CHAPTER 3.O

NOISE

A. INTRODUCTION

This section addresses the noise issues which would be associated with the proposed aerial activity of and trucks for the application of adulticides on both workers and residents in the surrounding neighborhoods. The noise analysis consisted of a screening analysis to determine whether noise due to either) or truck spraying in connection with the *Mosquito-Borne Disease Control Program* would have the potential for resulting in significant adverse noise impacts.

B. NOISE FUNDAMENTALS

Quantitative information on the effects of airborne noise on people is well documented. If sufficiently loud, noise may adversely affect people in several ways. For example, noise may interfere with human activities, such as sleep, speech communication, and tasks requiring concentration or coordination. It may also cause annoyance, hearing damage, and other physiological problems. Several noise scales and rating methods are used to quantify the effects of noise on people. These scales and methods consider such factors as loudness, duration, time of occurrence, and changes in noise level with time. However, it must be remembered that all the stated effects of noise on people vary greatly with the individual.

"A"-WEIGHTED SOUND LEVEL (DBA)

Noise is typically measured in units called decibels (dB), which are 10 times the logarithm of the ratio of the sound pressure squared to a standard reference presence squared. Because loudness is important in the assessment of the effects of noise on people, the dependence of loudness on frequency must be taken into account in the noise scale used in environmental assessments. One of the simplified scales that accounts for the dependence of perceived loudness on frequency is the use of a weighting network, known as "A"-weighting, in the measurement system, to simulate the response of the human ear. For most noise assessments, the A-weighted sound pressure level in units of dBA is used in view of its widespread recognition and its close correlation with perception. In the current study, all measured noise levels are reported in dBA or A-weighted decibels. Common noise levels in dBA are shown in Table 3.O-1.

COMMUNITY RESPONSE TO CHANGES IN NOISE LEVELS

The average ability of an individual to perceive changes in noise levels is well documented (see Table 3.O-2). Generally, changes in noise levels less than 3 dBA are barely perceptible to most listeners, whereas 10 dBA changes are normally perceived as doublings (or halvings) of noise levels. These guidelines permit direct estimation of an individual's probable perception of changes in noise levels.

Table 3.O-1
Noise Levels of Common Sources

Sound Source	SPL (dBA)
Air Raid Siren at 50 feet	120
Levels at Rock Concerts (Rear Seats)	110
On Platform by Passing Subway Train	100
On Sidewalk by Passing Heavy Truck or Bus	90
On Sidewalk by Typical Highway	80
On Sidewalk by Passing Automobiles	70
Typical Urban Area Background/Busy Office	60
Typical Suburban Area Background	50
Quiet Suburban Area at Night	40
Typical Rural Area at Night	30
Isolated Broadcast Studio	20
Audiometric (Hearing Testing) Booth	10
Threshold of hearing	0

Note: A change of 3 dBA is a just noticeable change in SPL. A change of 10 dBA is perceived as a doubling or halving in SPL.
Source: CEQR Technical Manual

Table 3.O-2
Average Ability to Perceive Changes in Noise Levels

Change (dBA)	Human Perception of Sound
2-3	Barely perceptible
5	Readily noticeable
10	A doubling or halving of the loudness of sound
20	A “dramatic change”
40	Difference between a faintly audible sound and a very loud sound

Source: Bolt Beranek and Neuman, Inc., Fundamentals and Abatement of Highway Traffic Noise, Report No. PB-222-703. Prepared for Federal Highway Administration, June 1973.

It is also possible to characterize the effects of noise on people by studying the aggregate response of people in communities. The rating method used for this purpose is based on a statistical analysis of the fluctuations in noise levels in a community, and integrating the fluctuating sound energy over a known period of time, most typically during 1 hour or 24 hours. Various government and research institutions have proposed criteria that attempt to relate changes in noise levels to community response. One commonly applied criterion for estimating response is incorporated into the community response scale proposed by the International Standards Organization (ISO) of the United Nations (see Table 3.O-3). This scale relates changes in noise level to the degree of community response and permits direct estimation of the probable response of a community to a predicted change in noise level.

Table 3.O-3
Community Response to Increases in Noise Levels

Change (dBA)	Category	Description
0	None	No observed reaction
5	Little	Sporadic complaints
10	Medium	Widespread complaints
15	Strong	Threats of community action
20	Very strong	Vigorous community action

Source: International Standards Organization, *Noise Assessment with Respect to Community Responses*, ISO/TC 43. (New York: United Nations, November 1969).

NOISE DESCRIPTORS USED IN IMPACT ASSESSMENT

Because the sound pressure level unit of dBA describes a noise level at just one moment and very few noises are constant, other ways of describing noise over more extended periods have been developed. One way of describing fluctuating sound is to describe the fluctuating noise heard over a specific 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. L_{eq} is the constant sound level that, in a given situation and period (e.g., 1 hour, denoted by $L_{eq(1)}$, or 24 hours, denoted as $L_{eq(24)}$), 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 sometimes used to indicate noise levels that are exceeded 1, 10, 50, 90, and x percent of the time, respectively. Discrete event peak levels are given as L_{01} levels.

The relationship between L_{eq} and levels of exceedance is worth noting. Because L_{eq} is defined in energy rather than straight numerical terms, it is not simply related to the levels of exceedance. If the noise fluctuates very little, L_{eq} will approximate L_{50} or the median level. If the noise fluctuates broadly, the L_{eq} will be approximately equal to the L_{10} value. If extreme fluctuations are present, the L_{eq} will exceed L_{90} or the background level by 10 or more decibels. Thus, the relationship between L_{eq} and the levels of exceedance will depend on the character of the noise. In community noise measurements, it has been observed that the L_{eq} is generally between L_{10} and L_{50}. The relationship between L_{eq} and exceedance levels has been used in this analysis to characterize the noise sources and to determine the nature and extent of their impact at all receptor locations.

L_{dn} is the day-night equivalent sound level, defined as a 24-hour continuous L_{eq} with 10 dBA added to nighttime noise levels (i.e., noise levels between the hours of 10 PM and 7 AM). This 10 dBA addition accounts for the extra sensitivity people have to noise during typical sleeping hours.

For purposes of the proposed project, the maximum 1-hour equivalent sound level ($L_{eq(1)}$) and the day-night equivalent sound level (L_{dn}) have been selected as the noise descriptors to be used in the noise impact evaluation. $L_{eq(1)}$ is the noise descriptor recommended for use in the *New York City Environmental Quality Review (CEQR) Technical Manual* (December 1993) for vehicular traffic noise impact evaluation, and is used to provide an indication of highest expected sound levels. L_{dn} and $L_{eq(1)}$ are the noise descriptors recommended for use in the *CEQR Technical Manual* (December 1993) for aircraft related noise impact evaluation.

C. NOISE STANDARDS AND CRITERIA

Noise levels associated with the operation of the proposed project are subject to the emission source provisions of the New York City Noise Control Code and to Noise Standards set for the CEQR process. Other standards and guidelines promulgated by Federal agencies do not apply to project noise control, but are useful to review in that they establish measures of impacts. Construction equipment is regulated by the Noise Control Act of 1972.

NEW YORK CITY NOISE CODE

The New York City Noise Control Code promulgates sound-level standards for motor vehicles, air compressors, and paving breakers; requires that all exhausts be muffled; and prohibits all unnecessary noise adjacent to schools, hospitals, and courts. The code further limits construction activities to weekdays between 7 AM and 6 PM.

In 1979, Section 1403.3-6.01 of the code was reenacted as Local Law No. 64. This new law established ambient noise quality criteria and standards based on existing land use zoning designations. Conformance with the noise level values contained in the law is determined by considering noise emitted directly from stationary activities within the boundaries of a project. Construction activities and noise sources outside the boundaries of a project are not included within the provisions of this law. Table 3.O-4 summarizes the ambient noise quality criteria established under Local Law No. 64.

Table 3.O-4
City of New York Ambient Noise Quality Zone Criteria (dBA)

Ambient Noise Quality Zone (ANQZ)	Daytime Standards* (7 AM–10PM)	Nighttime Standards* (10 PM–7AM)
Low-Density Residential (R1 to R3) Land Uses (N1)	60	50
High-Density Residential (R4 to R10) Land Uses (N2)	65	55
Commercial (C1 to C8) and Manufacturing (M1 to M3) Land Uses (N3)	70	70

Note: *$L_{eq(1\ hour)}$.
Source: City of New York Local Law No. 64.

NEW YORK CEPO-CEQR NOISE STANDARDS

The New York City Department of Environmental Protection (NYCDEP), Division of Noise Abatement has set external noise exposure standards and attenuation values. These standards are shown in Tables 3.O-5 and 3.O-6. Noise exposure is classified into four categories—acceptable, marginally acceptable, marginally unacceptable, and clearly unacceptable. The standards for traffic noise are based on maintaining an interior noise level for the worst-case hour L_{10} of less than or equal to 45 A-weighted decibels (dBA). Standards for aircraft and train noise are different, and are derived from the standards of the Federal Department of Housing and Urban Development (HUD). These standards were adopted for use in the CEQR process.

Table 3.O-5
CEPO-CEQR Noise Exposure Standards
For Use in City Environmental Impact Review[1]

Receptor Type	Time Period	Acceptable General External Exposure	Airport[3] Exposure	Marginally Acceptable General External Exposure	Airport 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} ? 55 dBA	---- L_{dn} ? 60 dBA ----						
2. Hospital, Nursing Home		L_{10} ? 55 dBA		55 < L_{10} 65 dBA	---- 60 < L_{dn} ? 65 dBA ----	65 < L_{10} ? 80 dBA	(1) 65 < L_{dn} ? 70 dBA, (II) 70 ? L_{dn}	L_{10} > 80 dBA	---- L_{dn} ? 75 dBA ----
3. Residence, residential hotel or motel	7 AM to 11 PM	L_{10} ? 65 dBA		65 < L_{10} 70 dBA		70 < L_{10} ? 80 dBA		L_{10} > 80 dBA	
	11 PM to 7 AM	L_{10} ? 55 dBA		55 < L_{10} 70 dBA		70 < L_{10} ? 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-11 PM)		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 PM)	
5. Commercial or office		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 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 lev el by 3 dBA or more; (ii) CEPO-CEQR Noise Standards for train noise are similar to the above aircraft noise standards: the noise category for train noise is found by taking the L_{dn} value for such train noise to be an L_{dn} (L_{dn} contour) value (see table on the following page).
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 preser-v ation 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 indus trial operations other than operat ing 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).

D. IMPACT DEFINITION

As recommended in the *CEQR Technical Manual*, this study utilizes the following criteria to define a significant noise impact:

- An increase of 5 dBA, or more, in with the Proposed Project $L_{eq(1)}$ noise levels at sensitive receptors to those calculated for the No Action condition, if the No Action levels are less than 60 dBA $L_{eq(1)}$ and the analysis period is not a nighttime period.
- An increase of 4 dBA, or more, in with the Proposed Project $L_{eq(1)}$ noise levels at sensitive receptors to those calculated for the No Action condition, if the No Action levels are 61 dBA $L_{eq(1)}$ and the analysis period is not a nighttime period.
- An increase of 3 dBA, or more, in with the Proposed Project $L_{eq(1)}$ noise levels at sensitive receptors to those calculated for the No Action condition, if the No Action levels are greater than 62 dBA $L_{eq(1)}$ and the analysis period is not a nighttime period.

Table 3.O-6
CEPO-CEQR Exterior Noise Standards and Attenuation Values

Noise Category	Marginally Acceptable	Marginally Unacceptable		Clearly Unacceptable		
Vehicular A, B	65 < L_{10} 70	70 < L_{10} 75	75 < L_{10} 80	80 < L_{10} 85	85 < L_{10} 90	90 < L_{10} 95
Train A, B	60 < L_{dn} 65	65 < L_{dn} 70	70 < L_{dn} 75	75 < L_{dn} 80	80 < L_{dn} 85	85 < L_{dn} 90
Aircraft A, B	60 < L_{ydn} 65	65 < L_{ydn} 70	70 < L_{ydn} 75	L_{ydn} > 75	N/A	N/A
Required Attenuation C	25 dB(A)	(I) 30 dB(A)	(II) 35 dB(A)	(I) 40 dB(A)	(II) 45 dB(A)	(III) 50 dB(A)

Notes:

A Different descriptors are used for each noise source: L_{10} for vehicular traffic; L_{dn} for train noise; and L_{ydn} (L_{dn} Contour)for aircraft noise. *,†

B The various noise sources at a receptor location are measured and reported separately in accordance with generally accepted procedures for assessing an overall noise level. Cases where there is not a clearly dominant noise source require a judicious decision based on adequate field experience and analysis to determine the final noise category that is deemed appropriate for the overall noise exposure at each noise receptor site.

C The above composite window-wall attenuation values are for residential dwellings. Commercial office spaces and meeting rooms would be 5 dB(A) less in each category. All the above categories require a closed window situation and hence an alternate means of ventilation.

* L_{dn} requires a 24-hour measurement or supportive analysis if a shorter period is employed.

† L_{ydn} = "L_{dn} Contour" is an annual average of L_{dn} values ("y" indicates "yearly average").

✍ An increase of 3 dBA, or more, in with the Proposed Project Leq(1) noise levels at sensitive receptors to those calculated for the No Action condition, if the analysis period is a nighttime period (defined by the CEPO-CEQR standards as being between 10 PM and 7 AM.).

E. EXISTING AND NO ACTION NOISE LEVELS

There is a wide range of noise levels in New York City. In some of the outer borough areas, where traffic volumes are very low and there are no noise sources in the area, noise levels are extremely low (in the range experienced in quiet suburban areas), with nighttime L_{eq} noise levels in the high 40 to low 50 dBA range, and L_{dn} values in the low to mid 50 dBA range. In more densely developed areas of the City, where traffic volumes are moderate and where their may be some additional noise sources in the area, nighttime L_{eq} noise levels in the mid-50 to low 60 dBA range, and L_{dn} values in the low to mid-60 dBA range. In more developed areas, where traffic volumes are high (particularly areas adjacent to busy roadways and near bus and truck routes) and where there may be some additional noise sources in the area, noise levels are high, with nighttime L_{eq} noise levels in the mid-60 to low 70 dBA range, and L_{dn} values in the low to mid 70 dBA range.

F. PROBABLE IMPACTS OF THE PROPOSED ACTION

IMPACTS FROM AIRCRAFT OPERATIONS

A screening analysis was performed to determine the potential effects of aerial adulticiding operations which may be used in some area of the City to apply adulticides. Both may be used for spraying operations, including C130, Air Tractor AT400, Bell 206 Helicopter, Twin Turbo Prop King Air B-90, Bell 47 Turbin Helicopter, Turbin Engine Crop Duster S2R-DC-45, Turbin Engine Crop Duster S2R-DC-65, S2R-510, Piper Aztec Twin Engine PA23-250, and Piper Aztec Twin Engine PA23-250 6 place aircraft.

At the quietest of locations, while the change in L_{dn} values would be insignificant (i.e., less than 1 dBA), the change in $L_{eq(1)}$ noise levels during nighttime hours would be approximately 5-10 dBA, which would be a readily noticeable and significant increase in noise levels. However, both in quiet and even in relatively noisy neighborhoods, peak passbys aircraft noise levels during spraying operation would be noticeable, and produce intrusive short-term noise levels at residences.

IMPACTS FROM TRUCK OPERATIONS

A screening analysis was performed to determine the potential effects of truck adulticiding operations, which may be used throughout the City to apply adulticides under the *Mosquito-Borne Disease Control Program.* Predicted incremental noise levels and impacts from trucks should be greater than those anticipated for All Terrain Vehicles, which may be used in areas with limited vehicular access. The screening analysis was performed using the Federal Highway Administration's (FHWA) *Traffic Noise Model* version 1.1 (TNM). The TNM model is a computerized model developed fro FHWA that takes into account various factors due to traffic flow, including traffic volumes, vehicle mix (i.e., percentage of autos, light-duty trucks, heavy-duty trucks, buses, etc.), source/receptor geometry, and shielding (including barriers and terrain, ground attenuation, etc.). The model is the current state-of-the-art model used for the prediction of noise levels due to vehicular traffic. Using the TNM model, on medium truck, with a speed of 20 mph, would produce an $L_{eq(1)}$ noise level of approximately 45 dBA at 25 feet. However, each truck is escorted by a police vehicle with an announcement to warn people about the spraying. This warning vehicle's purpose is to produce announcements that the public can hear, and, therefore, it will produce short-term noise levels that are noticeable and may be considered intrusive. Noise from the police warning vehicle and an announcement would produce an $L_{eq(1)}$ noise level of at least approximately 50 dBA at 25 feet. Together, the warning police vehicle announcement and the spray truck would produce an $L_{eq(1)}$ noise level of approximately 51.2 dBA at 25 feet. Therefore, at the quietest of locations, with the Proposed Action, nighttime $L_{eq(1)}$ noise levels would increase from approximately 48 dBA to approximately 53 dBA. This change in noise level, the increase in $L_{eq(1)}$ noise levels of approximately 5 dBA, would be a readily noticeable change in noise levels, which would be a significant adverse impact. More importantly, when the police warning vehicle and spray truck pass, both in quiet neighborhoods and even in neighborhoods that are not particularly quiet, they will produce short-term passby noise levels that are likely to be noticeable and intrusive to residents. ☞

CHAPTER 3.O 3.O-1
A. Introduction 3.O-1
B. NOISE FUNDAMENTALS 3.O-1
"A"-Weighted Sound Level (dBA) 3.O-1
Community Response To Changes In Noise Levels 3.O-1
Noise Descriptors Used In Impact Assessment 3.O-3
C. NOISE STANDARDS AND CRITERIA 3.O-4
New York City Noise Code 3.O-4
New York CEPO-CEQR Noise Standards 3.O-4
D. IMPACT DEFINITION 3.O-5
E. EXISTING AND NO Action NOISE LEVELS 3.O-6
F. Probable Impacts of the Proposed aCTION 3.O-6
Impacts from Aircraft Operations 3.O-6

Table 3.O-1 Noise Levels of Common Sources 3.O-2
Table 3.O-2 Average Ability to Perceive Changes in Noise Levels 3.O-2
Table 3.O-3 Community Response to Increases in Noise Levels 3.O-3
Table 3.O-4 City of New York Ambient Noise Quality Zone Criteria (dBA) 3.O-4
Table 3.O-5 CEPO-CEQR Noise Exposure Standards For Use in City Environmental Impact Review[1] 3.O-5
Table 3.O-6 CEPO-CEQR Exterior Noise Standards and Attenuation Values 3.O-6