported based on the sound data obtained at Location 2, which typified receptors along active roadways. Across the survey period, average sound levels were routinely above 60 dB(A) and maximum sound levels each hour exceeded 70 dB(A) even during the night. Given the above, we conclude that project truck traffic will blend in with existing traffic flow noise in the area and no negative acoustical impact is expected from off-site truck routes.

RECOMMENDATIONS

1. To ensure the project goal is met to the south, construct two sound barriers as shown in the figures. Both barriers, shown in light blue in the figures above, should be carried to 15 feet above the paved truck court. The sound barrier for Building 2 should be approximately 130 feet in length; the sound barrier for Building 3 should be approximately 375 feet in length. Note that to be effective, the noise control barrier needs to meet the following requirements:

    a. The barrier needs to be solid, without openings, and be of sufficient surface weight. A recommended minimum surface weight for the barrier is 7 lbs/ft^2.

    b. Appropriate materials of construction for the barrier include 5/8-inch-thick sheet steel piling, precast or poured-in-place concrete, treated wood/engineered lumber, acoustical metal panels, or other hybrid system specifically manufactured for the purpose.

    c. 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. Back-up alarms can be the cause of noise complaints. To minimize any potential complaints from back-up alarms, we generally recommend outfitting trucks owned and controlled by the site with smart, ambient sensing, multi-frequency back-up alarms. This is especially effective on on-site terminal tractors/yard jockeys as these trucks are responsible for the majority of back-up movements at sites like this. Acceptable back-up alarms 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 current HVAC equipment plans, assuming plans do not markedly deviate from those presented in the model. Acoustical performance of new equipment should be kept in mind.

ADDITIONAL CONSIDERATIONS

The Village noise code prohibits construction noise outside of allowable hours. Although construction noise is temporary in nature, it is worth discussing considerations to minimize the acoustical impact of this activity. The closest on-site building is at least 500 feet from the nearest dwelling. 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 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 generally result in sound emissions comparable to those shown in Figure 4. At a distance of 500 feet, with line-of-sight, construction equipment may approach 60 dB(A). OAA finds that levels of this magnitude to not have any negative impact given they will occur during the day during allowable construction hours. To minimize receptor exposure to construction noise during this phase, consider the following construction mitigation measures:

- Limit all heavy equipment operation to non-noise-sensitive daytime hours and follow allowable town construction hours as applicable.

- 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.

- ❑ Coordinate any high sound level construction activities with town representatives and provide advance notice to residences as feasible.

- ❑ Should blasting need to occur, follow applicable code directives.

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

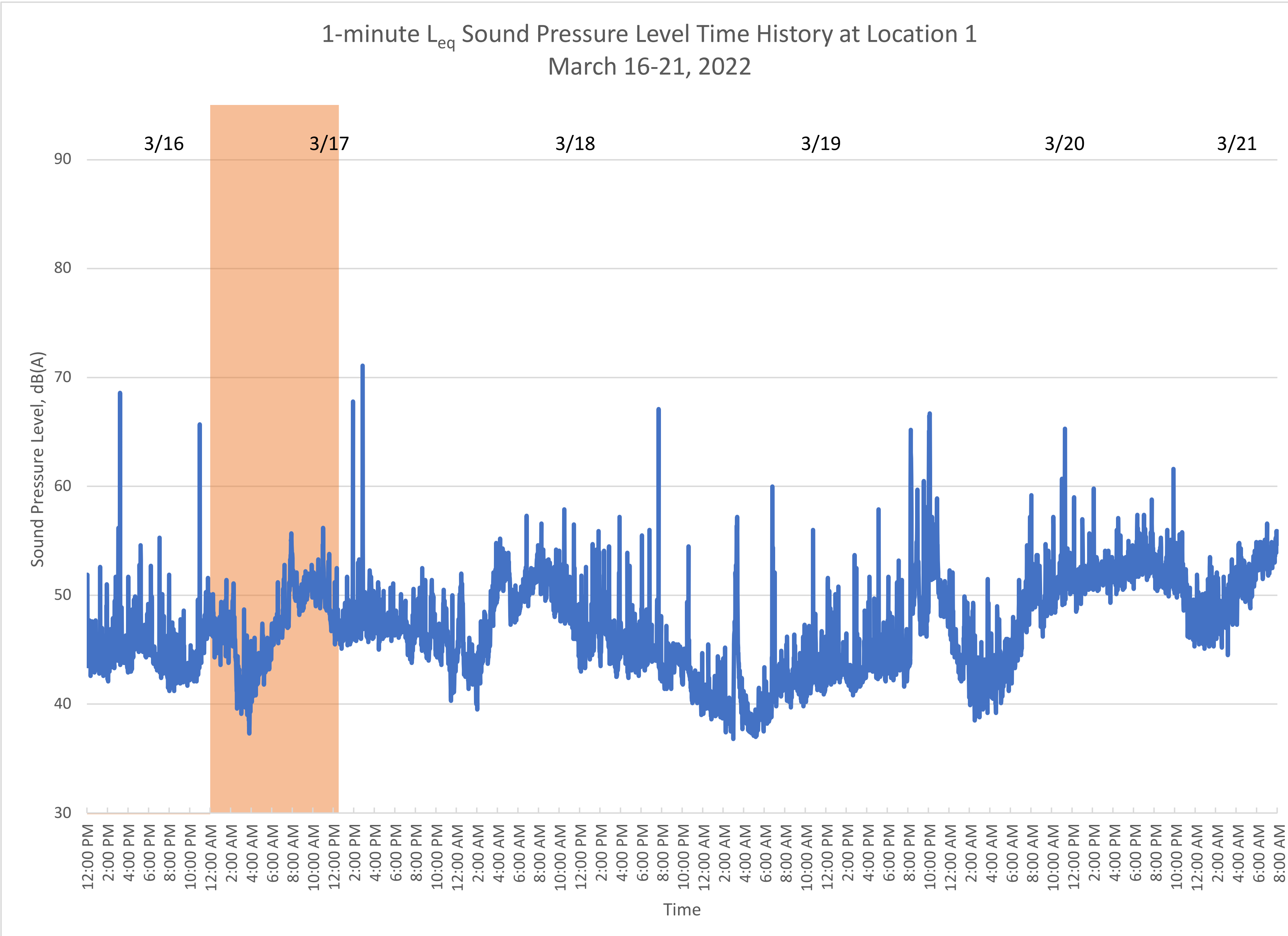
CONCLUSION

Plans call for the development of a speculative industrial park on appropriately zoned property, along the Interstate, in the Village of Suffern, New York. There are residences in the vicinity and hence the focus of this analysis was on these potentially noise sensitive receptors. Other receptors of interest evaluated include a school, college, hospital, and a monastery. The construction of a 24/7 industrial park would bring car and truck activity to the area. Site sound emissions must meet the local noise code and should also not deviate from existing sounds in the area to ensue no negative acoustical impact at potentially noise sensitive receptors.

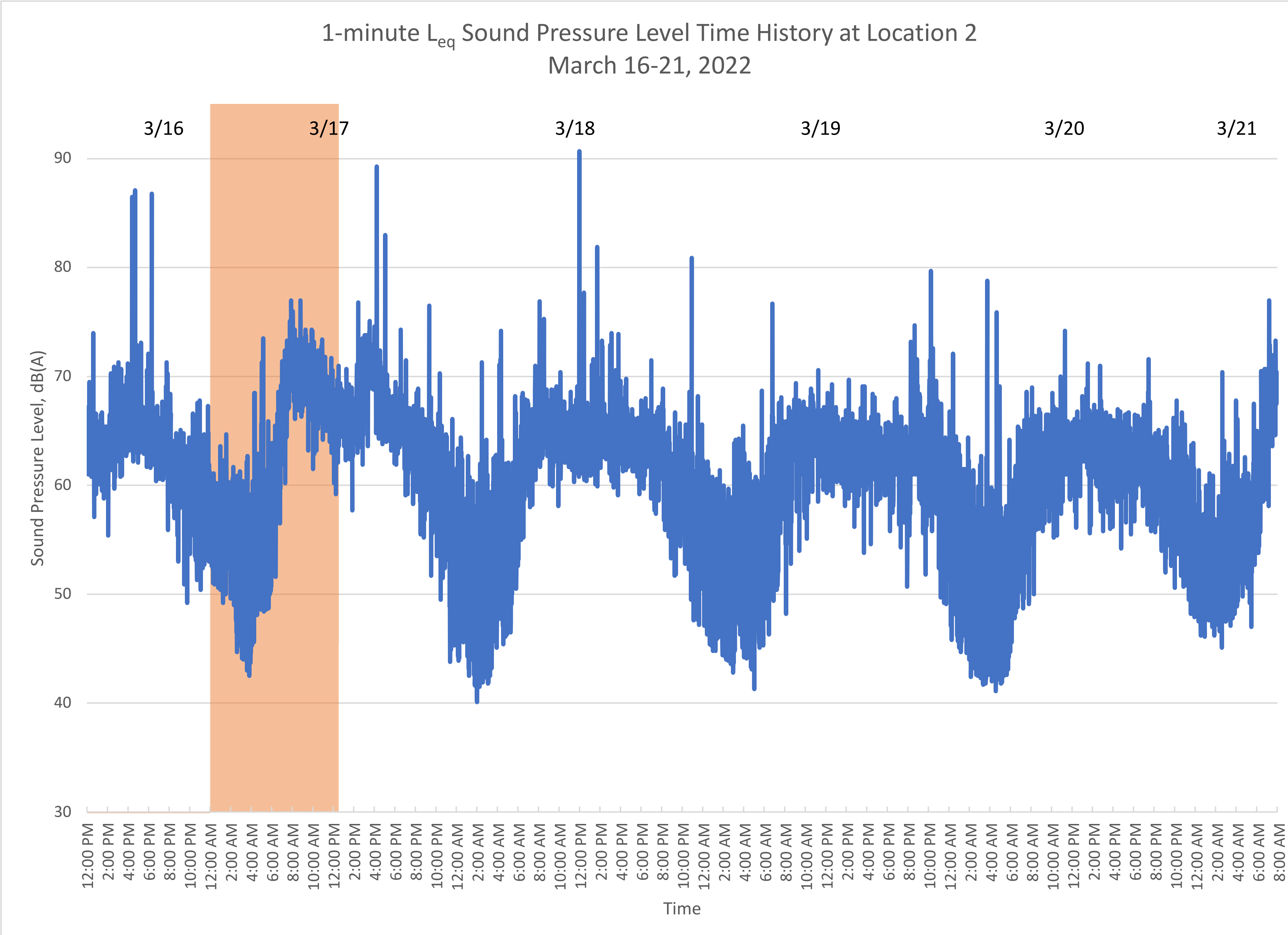
The site is well laid out and designed. Off-site truck routes via Laffayette Avenue are a direct path to the Interstate and use existing well-travelled roads. Analyses show that distance and site geometry will sufficiently attenuate on-site HVAC and vehicle noise to have no negative effect on the surroundings. Steady site sound will blend in with existing average sound levels in the area. In a similar manner, intermittent site sound will blend in with existing maximum sound levels in the area with the help of two proposed sound barriers in the southern portion of the site. Following DEC guidelines, analyses show that worst-case average future sound levels will increase by at most 6 dB, which will have no negative acoustical impact on the area. Most receptors in the vicinity will only see increases of 1-to-4 dB, which are difficult to discern. Construction noise and potential blasting are temporary noise producing activities, that when carried out in accordance with appliable code will minimize any impact on the surrounding area; note that while blasting is referenced it is not anticipated at this time. Based on the foregoing, the findings in this report support and conclude that the industrial park will not create any significant adverse sound impacts and is appropriate for this site.

APPENDIX

1-minute L_{eq} Time History Graphs from Sound Survey



1-minute L_{eq} Sound Pressure Level Time History at Location 1
March 16-21, 2022
3/16
3/17
3/18
3/19
3/20
3/21
90
80
70
60
50
40
30
Sound Pressure Level, dB(A)
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
10:00 AM
Time


1-minute Leq Sound Pressure Level Time History at Location 2
March 16-21, 2022
3/16
3/17
3/18
3/19
3/20
3/21
Sound Pressure Level, dB(A)
90
80
70
60
50
40
30
Time