2.16 NOISE

2.16.1 INTRODUCTION

The *CEQR Technical Manual* defines noise as any unwanted sound, and sound is defined as any air pressure variation that the human ear can detect. According to the CEQR guidelines, an assessment of potential noise impacts evaluates three principal types of noise sources: mobile, stationary and construction. The noise impact assessment process considers noise ranging from extreme hazardous levels that can cause hearing loss, to more common significant noise level changes that adversely affect the quality of life. The high density of people working and living in close quarters in New York City makes determining existing and future noise conditions a vital component of the environmental assessment process because of the potential for this unwanted sound to disrupt sleep, interrupt activities requiring concentration, cause annoyance and/or add to stress-related illnesses.

2.16.1.1 Year 2015

~~Developments~~Components of the Proposed Project are expected to be completed over several years. Construction of Retail Site "A" and Fairview Park are expected to be completed by the year 2015, which would include new stationary sources of noise (i.e., mechanical equipment) and ~~generate~~would create new mobile sources (i.e., vehicular traffic) that would ~~create~~generate noise. ~~However, the~~The mobile source, noise analyses ~~presented~~of conditions in ~~this chapter~~2015 were ~~conducted using~~based on the worst-case ~~approach by focusing on potential noise impacts under the 2020~~traffic forecasts for the 2015 analysis year~~, by which time all of the components of the proposed development would be constructed and operational,~~ as ~~described below and~~ presented in ~~this chapter~~**Chapter 2.13, Transportation**.

2.16.1.2 Year 2020

~~Construction of~~The remainder of the ~~Development Area~~Proposed Project components is expected to be completed by the year 2020, including the developments of Retail Site "B", the combined public elementary/intermediate school, and the senior housing, as well as the construction of Englewood Avenue ~~and other road constructions~~.

~~The noise analysis presented in this chapter were conducted using the worst-case approach by focusing on potential noise impacts under the 2020 year analysis, when all the components of the development are complete and fully operational.~~ As described in **Chapter 1.0**, "Project Description," the 2020 analysis year represents the full build-out of the Development Area ~~under a worst-case scenario~~ with the greatest potential to create mobile source noise impacts from vehicle trips added by the project~~, and the~~. The associated potential for ambient noise impacts would also be greatest, as new sensitive receptors would be introduced (the school and senior housing), along with new stationary sources creating noise (i.e., mechanical equipment and a school playground). ~~In addition the~~The effects of noise generated by stationary sources created within the Development Area on sensitive land uses are also discussed qualitatively in this chapter. ~~Therefore if the worst-case 2020 conditions show no significant noise impacts, the impacts under a 2015 year analysis would be less than the performed 2020 year analysis, and as such, do not warrant a further analysis.~~ The potential noise impacts generated by the construction of the proposed Charleston Mixed-Use Development are discussed in **Chapter 2.19~~.~~, "Construction".**

2.16.2 METHODOLOGY

2.16.2.1 Noise Fundamentals

Noise impacts may occur from numerous sources. Some noise is caused by activities essential to the health, safety, and welfare of a community, such as emergency vehicle sirens, garbage collection

operations, and construction and maintenance equipment. Other sources of noise, such as traffic and aircraft, stem from the movement of people and goods, activities that are essential to the viability of a community as a place to live and do business. Although these and other noise-producing activities are necessary to modern life, the noise they produce is sometimes undesirable and may detract from the quality of the living environment. Noise levels of common sources are presented in **Table 2.16-1**.

A number of factors affect sound, as it is perceived by the human ear. These include the actual level of the sound (or noise), the frequencies involved, the period of exposure, and changes or fluctuations in the noise levels during exposure. Levels of noise are measured in units called decibels (dB). Since the human ear cannot perceive all pitches or frequencies equally well, these measures are adjusted or weighted to compensate for the human lack of sensitivity to low-pitched and high-pitched sounds. This adjusted unit is known as the A-weighted decibel, or dBA. The A-weighted network de-emphasizes both very low- and very high-pitched sounds, so the measured levels correlate well with the human perception of loudness.

Since the dBA noise metric describes a noise level at just one moment, and very few noises are constant, other ways of describing noise over extended periods are needed. One way of describing fluctuating sound is to describe the fluctuating noise heard over a specific time period, as if it had been a steady, unchanging sound. For this condition, a descriptor called the equivalent sound level, L_{eq}, can be computed. The L_{eq} descriptor is the constant sound level that, in a given situation and time period (e.g., one-hour L_{eq}, or 24-hour L_{eq}), conveys the same sound energy as the actual time-varying sound. Statistical sound level descriptors such as L_1, L_{10}, L_{50}, L_{90}, and L_x are also sometimes used to indicate noise levels which are exceeded 1, 10, 50, 90, and x percent of the time, respectively. The descriptors of the maximum and minimum noise during a noise event are L_{max} and L_{min}, respectively.

Table 2.16-1
Noise Levels of Common Sources

Noise Source	Level (dBA)
Air Raid Siren at 50 Feet	120
On Platform by Passing Subway	100
On Sidewalk by Passing Heavy Truck or Bus	90
On Sidewalk by Typical Highway	80
On Sidewalk by Passing Automobiles with Mufflers	70
Typical Urban Area	60-70
Typical Suburban Area Background	50-60
Quiet Suburban Area at Night	40-50
Typical Rural Area at Night	30-40

Source: *CEQR Technical Manual*.

Human response to changes in noise levels depends on a number of factors, including the quality of the sound, the magnitude of the changes, the time of day at which the changes take place, whether the noise is continuous or intermittent, and the individual's ability to perceive the changes. Human ability to perceive changes in noise levels varies widely with the individual, as does the response to the perceived changes. Generally, change in noise levels less than ~~three (~~3~~)~~ dBA will barely be perceptible to most listeners, whereas a ~~ten (~~10~~)~~ dBA change normally is perceived as a doubling (or halving) of noise levels. These guidelines permit direct estimation of an individual's probable perception of changes in noise levels in common environment.

Another factor that describes how noise is characterized and analyzed is whether the noise source is continuous or impulsive. Continuous noise sources include those from traffic, aircraft, stationary sources for which the appropriate metrics are described above. Impulsive noise is generated from such things as explosive detonations or gun firing. Because the proposed site is adjacent to a gun range, such impulsive gun firing noise may have certain effects on the proposed sensitive land uses.

Continuous noise is fundamentally different from impulsive noise. As such, noise threshold criteria differ. For example, permanent damage to unprotected ears due to continuous noise occurs at approximately 85 dB, based on an eight-hour-per-day exposure, while the threshold for permanent damage to unprotected ears due to impulsive noise is approximately 140 dB peak noise based on 100 exposures per day (Pater, 1976 as cited in *Operational Noise Manual*, USACHPPM, 2005).

2.16.2.2 Noise Impact Criteria and Methodology

The *CEQR Technical Manual* contains noise exposure guidelines for use in New York City environmental impact review, and required attenuation values to achieve acceptable interior noise levels. These values are shown in **Table 2.16-2**. Noise exposure is classified into four categories: "acceptable," "marginally acceptable," "marginally unacceptable," and "clearly unacceptable." The *CEQR Technical Manual* criteria are based on maintaining an interior noise level for the worst-case hour L_{10} less than or equal to 45 dBA.

Additionally, according to the noise impact assessment guideline provided in the *CEQR Technical Manual*, to determine a significant impact during daytime hours, 65 dBA $L_{eq}(1)$ is the absolute noise level that should not be significantly exceeded. Therefore a 3-dBA L_{eq} increase over Future No-Action condition, although just barely perceptible to most listeners, is considered an indicator of noise impact significance when the daytime level is at or above 62 dBA. The same 3-dBA threshold is applicable for all nighttime noise levels. These assessment guidelines were used to assess noise impacts from the Proposed Project.

Table 2.16-2
Noise Exposure Guidelines

Receptor Type	Time Period	Acceptable General External Exposure	Airport[3] Exposure	Marginally Acceptable General External Exposure	Airport[3] Exposure	Marginally Unacceptable General External Exposure	Airport[3] Exposure	Clearly Unacceptable General External Exposure	Airport[3] Exposure
1. Outdoor area requiring serenity and quiet[2]		$L_{10} \leq 55$ dBA	---- Ldn ≤ 60 dBA ----	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
2. Hospital, Nursing Home		$L_{10} \leq 55$ dBA		$55 < L_{10} \leq 65$ dBA	---- 60 < Ldn ≤ 65 dBA ----	$65 < L_{10} \leq 80$ dBA	(1) 65 < Ldn ≤ 70 dBA, (2) 70 ≤ Ldn	$L_{10} > 80$ dBA	---- Ldn ≤ 75 dBA ----
3. Residence, residential hotel or motel	7 AM to 10 PM	$L_{10} \leq 65$ dBA		$65 < L_{10} \leq 70$ dBA		$70 < L_{10} \leq 80$ dBA		$L_{10} > 80$ dBA	
	10 PM to 7 AM	$L_{10} \leq 55$ dBA		$55 < L_{10} \leq 70$ dBA		$70 < L_{10} \leq 80$ dBA		$L_{10} > 80$ dBA	
4. School, museum, library, court, house of worship, transient hotel or motel, public meeting room, auditorium, out-patient public health facility		Same as Residential Day (7 AM-10 PM)		Same as Residential Day (7 AM-10 PM)		Same as Residential Day (7 AM-10 PM)		Same as Residential Day (7 AM-10 PM)	
5. Commercial or office		Same as Residential Day (7 AM-10 PM)		Same as Residential Day (7 AM-10 PM)		Same as Residential Day (7 AM-10 PM)		Same as Residential Day (7 AM-10 PM)	
6. Industrial, public areas only[4]	Note 4	Note 4		Note 4		Note 4		Note 4	

Notes:
(i) In addition, any new activity shall not increase the ambient noise level by 3 dBA or more;
[1] Measurements and projections of noise exposures are to be made at appropriate heights above site boundaries as given by American National Standards Institute (ANSI) Standards; all values are for the worst hour in the time period.
[2] Tracts of land where serenity and quiet are extraordinarily important and serve an important public need and where the preservation of these qualities is essential for the area to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks or open spaces dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet. Examples are grounds for ambulatory hospital patients and patients and residents of sanitariums and old-age homes.
[3] One may use the FAA-approved L_{dn} contours supplied by the Port Authority, or the noise contours may be computed from the federally approved INM Computer Model using flight data supplied by the Port Authority of New York and New Jersey.
[4] External Noise Exposure standards for industrial areas of sounds produced by industrial operations other than operating motor vehicles or other transportation facilities are spelled out in the New York City Zoning Resolution, Sections 42-20 and 42-21. The referenced standards apply to M1, M2, and M3 manufacturing districts and to adjoining residence districts (performance standards are octave band standards).
Source: *New York City Department of Environmental Protection (adopted policy 1983)*

~~Additionally, according to the noise impact assessment guideline provided in the *CEQR Technical Manual*, to determine a significant impact during daytime hours, 65 dBA L_{eq}(1) is the absolute noise level that should not be significantly exceeded. Therefore a three (3)-dBA L_{eq} increase over Future No-Action condition, although just barely perceptible to most listeners, is considered an indicator of noise impact significance when the daytime level is at or above 62 dBA. The same 3-dBA threshold is applicable for all nighttime noise levels. These assessment guidelines were used to assess noise impacts from the Proposed Project.~~

Stationary Sources

The anticipated new stationary sources under the Proposed Project would be limited to ~~those typical~~the heating and cooling and ventilation (HVAC) equipment installed at commercial, residential ~~or~~, and community facility buildings ~~and~~plus the proposed new school playground ~~noise~~.

HVAC

For larger buildings, ~~such~~HVAC equipment is either inside the proposed buildings, or on their respective rooftops. Smaller residential buildings may include window or built-in wall air conditioning units or ~~have~~

some equipment located outdoors in side or rear yards. Indoor equipment is not considered a substantial stationary noise sources as defined in the *CEQR Technical Manual.* The larger building's rooftop equipment is typically screened and would be sufficiently removed from existing or proposed sensitive receptors to avoid creating significant noise impacts. Noise from window or wall units would similarly not warrant detailed impact analysis and would be unlikely to result in any significant noise impacts to the surrounding community. Therefore the HVAC noise impacts to the neighborhood from the Proposed Project are considered to be negligible and require no further analysis in this chapter.

School Playground

Noise from the proposed new school playground activities was predicted based on the measurement data and analysis approach adopted by the New York City School Construction Authority to assess potential school noise impacts on the community. The prediction was made using the following acoustic formula:

$$L_{p1} = L_{p2} - 15 * \log(d/10)$$

where:

L_{p1} is the predicted playground equivalent noise level at a specific distance
L_{p2} is the maximum hourly equivalent noise level at the playground boundary
d is the distance from the source to the receiver

Mobile Sources

The methodology for predicting future on-road traffic noise levels assumes that existing noise levels are dominated by, and are a function of, existing traffic volumes. Changes in future noise levels can therefore be determined by the proportional increase in traffic on the adjacent roadway due to a project. For example, if the existing traffic volume at an intersection were 100 vehicles per hour (vph), and the future traffic volume increased by 50 vph to 150 vph, the noise levels would increase by approximately 1.8 decibels (dBA). For an increase of 100 vph (a doubling of traffic volume) for a total of 200 vehicles per hour, noise levels would increase by 3 dBA. However, as different noise levels are generated by different types of vehicles (cars, trucks, buses, etc.), CEQR recommends using Passenger Car Equivalents (PCEs) to create a common unit of measurement to conservatively estimate noise from traffic. The PCE conversion factors are summarized below:

- Each Automobile or Light Truck: 1 Noise PCE
- Each Medium Truck: 13 Noise PCEs
- Each Bus: 18 Noise PCEs
- Each Heavy Truck: 47 Noise PCEs

Where traffic noise at a location primarily comes from a single adjacent roadway, with no nearby higher-volume roadways, estimating whether the Proposed Project would double PCE traffic– the threshold under CEQR for potential traffic noise impacts – can be used. However, at locations where traffic noise from multiple roadways substantially ~~contribute~~contributes to ambient sound levels, a simple PCE comparison for traffic on the nearest roadway is insufficient as it does not account for ambient noise levels generated by those other roadways. In those cases, a refined noise analysis using the Traffic Noise Model (TNM) was conducted to predict the true project-generated traffic noise incremental increase along the immediately adjacent road. The noise levels predicted by the TNM model were then compared to the existing measured noise levels to determine whether a significant noise increase above the ambient levels or an exceedance of the daytime absolute threshold of 65 dBA would occur as a result of the Proposed Project.

Gun Firing Noise

Given the lack of regulatory guidance in addressing potential gun firing impulsive noise effects, such as those which would be generated by the Colonial Rifle ~~&~~and Pistol Club during its operational hours (i.e., 9

~~AM~~:00 a.m. to sunset between Monday and Saturday and 10~~ AM~~:00 a.m. to sunset on Sunday), the maximum noise level in terms of L_{max} that is typically used in addressing event noise was considered. The available L_{max} levels from a typical rifle firing at various distances and azimuth angles toward a receiver published in a research paper[1] were used in a comparison with the existing L_{max} levels monitored at each relevant monitoring site from gun firing or traffic noise. A qualitative assessment of the potential gun firing noise effects on the proposed sensitive land uses was performed based on this comparison.

2.16.3 EXISTING CONDITIONS

Existing noise levels at and in the vicinity of the Charleston Mixed-Use Development Site are typical for areas with moderate-density commercial and residential uses in this type of suburban-like setting. As expected, greater noise levels exist in the areas adjacent to the West Shore Expressway (Route 440) and near arterial roadways such as Arthur Kill Road and Veterans Road West. A total of seven noise-sensitive sites in the neighborhood surrounding the Project Area were selected for weekday peak period noise monitoring to determine current noise conditions. These selected sites include existing residential areas, a motel, a park, as well as the future senior housing and Fairview Park sites. Several noise monitoring sites were selected based on their proximity to existing residences in the area, such as ~~the~~The Tides residential community across Arthur Kill Road, and those residences located along the western segment of Englewood Avenue. **Figure 2.16-1** shows these selected sites in the context of existing land uses.

Noise monitoring was conducted per the procedures described in the *CEQR Technical Manual* using two Bruel & Kjaer Type 1 sound level meters, Models 2250 and 2238. During each sampling event, a sound signal was obtained by an outdoor microphone positioned five feet above the ground and was transferred to the noise analyzer. The sound level meters then converted the incoming signal to A-weighting, sound statistics, including L_{eq}, L_{10}, L_{90}, L_{min} and L_{max}. The data were digitally recorded by the noise analyzer for a continuous 20-minute period. A wind screen was used to minimize wind noise across the face of the microphone.

With the exception of Monitoring Site 4 located on the dead-end section of Englewood Avenue near the proposed housing and school sites, the predominant source of noise at each monitoring location is vehicular traffic along highways and principal ~~arterial~~arterials or local roadways. At Site 4 along Englewood Avenue, ambient noise levels are generated primarily by sounds from wind and area-wide background noise, as existing traffic along this portion of Englewood Avenue is minimal. The monitored hourly noise levels summarized in **Table 2.16-3** indicate that:

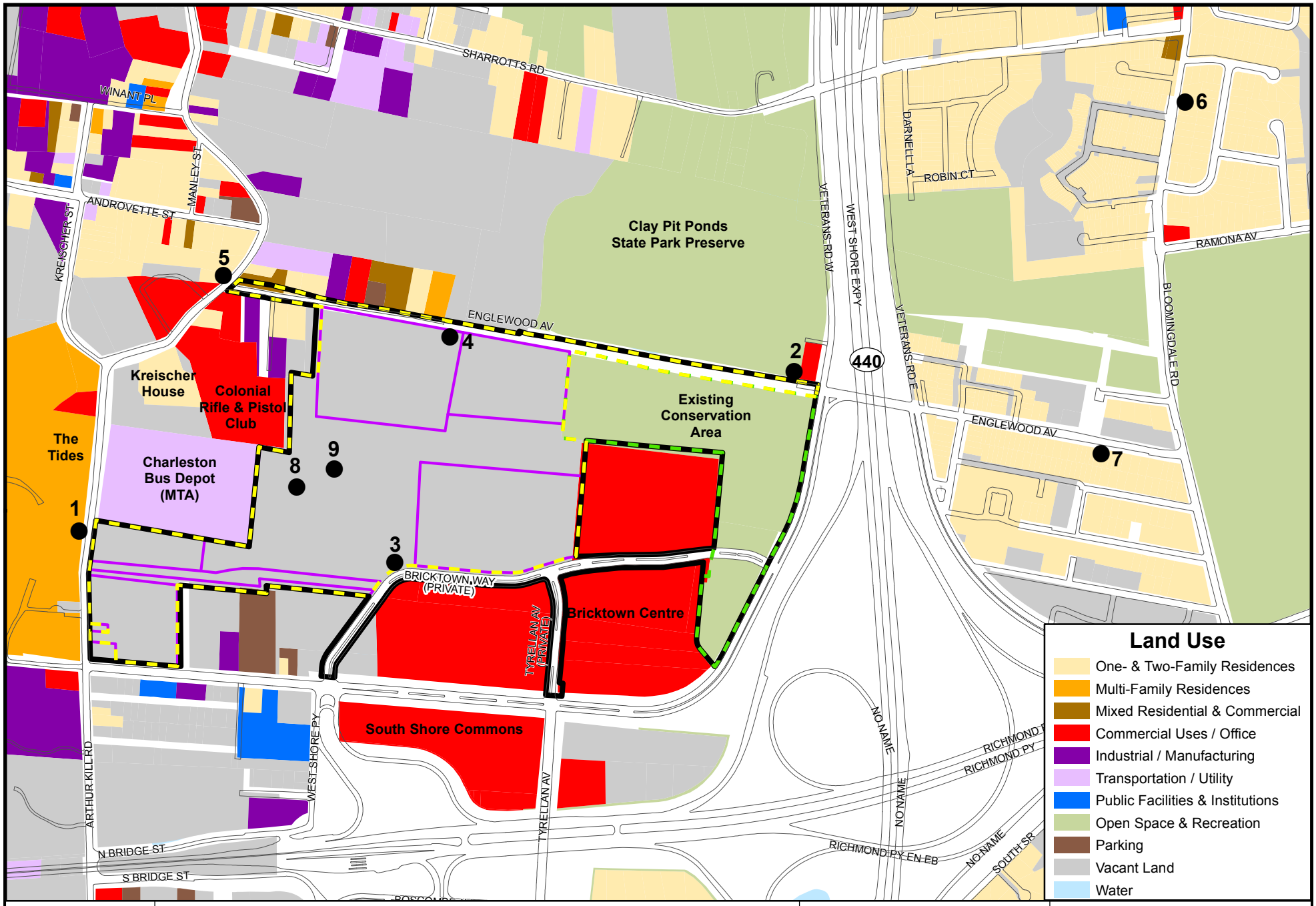
- L_{10} noise levels at each site are comparable among three monitored peak periods. The differences among these peak periods are less than five dBA, the threshold at which differences are noticeable.

- L_{10} noise levels at Monitoring Sites 2, 3 and 4, located on Englewood Avenue and Bricktown Way, which are away from major highways or arterial roadways, are classified “Acceptable” under the City’s noise exposure guidelines presented in **Table 2.16-2** above.

- L_{10} noise levels on Arthur Kill Road and areas adjacent to major highways or arterial roadways at Monitoring Sites 1, 5, 6 and 7 are classified as “Marginally Acceptable” or “Marginally Unacceptable,”

Existing noise levels at two additional sites (Sites 8 and 9 in **Figure 2.16-1**) within the Development Area that are close to both the MTA bus depot and the Colonial Rifle & Pistol Club were also monitored. These sites represent the proposed sensitive land uses (the senior housing and Fairview Park) that could be impacted by existing noise-generating activities:

[1] Sorenson and Magnusson (1979), “Annoyance caused by noise from shooting ranges”, Journal of Sound and Vibration, 62, 437-442 (cross reference from a report done by Army Center for Health Promotion and Preventive Medicine in a report titled “Fort Lewis Installation Operational Noise Management Plan” dated September 2005).



AECOM

Legend

- Noise Monitoring Location
- Project Area
- Development Area
- Conservation Area
- Site Boundary

0 175 350 700 Feet

1 inch = 700 feet

N

Charleston Mixed-Use Development

Figure 2.16-1

Noise Monitoring Locations

- Site 8: along the trail in the park area that is behind the MTA bus depot.
- Site 9: near the senior housing area/public open space.

The measured ambient levels at these two sites (**Table 2.16-3**) indicate that:

- High ambient noise levels are expected in the park areas that are immediately behind the MTA bus depot and directly along the shooting path of gun firing from the Colonial Rifle & Pistol Club during peak hours. The noise levels, in terms of worst-case $L_{10,}$ show that the areas measured may be classified as "Marginal Acceptable" for noise sensitive land uses.
- When the noise receptor moves further away from the MTA bus depot (see Site 9 in **Figure 2.6-1**), the existing noise levels become lower in other park areas and senior housing areas represented by Site 9 are considered "Acceptable" for noise sensitive land uses.

2.16.4 FUTURE NO-ACTION CONDITIONS

Under the Future No-Action Condition, no development would occur in the Project Area, and the noise levels from mobile sources would be similar to but slightly higher from natural traffic growth when compared to noise levels under existing conditions.

Table 2.16-3
Existing Ambient Noise Monitoring Results

Site	Weekday Peak Hour	Noise Level (dBA)				
		L_{eq}	L_{10}	L_{90}	L_{min}	L_{max}
1 – Arthur Kill Road near The Tides	AM	65.5	69.5	56.3	54.7	86.5
	Mid Day	67.5	70.0	52.9	45.8	85.9
	PM	66.9	70.4	52.2	52.6	74.0
2 – West Shore Motel at Veterans Road West and Englewood Avenue	AM	58.6	60.2	55.3	52.6	91.8
	Mid Day	58.0	60.7	52.5	47.4	74.9
	PM	59.4	61.2	55.6	53.4	75.0
3 – Empty lot for future park site (near Bricktown Centre)	AM	54.2	55.9	51.6	50.1	67.0
	Mid Day	54.7	56.3	49.4	46.8	73.4
	PM	56.1	57.6	53.8	51.9	74.0
4 – Residential open space for future housing site on Englewood Avenue	AM	48.0	49.5	46.5	44.8	59.2
	Mid Day	51.3	53.9	45.9	43.2	74.2
	PM	51.7	53.2	48.1	46.0	75.9
5 – Mixed residential and commercial area along Arthur Kill Road	AM	68.6	71.7	49.5	47.2	88.8
	Mid Day	67.9	71.1	46.3	42.8	88.9
	PM	69.4	73.2	50.1	46.2	88.8
6 – 483 Bloomingdale Avenue	AM	71.2	75.4	53.3	43.7	91.8
	Mid Day	69.6	74.2	48.9	41.8	81.8
	PM	68.1	72.1	52.9	43.1	85.1
7 – 470 Englewood Avenue, east of Veterans Road East	AM	65.1	69.8	49.5	45.8	84.3
	Mid Day	63.6	65.8	46.6	42.5	85.5
	PM	63.2	66.3	48.7	44.5	82.6
8 – Park Trail	AM	59.6	59.0	53.0	52.0	78.7
	PM	65.3	68.0	51.5	49.6	86.1[1]
9 – Proposed Senior Housing Site/Tennis Court	AM	52.0	53.0	50.0	49.7	59.5
	PM	55.4	58.0	46.5	44.9	74.9[1]
Note: [1] Gunshot Lmax.						

2.16.5 FUTURE WITH-ACTION CONDITIONS

2.16.5.1 Stationary Source Impact on Off- and On-site Sensitive Land Uses

Based on the school playground boundary reference level of 71.4 dBA $L_{eq}(1)$, during the daytime school opening hours, the closest residential land use, the proposed on-site senior housing, would experience a maximum of 55 dBA $L_{eq}(1)$ which is equivalent to approximately 58 dBA L_{10}. This level alone is well below the 65 dBA noise exposure guideline (see previous **Table 2.16-2**) as classified "Acceptable" for general residential external use. Therefore, the proposed daytime school operation itself would not result in a significant noise impact in the neighborhood including the senior housing that would be immediately adjacent to the new school. The cumulative effects from daytime school operation with on road traffic are discussed below.

2.16.5.2 Mobile Source Impact on Off- and On-site Sensitive Land Uses

As discussed above, if a Proposed Project would double PCE volumes at a given intersection, noise levels would increase by 3 dBA, the threshold for a significant noise impact from the proposed project at nighttime and daytime, provided Future No-Action levels exceed 62 dBA. The mid-block PCEs along the immediately adjacent roadway where noise sensitive receptors are located were calculated for each of three peak traffic analysis periods, (AM, Mid-day and PM) for which future traffic was predicted for both 2015 and 2020, as discussed in **Chapter 13**, "Transportation." For the No-action condition, vehicle mix data compiled by the New York State Department of Transportation (NYSDOT) for corresponding roadway types was used to calculate the future PCE volumes. The project-generated vehicle mix was used to calculate the incremental traffic-related PCEs under the Future With-Action condition. for both 2015 and 2020. The weekday AM peak period would generally have the highest incremental PCEs due to higher truck percentage as compared to the other analysis periods. **Table 2.16-4** summarizes the maximum incremental noise predicted among the three weekday periods within the forecasted traffic network under 2015. The locations where ambient noise monitoring levels were collected along the same route are also indicated in **Table 2.16-4**.

As shown in **Table 2.16-4**During the year 2015 analysis, as shown in **Table 2.16-4**, no increase of 3 dBA or more in traffic noise was predicted using the PCE screening method and therefore no further analysis is warranted.

During the year 2020, as shown in **Table 2.16-5**, an incremental increase greater than 3 dBA was predicted in areas along Englewood Avenue, at Monitoring Site 4 and 7.

As previously shown in **Table 2.16.3**, even with the projected 76.3 dBA increment at Site 4, the predicted peak traffic noise level of 5958 dBA (51.7+76.3) would be well below the 65 dBA absolute impact threshold level. By combining with the school playground-generated noise of 55 dBA discussed previously with the traffic generated noise, the total project noise would become 6059.8 dBA. That total is still well below the 65 dBA threshold, Therefore there is no potential for a significant noise impact at this location.

However, at Site 7 the measured ambient level is above 65 dBA was exceeded at Monitoring Site 7. A further valuation was therefore performed for Site 7 using the TNM model to better predict the project's incremental noise contribution along that segment of Englewood Avenue east of the West Shore Expressway. This approach was needed, since the sensitive receptors along this road segment are near other major traffic noise sources such as the West Shore Expressway, Veterans Road East, and Bloomingdale Avenue.

Table 2.16-5 summarizes the findings resulting from this more refined analysis. The modeling results combine: (1) the measured sound levels at this complex location (63.2 to 65.1 dBA) with (2) the TNM-predicted noise contribution from project-generated traffic on Englewood Avenue. The results indicate the following:

- The combined sound levels in ~~all three~~AM and Mid-Day peak periods would be above the 65.0 dBA absolute level ~~for significant impacts~~; but
- Comparing the combined sound levels with the actual monitored values shows a projected increase due to the project of from 1.~~8~~2 dBA to ~~2~~1.6 dBA, all of which are less than the 3 dBA increment for significant impact.

These results confirm that no significant traffic noise impacts would occur at Monitoring Site 7, since the future combined noise levels (measured ambient levels plus estimated noise increment from project-generated traffic) minus the measured ambient levels would not exceed the 3-dBA significance threshold when the absolute level would be above 65 dBA.

Table 2.16-4
Mid-Block PCEs Comparison - 2015

Location	Worst-case Peak Hour Condition			Representative Noise Monitoring Location	Significant Noise Impact?
	No Action PCE	With Action PCE	Noise Increment (dBA)		
Sharrotts Rd between Arthur Kill Rd & Veterans Rd W	~~545~~404	~~521~~404	~~-~~0.20	-	No
Arthur Kill Rd between Sharrotts Rd & Winant Pl	~~10411~~1366	~~13171~~1546	~~1.~~0.5	5	No
Englewood Ave between Arthur Kill Rd & Veterans Rd W	~~179~~173	~~890~~173	~~7~~0.0	4	~~See discussion below~~No
Arthur Kill Rd between Englewood Ave & Winant Pl	~~10391~~1366	~~13151~~1546	~~1.~~0.5	5	No
Arthur Kill Rd between Kreischer St & Englewood Ave	~~10471~~1337	~~1542~~1517	~~1.7~~0.5	5	No
Arthur Kill Rd between Veterans Rd W & Kreischer St	~~2184~~2045	~~2748~~2225	~~1.~~0.4	1	No
Arthur Kill Rd between N. Bridge St & Veterans Rd W	~~1711~~2523	~~1973~~2680	0.63	1	No
Richmond Valley Rd between Arthur Kill Rd & Page Ave	~~905~~3726	~~1010~~3883	0.52	-	No
Arthur Kill Rd between Richmond Valley Rd & S. Bridge St	~~255~~1830	~~281~~2830	0.40	-	No
Richmond Valley Rd between Page Ave & Madsen Ave	~~951~~834	~~951~~834	0.0	-	No
Boscombe Ave East of Weiner St	~~401~~387	~~401~~387	0.0	-	No
Weiner St between Boscombe Ave and Mead St	~~212~~204	~~212~~204	0.0	-	No
Motel at Intersection of Veterans Rd W & Englewood Rd	~~1868~~4200	~~2970~~5122	~~2.~~0.9	2	No
Englewood Ave between Veterans Rd E & Bloomingdale Rd	~~266~~413	~~649~~854	1.3~~.9~~	7	~~See discussion below~~No
Bloomingdale Rd between Ramona Ave & Englewood Rd	~~2123~~2260	~~2507~~2454	0.74	6	No
Bloomingdale Rd between Englewood Rd & Drumgoole Rd W	~~2019~~1934	~~2019~~1934	0.0	-	No
Sharrotts Rd between Veterans Rd E & Bloomingdale Rd	~~744~~697	~~1376~~1212	~~1.~~0.9	-	No
Bloomingdale Rd between Marisa Circle & Sharrotts Rd	~~1984~~2629	~~2515~~3045	~~1.~~0.6	6	No
Bloomingdale Rd between Sharrotts Rd & Mandy Ct	~~1763~~2135	~~2146~~2330	0.94	-	No
Drumgoole Rd E between Bloomingdale Rd & Igro Ct	~~928~~871	~~1091~~871	0.70	-	No
Drumgoole Rd E between Hallister St & Bloomingdale Rd	~~232~~224	~~232~~224	0.0	-	No
Bloomingdale Rd between Drumgoole Rd E & Outerbridge Ave	~~2158~~2046	~~2464~~2251	0.64	-	No
Amboy Rd between Bloomingdale Rd & Idaho Ave	~~1366~~1319	~~1366~~1319	0.0	-	No
Pleasant Plains Ave between Dunham St & Bloomingdale Rd	~~176~~170	~~176~~170	0.0	-	No

Bloomingdale Rd between Idaho Ave & Amboy Rd/Pleasant Plains Ave	~~2042~~1934	~~2348~~2140	0.~~6~~4	-	No
Amboy Rd between Station Ave & Bloomingdale Rd	~~1894~~2749	~~2095~~2955	0.43	-	No
~~Note: The bold number indicates an exceedance of 3-dBA and a further determination is required.~~ ~~TBD – to be determined.~~					

Table 2.16-5
Mid-Block PCEs Comparison - 2020

Location	Worst-case Peak Hour Condition			Representative Noise Monitoring Location	Significant Noise Impact?
	No Action PCE	With Action PCE	Noise Increment (dBA)		
Sharrotts Rd between Arthur Kill Rd & Veterans Rd W	542	519	-0.2	-	No
Arthur Kill Rd between Sharrotts Rd & Winant Pl	1529	1774	0.6	5	No
Englewood Ave between Arthur Kill Rd & Veterans Rd W	178	756	***6.3***	4	See discussion below
Arthur Kill Rd between Englewood Ave & Winant Pl	1529	1777	0.7	5	No
Arthur Kill Rd between Kreischer St & Englewood Ave	1054	1549	1.7	5	No
Arthur Kill Rd between Veterans Rd W & Kreischer St	2228	2792	1.0	1	No
Arthur Kill Rd between N. Bridge St & Veterans Rd W	1977	2236	0.5	1	No
Richmond Valley Rd between Arthur Kill Rd & Page Ave	910	1015	0.5	-	No
Arthur Kill Rd between Richmond Valley Rd & S. Bridge St	2559	2821	0.4	-	No
Richmond Valley Rd between Page Ave & Madsen Ave	961	961	0.0	-	No
Boscombe Ave East of Weiner St	399	399	0.0	-	No
Weiner St between Boscombe Ave and Mead St	211	211	0.0	-	No
Motel at Intersection of Veterans Rd W & Englewood Rd	2414	3777	1.9	2	No
Englewood Ave between Veterans Rd E & Bloomingdale Rd	274	658	***3.8***	7	See discussion below
Bloomingdale Rd between Ramona Ave & Englewood Rd	2122	2506	0.7	6	No
Bloomingdale Rd between Englewood Rd & Drumgoole Rd W	2009	2009	0.0	-	No
Sharrotts Rd between Veterans Rd E & Bloomingdale Rd	789	1441	1.0	-	No
Bloomingdale Rd between Marisa Circle & Sharrotts Rd	2240	2770	0.9	6	No
Bloomingdale Rd between Sharrotts Rd & Mandy Ct	1939	2323	0.8	-	No
Drumgoole Rd E between Bloomingdale Rd & Igro Ct	923	1087	0.7	-	No
Drumgoole Rd E between Hallister St & Bloomingdale Rd	231	231	0.0	-	No
Bloomingdale Rd between Drumgoole Rd E & Outerbridge Ave	2148	2454	0.6	-	No
Amboy Rd between Bloomingdale Rd & Idaho Ave	1359	1359	0.0	-	No
Pleasant Plains Ave between Dunham St & Bloomingdale Rd	175	175	0.0	-	No
Bloomingdale Rd between Idaho Ave & Amboy Rd/Pleasant Plains Ave	2032	2339	0.6	-	No
Amboy Rd between Station Ave & Bloomingdale Rd	1885	2086	0.4	-	No
Note: The bold number indicates an exceedance of 3-dBA and a further determination is required.					

Table 2.16-6
Refined Traffic Noise Impact Significance Evaluation - 2020

Site #	Weekday Peak Hour	L_{eq} Noise Level (dBA)					
		Measured Existing Level	Maximum Incremental Noise from PCE Method	TNM Predicted Noise Contribution From Project-Generated Traffic	Total Combined Levels	Absolute Noise Significance (>65 dBA)	Incremental Noise Significance (>3 dBA)
7 – 470 Englewood Avenue	AM	65.1	--	~~62.3~~60.0	66.9~~3~~	Yes	No
	Mid Day	63.6	--	~~62.3~~60.0	~~66.0~~65.2	Yes	No
	PM	63.2	--	~~62.3~~60.0	~~65.8~~64.9	~~Yes~~No	No

2.16.5.3 Existing Gun Firing Noise Effects on On-site Sensitive Land Uses

A Swedish study[2] predicted noise in terms of L_{max} from shooting ranges using rifles and machine guns (Sorensen and Magnusson 1979). In this study, typical ~~A-weighted integrated maximum noise~~L_{max} levels ~~(L_{max})~~ during a shooting event for M-16 (5.56 mm) rifle received at several distances and along various shooting directions (i.e., azimuth) are predicted and summarized in **Table 2.16-6**. The zero degree azimuth is related to a shot in the direction toward the receiver, while the 180^o azimuth is a shot towards the opposite direction of the receiver.

The closest distances from proposed on-site sensitive land uses include:

- 500 feet from the trail in 0^o azimuth.
- 700 feet from the single family house approximately 45^o azimuth.

The typical rifle shot event noise in terms of L_{max} at the closest sensitive receptors could be in a range of:

- 65 – 83 dBA at the trail.
- 54 – 81 dBA at the housing site.

These levels generated are comparable to the ambient levels measured (59 ~~–~~to 76 dBA) due to roadway traffic near the sites where Fairview Park (Site 3) and senior housing (Site 4) would be constructed according to **Table 2.16-3.** The highest existing gunshot noise Lmax levels recorded during the PM peak period, when the rifle firing occurred, at Sites 8 and 9, show below levels comparable to those summarized in **Table 2.16-3**~~:~~.

- 86.1 dBA at the trail.
- 74.9 dBA near the senior housing site.

Although gunshot impulsive noise would be noticeable within the proposed sensitive land uses with the highest levels observed along the trail in the park, the L_{max} levels are still comparable to those generated from other background noise sources such as on road traffic in the neighborhood particularly within the most sensitive development site, the senior housing site. Therefore, it is anticipated that the ~~adverse~~ impulsive noise effects from the existing gun firing on the proposed on-site sensitive land uses would not ~~be~~create a significant adverse noise impact.

[2] Sorenson and Magnusson (1979), "Annoyance caused by noise from shooting ranges", Journal of Sound and Vibration, 62, 437-442 (cross reference from a report done by Army Center for Health Promotion and Preventive Medicine in a report titled "Fort Lewis Installation Operational Noise Management Plan" dated September 2005).

Table 2.16-6
Predicted L_{max} for M-16 (5.56 mm) Rifle

Distance (meters)	Predicted Level, dBA				
	Azimuth				
	0°	45°	90°	135°	180°
50	95-107	93-105	88-100	81-93	78-90
100	86-100	84-98	79-93	72-86	69-83
200	77-93	75-91	70-86	63-79	60-76
500	65-83	63-81	58-76	51-69	48-66
1000	56-76	54-74	49-69	42-62	39-59
2000	47-69	45-67	40-62	33-55	30-52