PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

ENVIRONMENTAL NOISE CONTROL GUIDELINES: Introduction and Glossary

January 2016

Contents

Introduction

The Environmental Noise Control Guidelines (ENCG) are an important tool for the implementation of the City's environmental noise policies contained in the Official Plan. These Guidelines are to be used by city staff and the development and consulting industries when dealing with issues involving all sources of environmental noise in the land use and transportation planning and development processes.

Much of what can be accomplished to address environmental noise can be done with good planning and urban design. These Guidelines and the Official Plan take the approach that noise is a matter for study early in the development process. Early consideration of environmental noise ensures that noise can be considered early in the urban design process. In this way, land use decisions can be better informed and there will be less need to retrofit buildings and neighbourhoods with noise attenuation measures in the future.

Acoustic barriers (also called noise walls) help to contain sound but they also separate communities; they interfere with the movement and views of people and wildlife, and they separate neighbourhoods. Acoustic Barriers also decrease a feeling of safety in neighbourhoods and can be a barrier to community cohesiveness. With the goal of building liveable communities, acoustic barriers should be avoided under most circumstances. Acoustic barriers should only be used when other noise control measures have been considered and there is no other alternative.

For surface transportation and stationary noise sources, landscaping with trees and shrubs are often included in this guideline as an additional measure. While it is known that the effect of trees and shrubs on noise attenuation is negligible the effect of screening the noise source from people and neighbourhoods is known to have a profound effect on the perception of noise. Therefore as a best management practice, the provision for natural landscaping in the recommended design of new mitigation measures and retrofit applications have been included.

Implementation and Interpretation

These guidelines are intended to work in concert with the City's noise control by-law (Bylaw 2004-253) and the Environmental Protection Act to comprehensively provide and protect livable and healthy public and private spaces in the City. Enforcement of the noise by-law is important because its implementation to protect private spaces supports the decisions made in land use planning and infrastructure engineering. Similarly, the implementation and enforcement of the Environmental Protection Act works to protect private spaces from industry noise sources.

The Environmental Noise Control Guidelines are based on the Ministry of Environmental and Climate Change's Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning Publication NPC-300 (herein referred to as NPC-300). Where relevant, other guidelines or variations may be presented. Throughout this document the guidelines are to be considered minimum measures. Where ever possible the guidelines should be exceeded to provide for a quieter, healthier environment.

The Environmental Noise guidelines are intended to be interpreted in the context of the Official Plan and Zoning By-law. This guideline is also intended to be used in the context of applicable Federal and Provincial legislation, guidelines and regulations. This includes the Provincial Policy Statement (Ontario Ministry of Municipal Affairs and Housing 2014) issued under the Planning Act as well as the D series guidelines issued under the Provincial Environmental Protection Act (D-6 Guidelines: Compatibility between Industrial Facilities and Sensitive Land Uses, Ontario Ministry of Environment 1995). Unless noted, if there is a discrepancy between the federal or provincial guidelines and this document the more specific standards (that more limiting of noise) should be used.

Structure of the Environmental Noise Control Guidelines

The guidelines are divided into this introduction and glossary, three guidelines and four technical requirements documents.

1. Environmental Noise Control Guidelines for Land Use Planning

Part 1 is intended to assist proponents and the City in the review and approval process for applications under the Planning Act. The section is divided into surface transportation noise, stationary noise and air craft noise.

2. Environmental Noise Control Guidelines for Surface Transportation Projects

Part 2 of the guidelines addresses transportation corridor projects in proximity to noise-sensitive land uses.

3. Environmental Noise Control Guidelines for Local Improvements Along Existing City Surface Transportation Corridors

Part 3 addresses the technical guidelines for local improvement noise control measures due to impact from existing transportation sources.

4. Technical Requirements: Noise Studies and Noise Control Implementation

Part 4 establishes the technical requirements for the submission of noise control studies. The requirements also include information detailing the implementation of Noise Control measures and sample warning clauses for transportation and stationary noise.

5. Technical Standards: Acoustic Barrier Systems

Part 5 addresses the technical guidelines for acoustic barrier installation along City surface transportation corridors.

6. Technical Requirements: Prescribed Measures for Aircraft Noise

Part 6 provides the prescribed measure for the mitigation of aircraft noise as well as a sample warning clause.

7. Technical Requirements: Noise Studies for Surface Transportation Projects

Part 7 establishes the technical requirements for the submission of noise control studies for transportation projects.

Glossary

This glossary provides plain language definitions of many terms used in the Environmental Noise Control Guidelines. Unless otherwise noted, reference should additionally be made to the definitions in NPC-300.

AADT "Annual Average Daily Traffic"

Is defined as the average twenty-four hour, two-way traffic for the period January 1st to December 31st.

Acoustic "Shadow Zone" (and Acoustic "Bright Zone")

Acoustic "Shadow Zone" is the area behind a sound barrier with no direct line-of-sight from the receptor to the source where the sound wave may diffract (bend) around the barrier. The Acoustic "Bright Zone" is an area behind a sound barrier with direct line-of-sight from the receptor to the source.

Acoustic Insulation Factor (AIF)

Is a technical descriptor developed by the National Research Council of Canada (NRC) to signify the ability of a structure or an assembly to reduce the noise from the outside to the inside of a building based on specified indoor design conditions.

Acoustic Barrier / Acoustic Barrier System

Means a wall, berm, wall/berm combination or similar structure, used as a noise control measure, and high enough to break the line-of-sight between the source and the receptor.

The acoustic barrier as a system includes the panels, posts, foundation, methods of design and construction details, finish and all other components as approved by the City.

The minimum surface density (face weight) is 20 kg/m2. Subject to technical justification, the surface density can be reduced to no lower than 10 kg/m2 for:

- rooftop barriers; and
- temporary barriers for noise sources operating for a short duration, such as portable equipment.

The barrier should be structurally sound, appropriately designed to withstand wind and snow load, and constructed without cracks or surface gaps.
The term acoustic barrier may be used interchangeably with the terms noise barrier, noise wall, noise fence, or simply a barrier.

Ambient sound level

see Background Sound Level.

Background sound level

Means the sound level that is present in the environment, produced by noise sources other than the source under impact assessment.

Construction

Includes erection, alteration, repair, dismantling, demolition, structural maintenance, painting, moving, land clearing, earth moving, grading, excavating, the laying of pipe and conduit whether above or below ground level, street and highway building, concreting, equipment installation and alteration and the structural installation of construction components and materials in any form or for any purpose, and includes any work in connection therewith; activities associated with the operation at waste and snow disposal sites are excluded.

Control Measure

For planning of new noise sensitive land uses for transportation sources of noise only: a control measure refers to action which can be taken to achieve compatibility for the specific land use or activity. The control measure should be permanent in nature and not be readily removable or alterable by the future occupants.

Control measures may include, but are not limited to, the following:

- Acoustical Barriers - berms, walls, favorable topographical features, other intervening structures;
- Architectural Design - room and corridor arrangement, blank walls, placement of windows, balconies, and courtyards, building height;
- Building Construction - acoustical treatment of walls, ceilings, selection of acoustical materials and other control devices. Provision for air conditioning;
- Mitigation at Source - noise control applied directly to the noise source;
- Site Planning - orientation of buildings and Outdoor Living Areas with respect to noise sources, spatial separation such as the insertion of noise insensitive land uses between source and receiver, appropriate setbacks, and the use of intervening service roads;
- Windows/Doors - acoustically designed windows or doors that provide the required noise reduction. In order to allow for the windows and doors to remain closed, air conditioning, i.e. mechanical ventilation and climatic control system, may be necessary.

dBA

Means the sound pressure level measured in decibels. The suffix “A” refers to the use of a weighting filter to more closely approximate the human ear's response to sound.

dBAi

Means the A-weighted sound pressure level of an impulsive sound measured with a sound level meter set to "impulse" response.

Environmental Noise

Is noise transmitted through the outdoor environment as opposed to noise generated and contained within buildings. In the context of this document, environmental noise pertains to transportation and stationary source noise

Indoor Sound Level

Is an estimated/calculated sound level in the central part of a room.

L_{eq} – The Logarithmic Energy Equivalent Continuous Sound Level

Is the constant sound level over the time period in question, that results in the same total sound energy as the actually varying sound. It must be associated with a time period. Leq is a measure of total sound energy dose over a specified time period.

Leq (T): Leq (16 hours), Leq (8 hours), Leq (1 hour)

Means the A-weighted level of a steady sound carrying the same total energy in the time period T as the observed fluctuating sound. The time period T is given in brackets.

Mature State of Development

Is the future build-out of development to the ultimate population and traffic capacity forecasts corresponding to the Official Plan of the City.

Noise

Is defined as any unwanted sound. (includes environmental noise)

Noise barrier / Noise wall

- See Acoustic Barrier.

Noise control measure

Means a physical measure which can be used to achieve compatibility for the specific land use or activity with respect to noise from transportation sources and/or stationary sources. The noise control measure for a stationary source should be permanent in the context of the operation of the stationary source and not be readily removable or alterable by the future occupants. Temporary noise control measures are only acceptable when the noise from the source is temporary, for example, a portable concrete crusher or portable tub grinder.

Noise control measures may include, but are not limited to, the following:

- Source based noise control measures
- Noise control measures applied directly to the noise source, or within the property of the noise source, for example, a silencer, muffler, acoustical louver, acoustic barrier, acoustical absorption, etc.
- Receptor based outdoor noise control measures
- Noise control measures implemented on the property of the receptor but not directly on a building, for example, ground (or berm) mounted acoustic barriers suitable for transportation noise sources or for stationary sources.
- Receptor based “on building” noise control measures
- Noise control measures implemented on the property of the receptor, directly on the building, for example, inoperable windows, enclosed noise buffers, parapets, acoustic barriers, etc. attached to the receptor building.
- Receptor based site configuration noise control measures
- Orientation of buildings and outdoor living areas (OLAs) with respect to noise sources and spatial separation, for example, the insertion of noise insensitive land uses between source and receptor, appropriate setback distances, the use of intervening service roads.
- Receptor based site construction and architectural noise control measures
- Building construction, for example, enhanced window glazing, cavity walls, resiliently suspended sound isolation channels, special acoustical materials, other sound isolation details; and
- Architectural design, for example, room and corridor arrangement, blank walls, windows, balconies, courtyards, building height.

Additional guidance concerning noise control measures is included in part b and part c of the NPC-300 guideline.

Noise Exposure Forecast (NEF)

The NEF descriptor reflects the sound levels produced by all types of aircraft at an airport, taking into consideration the number of flights, the duration of the noise, the time of day and the frequency components of the sound (pure tones). The NEF contours around airports in general, are developed from 25 NEF to 40 or 45 NEF based on predictions up to 10 years.

Noise Exposure Projection (NEP)

The NEP descriptor is essentially similar to the NEF descriptor except it provides a long-term projection beyond 10 years; if the data is available.

Noise Reduction (NR)

Is the difference in sound level between two adjacent spaces.

Noise Reduction Coefficient (NRC)

Is a single-number rating of the sound-absorptive property of a material. It is calculated as the average of the sound-absorption coefficients, measured in accordance with astm test method C423, at 250, 500, 1000 and 2000 Hz, and rounded to the nearest multiple of 0.05.

Noise Sensitive Land Use

Means a land use that is sensitive to noise, whether inside and/or outside the building and that must be planned and/or designed using appropriate land use compatibility principles. Examples of sensitive land uses:

- Residential developments;
- Seasonal residential developments;
- Hospitals, nursing/retirement homes, schools, day-care centres;
- Other land uses that may contain outdoor and/or outdoor areas/spaces where an intruding noise may create an adverse effect.

In general, a noise-sensitive land use could be any type of land use where environmental noise is likely to cause an *adverse effect* or material discomfort whether inside or outside of a building.

Noise sensitive zoned lot

Is a lot or property that is zoned to permit a noise sensitive land use and that is either:

- Currently vacant; or
- Has an existing land use that is not a noise sensitive land use.

Noise Study (types of)

A Phase 1 Noise Control Feasibility Study is a study used to scope the potential impacts of noise on a development. The intent of a feasibility study is to complete the preliminary identification and modelling of noise issues so that urban design and potential mitigation measures can be identified and implemented early in the planning and design process of development.

A Phase 2 Noise Control Detailed Study provides detailed modelling of noise impacts and details the specific mitigation measures that are required to meet or exceed City and provincial guidelines.

An Acoustical Audit is a study used to determine the impacts and potential mitigation associated with a new or expanded stationary noise source.

Outdoor Living Area (OLA) / Outdoor Amenity Area

Means that part of a noise sensitive land use that is:

- Intended and designed for the quiet enjoyment of the outdoor environment; and
- Readily accessible from the building.

include, but are not limited to, the following:

- Backyard areas of approximately 56 m^2 for single family dwellings, 46 m^2 for semi-detached units and 37 m^2 per unit for row housing;
- The side yard area may be considered if the backyard area is less than 37 m^2
- Balconies and elevated terraces, provided they are the only outdoor living areas for the occupant and meet the following conditions:
  - Minimum depth of 4 m;
  - Outside the exterior building facade;
  - Unenclosed;
- Common outdoor living areas associated with multi-storey apartment buildings or condominiums;
- Passive recreational areas such as parks if identified by the city.

An enclosed balcony, sometimes referred to as solarium, sunroom or Florida room may in some cases offer the only available private outdoor amenity space for a dwelling unit. For the purposes of these guidelines the City will consider enclosed balconies, which are thermally insulated and heated, and/or air-conditioned, without door(s) to separate it from other indoor space to be an indoor space. If this space is not thermally insulated nor heated and/or air-conditioned and separated from other interior spaces by door(s) then it should evaluated as an outdoor living area.
The OLA does not include:

- The front yard
- Outdoor areas within the Airport Operating Influence Zone for purposes of aircraft noise (and subject to an additional warning clause for new development),
- Balconies or elevated terraces for purposes of Sections 2 and 3 (transportation corridor projects and local improvement)

The following additional considerations apply to OLAs:

1) For the purposes of noise impact assessment in an OLA at grade, the point of assessment is typically:
   a. 3 metres from the building façade;
   b. 1.5 metres above grade or floor level; and
   c. Aligned with the midpoint of the subject façade.
2) For elevated OLAs or those at grade that are less than 6 metres in depth, the point of assessment is in the middle of the OLA at 1.5 metres above grade or floor level.
3) For the purposes of the noise impact assessment in an OLA at grade, the minimum areas that require protection/consideration are 56 m2 for single family dwellings, 46 m2 for semi-detached dwellings and 37 m2 per unit for row housing (dwellings). If the total area of the OLA is smaller than the areas noted above, then the entire OLA, excluding the footprint of the dwelling needs to be protected.

4) The noise impact assessment at an OLA excludes the effect of sound reflection from the façade. In general, the point of assessment in the OLA is a point used for prediction (including extrapolation), rather than measurement, of sound levels.

Point of reception

(Applies to impact assessments of stationary sources) means any location on a noise sensitive land use where noise from a stationary source is received. Noise sensitive land uses may have one or more points of reception.
The following locations are points of reception:

1) Location outdoors within 30 metres of a façade of a dwelling, at a height of 1.5 metres above ground, typically in backyards and rear yard terraces or patios. If the dwelling is a high-rise multi-unit building, the location should be confined to a common outdoor amenity area.
2) Location on balconies and elevated terraces (e.g., rooftops) provided they are the only outdoor living area for the occupant, have a minimum depth of 4 metres, and are not enclosed.
3) Location within 30 metres of a portion of property that is used as a campsite or campground, at a height of 1.5 metres above ground.
4) Location in the centre of any window on a noise sensitive space of a dwelling or a building used for a noise sensitive institutional purpose or a noise sensitive commercial purpose; the location should be a minimum of 1.5 metres above ground for a first storey window, a minimum of 4.5 metres above ground for a second storey window, a minimum of 7.5 metres above ground for a third storey window, and the height of the vertical midpoint of the nearest and most exposed storey for a high-rise multi-unit building.
5) If the construction of a building or structure on the property of a noise sensitive land use has not commenced but an approval under section 41 of the planning act or a building permit under section 8 of the building code act, 1992 has been issued in respect of the building or structure, the locations described in paragraph 1, 2 or 4 above apply.
6) Location on a noise sensitive zoned lot, other than an inaccessible vacant lot, in respect of which no approval or building permit for a building or structure mentioned in paragraph 5 above has been issued, described by the following:

a. If the area of the vacant lot is smaller than 1 hectare (10,000 m²), the location of the point of reception should be approximately in the centre of the vacant lot, having regard for the existing zoning by-law, the typical building pattern in the area and an appropriate or likely future use of the vacant lot, at a height of 4.5 metres above ground.
b. If the area of the vacant lot is greater than 1 hectare (10,000 m²), the area of the vacant lot for noise assessment purposes should be considered limited to 1 hectare (10,000 m²). This 1 hectare portion of the vacant lot should be consistent with the existing zoning by-law, the typical building pattern in the area and an appropriate or likely future use of the vacant lot. The location of the point of reception is the centre of this 1 hectare portion of the vacant lot, at a height of 4.5 metres above

ground.

The following are examples of locations that are not considered to be points of reception:

1) Outdoor locations associated with a noise sensitive institutional purpose or a noise sensitive commercial purpose;
2) Inoperable (fixed or sealed) window as defined in part a of this guideline; and
3) Plane of a window of an enclosed noise buffer. Note that the planes of a window on the façade of a dwelling in the enclosed noise buffer are considered to be points of reception in accordance with paragraph 4 above.

Principle Main Railway Line

Refers to a train line, with train volume generally exceeding 10 trains per day with 3 or 4 power units per train at speeds frequently exceeding 80 km/hr. The railway authority should be consulted on a case-by-case basis.

SADT "Summer Average Daily Traffic";

Defined as the average twenty-four hour, two-way traffic for the period 1 July to 31 August, including weekends.

Secondary Main Railway Line

Refers to a train line, with train volume generally exceeding 5 trains per day with 1 or 2 power units per train at speeds frequently exceeding 80 km/hr. The railway authority should be consulted on a case-by-case basis.

Sound Transmission Class (STC)

Is a single-number rating of the capacity of a structure to prevent sound from reaching a receiving location. It is calculated in accordance with astm classification e413 using values of sound-transmission loss measured in accordance with astm test method e90. It provides an estimate of the performance of a partition in dealing with certain common sound insulation problems.

Stationary Source of Noise

Stationary sources of noise are defined as all sources of sound and vibration, whether fixed or mobile, that exist or operate on a premises, property or facility, the combined sound and vibration levels of which are emitted beyond the property boundary of the premises, property or facility, unless the source(s) is (are) due to construction. Stationary source noise can be generated by individual sources or multiple sources. Individual noise sources include, but are not limited to, generators, fans or commercial air conditioners.
Facilities usually comprise multiple sources of noise and are considered as a single stationary source of noise for purposes of noise study, assessment and mitigation. Facilities that are considered as stationary sources of noise include, for example, industrial facilities, car dealerships, motor vehicle maintenance and repair facilities, snow disposal sites, car washes, motor vehicle racing facilities and transit stations.

Sources of noise excluded from the definition of stationary sources include: construction activities, gas stations, music, people noise and retail facilities such as convenience stores where goods are delivered infrequently
Additional examples of stationary noise sources and classes of facilities are described in NPC 300.

Time periods (applicable to stationary sources)	• "Daytime": is the 12-hour period between 07:00 and 19:00 hours; • "Evening": is the 4-hour period between 19:00 and 23:00 hours; and • "Nighttime": is the 8-hour period between 23:00 and 07:00 hours.
Time periods (applicable to transportation sources)	• "Daytime": is the 16-hour period between 07:00 and 23:00 hours; and • "Nighttime": is the 8-hour period between 23:00 and 07:00 hours.
Warning clause	Means a notification of or obligation to notify a potential purchaser or tenant of a potential annoyance due to an existing source of environmental noise. Agreements that are registered on title to the lands in question should incorporate provisions for using warning clauses. Warning clauses would be included in agreements of offers of purchase and sale, lease/rental agreements and condominium declarations.

PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

Part 1:
ENVIRONMENTAL NOISE CONTROL GUIDELINES FOR LAND USE PLANNING

January 2016

Contents

Tables

1.0 Introduction

Exposure to environmental noise (or unwanted sound) can have a profound negative effect on people's health, well being and quality of life. Environmental noise is an important consideration in the planning of a healthy liveable city. The intent of this guideline is to implement Official Plan policies to protect people from potential adverse effects of environmental noise by requiring the planning and mitigation of environmental noise in new development.

This guideline provides information on the applicable standards for environmental noise, describes when a noise study is necessary and provides the City's preferred mitigation methods. Where a new development is proposed in proximity to a stationary or transportation source it is considered the responsibility of the proponent/developer of a new or expanded noise sensitive land use to ensure compliance with the applicable sound level limits in this guideline.

The guidelines for land use planning are divided into 3 subsections:

1. Surface Transportation Noise;
2. Stationary Noise
    a. New noise-sensitive development applications (noise receptors) in proximity to existing or approved stationary sources of noise, and
    b. New stationary sources of noise (noise generating) in proximity to existing or approved noise-sensitive developments;
3. Aircraft Noise.

These guidelines are considered to be a minimum and where possible the guideline is encouraged to be exceeded in order to provide for a quieter, healthier environment. Additionally, wherever possible the source of noise should be obscured to address the visual impact of noise sources on people and neighbourhoods.

2.0 Surface Transportation Noise

This section applies to development in proximity to the movement of vehicles within surface transportation corridors such as roads, transit and rail.

2.1 When a Study is required

Based on the Official Plan proposed new noise-sensitive development must evaluate noise impact and submit a noise feasibility and/or detailed noise study if it is within the following proximity to an existing or propose surface transportation source in the City.

- 100 metres from the right-of-way of:
    - an existing arterial road;
    - collector or major collector;
    - existing or proposed light rail transit corridor; or

- existing or proposed bus transitway, bus transit corridor or transit priority lane.

- 250 metres from the right-of-way of:
  - an existing or proposed highway, or
  - Secondary Main railway line.

Noise Sensitive Development and Transportation Sources

1. Development proposals for new noise sensitive land uses are required to include a noise feasibility study and/or detailed noise study in the following locations:
   - Mixed Use Centre, Town Centre and Mainstreets as identified on Schedule B;

   or within

   - 100 metres from the right-of-way of:
     - an existing or proposed arterial, collector or major collector road identified on Schedules E and F; or
     - a light rail transit corridor; bus rapid transit, or transit priority corridor identified on Schedule D;

   - 250 metres from the right-of-way of:
     - an existing or proposed highway;

   - 300 metres from the right of way of
     - a proposed or existing rail corridor or;
     - secondary main railway line;

   - 500 metres from the right-of-way of:
     - a 400-series provincial highway, freeway or
     - a principle main railway line.

   And will require noise mitigation and a warning clause where necessary, as a condition of approval.

2.2 Applicable Guidelines for Transportation Noise – Road and Rail

In late 2013 the Province issued updated environmental noise guidelines for stationary and transportation sources – Publication NPC-300. Unless otherwise noted the City requires development to be consistent with the NPC-300 guidelines. The City limits for road and rail transportation sources are below.

Table 2.2a: Sound Level Limit for Outdoor Living Areas - Road and Rail
(from NPC-300, 2013 Table C-1)

Time Period	Required L_{eq} (16) (dBA)
16-hour, 07:00 – 23:00	55

Table 2.2b: Sound Level Limit for Indoor Living Areas Road and Rail
(from NPC-300, 2013 Table C-2)

		Required L_{eq} (dBA)	
Type of Space	Time Period	Road	Rail
Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc.	07:00 – 23:00	45	40
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	23:00 – 07:00	45	40
Sleeping quarters	07:00 – 23:00	45	40
	23:00 – 07:00	40	35

The Province also provides for supplementary indoor sound level limits for land uses not generally considered noise sensitive (see Table 2.2c below). These good practice design objectives should be addressed in any noise study prepared for the City. These supplementary sound level limits are based on the windows and doors to an indoor space being closed.

Table 2.2c: Supplementary Sound Level Limits for Indoor Spaces - Road and Rail (adapted from NPC-300 Table C-9)

		Required L_{eq} (dBA)	
Type of Space	Time Period	Road	Rail
General offices, reception areas, retail stores, etc.	16 hours between 07:00 – 23:00	50	45
Theatres, places of worship, libraries, individual or semi- private offices, conference rooms, reading rooms, etc.	16 hours between 07:00 – 23:00	45	40
Sleeping quarters of hotels/motels	8 hours between 23:00 – 07:00	45	40
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	8 hours between 23:00 – 07:00	40	35

2.3 Noise Control Measures for Surface Transportation Noise

The choice of appropriate noise control measures for a specific development application depends on factors such as the stage of the planning approval desired, significance of the sound level relative to the sound level criteria, size of the parcel of land, nature of the source(s) of noise, other planning and zoning considerations/restrictions, type of development, and urban design considerations.

The most effective form of mitigation is to use distance to separate sensitive land use from the source of the noise. This is the preferred method of mitigation by the City because it is effective in the long term and also addresses potential impacts on air quality near surface transportation. If distance separation is shown to not be feasible there are additional forms of noise mitigation (or combinations of mitigation) which the City may consider.

The following tables 2.3a and 2.3b list primary mitigation methods and additional secondary measures for surface transportation outdoor and indoor noise mitigation that may be submitted to the City for approval. The list is in order from the most preferred (distance) to least preferred (acoustic barriers). In any noise studies prepared in support of new development it is necessary to demonstrate use of a particular method (or combination of methods) by providing technical justification of why more preferred measures are not feasible.

Table 2.3a: Outdoor Living Space Noise Control Measures for Surface Transportation Noise

Primary Mitigation Measure to achieve required dBA Leq – in order of preference	Secondary Mitigation Measures	
	Landscape plantings and/or non-acoustic fence to obscure noise source	Warning Clauses*
1. Distance setback with soft ground;	Recommended	
1. Insertion of noise insensitive land uses between the source and sensitive receptor		
2. Orientation of buildings to provide sheltered zones in rear yards	Required	Warning clauses necessary and to include: • reference to specific noise mitigation measures in the development, • whether noise is expected to increase in the future and • that there is a need to maintain mitigation.
3. Shared outdoor amenity areas		
4. Earth berms (sound barriers)		
5. Acoustic barriers (acoustic barriers)		

* A warning clause is necessary whenever noise is expected to meet or exceed 55 dBA Leq 16 in the Outdoor Living Area or Plane of Window of any living space prior to mitigation.

Table 2.3b: Indoor Noise Control Measures for Surface Transportation Noise

Primary Mitigation Measures to achieve required dBA - in order of preference	Secondary Mitigation Measures	
	Landscape plantings and/or non-acoustic fence to obscure noise source	Warning Clauses*
1. Distance setback with soft ground;	Recommended	Not necessary
1. Insertion of noise insensitive land uses between the source and sensitive receptor		
2. Orientation of buildings to provide sheltered zones or modified interior spaces (room and corridor arrangement) and amenity areas	Required	Warning clauses necessary and to include: • reference to specific noise mitigation measures in the development, • whether noise is expected to increase in the future and • that there is a need to maintain mitigation.
3. Enhanced construction techniques and construction quality (e.g. brick veneers, multi-pane windows).		
4. Earth berms (sound barriers)		
5. Indoor isolation - air conditioning and ventilation, enhanced dampening materials (indoor isolation)		

Where a noise-sensitive development precedes the construction or expansion of a planned surface transportation corridor the City may require noise control measures as a condition of approval. This mitigation may include, but is not necessarily limited to, the measures in the table above as well the conveyance of land to the City at no cost for construction and long term maintenance of noise control measures.

* A warning clause is necessary whenever noise is expected to meet or exceed 55 dBA Leq 16 at the Plane of Window for any living space prior to mitigation.

3.0 Stationary Sources of Noise

This section applies to new development in proximity to existing stationary sources of noise and to development of new stationary noise sources in proximity to noise sensitive land uses. Stationary sources of noise, either fixed or mobile, represent the combined sound and vibration levels emitted beyond the property boundary. Stationary source noise can be generated by individual or multiple sources (facilities). Examples of individual noise sources include generators, fans and commercial air conditioners. Examples of facilities include manufacturing facilities, car dealerships and vehicle maintenance facilities, snow disposal sites, car washes and transit stations. Some sources of noise are excluded from the definition of a stationary noise source by the province these include: construction activities, gas stations, music concerts and festivals, and individual retail stores where goods are not frequently delivered.

The impact of stationary noise on the community is largely dependent on its location in the city. Within the Provincial guidelines there are four separate community class areas which are defined by their ambient sound level (see Table 3.0 below).

Table 3.0: Area Classes for Definition of Stationary Noise Ambient Sound Level

Class 1	Means an area with an acoustical environment typical of a major population centre, where the background sound level is dominated by the activities of people, usually road traffic, often referred to as "urban hum." Within the City Class 1 areas generally include all of the urban area as well as lands in proximity to Employment Lands and the 416/417 corridor.
Class 2	Means an area with an acoustical environment that has qualities representative of both Class 1 and Class 3 areas. These are the suburban areas of the City outside of the busy core where the urban hum is evident but within the urban boundary. Class 2 areas also include core areas of large and medium sized villages such as Manotick, Greely, Richmond, Carp and Metcalfe. Class 2 areas have the following characteristics: i. sound levels characteristic of Class 1 during daytime (07:00 to 19:00 or to 23:00 hours); and ii. low evening and night background sound level defined by natural environment and infrequent human activity starting as early as 19:00 hours (19:00 or 23:00 to 07:00 hours).
Class 3	Means a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as: i. a small community or village; ii. agricultural area; iii. a rural recreational area such as a cottage or a resort area; or iv. a wilderness area. • Within the City, Class 3 areas are found in the rural area, Greenbelt and within small residential oriented villages such as Kinburn, Ashton, Sarsfield and Constance Bay.

Class 4	Means an area or specific site that would otherwise be defined as Class 1 or 2 and which: i. is an area intended for development with new noise sensitive land use(s) that are not yet built; ii. is in proximity to existing, lawfully established stationary source(s); and iii. has formal confirmation (designation) from the City of the Class 4 area classification through Council approval. This classification may not be applied retroactively. Existing noise sensitive land use(s) cannot be classified as Class 4 areas until these land uses are replaced, redeveloped or rebuilt. Class 4 is only applied on a property by property basis and, if the noise source is removed (i.e. the Provincial ECA is removed or lapses), the classification will become consistent with that of the adjacent lands (either Class 1 or 2). Finally, lands adjacent to undeveloped industrially zoned properties or areas defined as employment lands in the Official Plan may not be classified Class 4. Class 4 is considered to be an extraordinary circumstance that, while proposed by an applicant, can only be classified through a City or Ontario Municipal Board approval of a Planning Act application and accompanying noise study. A list and schedule for each Class 4 area that have been approved by the City is found in Appendix E.

3.1 When a Study is Required for Stationary Noise

The goal of an assessment of stationary noise is to provide for land use compatibility. To this end these guidelines follow the Provincial “D” Series of guidelines. The D guidelines were produced by the Ministry of Environment in the 1990’s to address land use compatibility between industry and sensitive land uses. A key component of the D series guidelines is the Area of Influence where a study is required. A key difference between the D series and these guidelines is for applications submitted to the Province under the Aggregate Resources Act. In this circumstance the assessment is widened to match the criteria in the Official Plan which is 500 metres for a quarry and 300 metres for a pit.

The City will apply the provincial stationary noise guidelines in any of three application situations:

1. when a new noise-sensitive receptor is proposed in proximity to existing stationary sources of noise or;
2. a new noise-generating facility/sources is proposed in proximity to existing noise-sensitive receptors or lands designated for future development of noise sensitive receptors .
3. An existing stationary noise source is expanded or intensified.

Proposed new noise-sensitive development must evaluate noise impact and submit a noise feasibility and/or detailed noise study if it is within:

- 100 metres of lands designated for employment under the Official Plan or zoned for industrial use;

- 100 metres of an existing stationary noise source;
- 300 metres of a pit licensed under the Aggregate Resources Act or;
- 500 metres of a quarry licensed under the Aggregate Resources Act.

Noise impacts from proposed equipment and facilities that are expanded or intensified are considered by the Province during approval processes under the Environmental Protection Act. Whether or not an updated or new approval is required from the Province, the City may request that a noise study or Acoustical Audit be prepared and that a certification of final construction be submitted.

3.2 Applicable Guidelines for Stationary Noise

In late 2013 the Province issued updated environmental noise guidelines for stationary and transportation sources – Publication NPC-300. Unless otherwise noted, the City requires development to be consistent with the NPC-300 guidelines. For convenience, the NPC-300 guidelines for Stationary Noise are reproduced in Table 3.2 below.

Table 3.2a: Guidelines for Stationary Noise – Steady and Varying Sound

Exclusion Limit Values of One-Hour Equivalent Sound Level (Leq, dBA)

Time of Day	Class 1 Area		Class 2 Area		Class 3 Area		Class 4 Area	
	Outdoor Point of Reception	Plane of Window	Outdoor Point of Reception	Plane of Window	Outdoor Point of Reception	Plane of Window	Outdoor Point of Reception	Plane of Window
07:00 – 19:00	50	50	50	50	45	45	55	60
19:00 – 23:00	50	50	45	50	40	40	55	60
23:00 – 07:00	-	45	-	45	-	40	-	55

Table 3.2b: Guidelines for Stationary Noise – Impulsive Sound

Exclusion Limit Values of One-Hour Equivalent Sound Level (Leq, dBA)

Time of Day	# of Impulses in Period of One-Hour	Class 1 Area		Class 2 Area		Class 3 Area		Class 4 Area	
		Outdoor Point of Reception	Plane of Window	Outdoor Point of Reception	Plane of Window	Outdoor Point of Reception	Plane of Window	Outdoor Point of Reception	Plane of Window
07:00 – 23:00	≥ 9	50	50	50	50	45	45	55	60
	7 to 8	55	55	55	55	50	50	60	65
	5 to 6	60	60	60	60	55	55	65	70
	4	65	65	65	65	60	60	70	75
	3	70	70	70	70	65	65	75	80
	2	75	75	75	75	70	70	80	85
	1	80	80	80	80	75	75	85	90
23:00 – 07:00	≥ 9	-	45	-	45	-	40	-	55
	7 to 8	-	50	-	50	-	45	-	60
	5 to 6	-	55	-	55	-	50	-	65
	4	-	60	-	60	-	55	-	70
	3	-	65	-	65	-	60	-	75
	2	-	70	-	70	-	65	-	80
	1	-	75	-	75	-	70	-	85

These guidelines are considered to be a minimum and where possible the guideline is encouraged to be exceeded with regards to stationary noise abatement and mitigation. Wherever possible the source of noise should be obscured with landscaping from the receptor to address the visual impact of the noise source on people and neighbourhoods.

3.3 Noise Control and Mitigation from Stationary Sources

The City requires that stationary noise be addressed at its source. This may include selecting specific equipment, changing processes and timing of equipment use, installation of equipment sound barriers and equipment sound attenuation. It may also include special acoustic treatments of the facilities where equipment is used, relocation of equipment within a facility and administrative controls over how the facility operates (i.e. closed door vs. open door).

Where stationary noise sources originate from a facility or group of facilities, individual source mitigation measures may be inadequate to meet Provincial and City guidelines. Under this circumstance the preferred mitigation for stationary noise in the City is to separate the noise source from the receptor. Distance separation removes the source of noise from the receptor and provides for the most compatible transition between incompatible land uses. Where both source measures and distance separation are not feasible the following table provides a list of preferred noise mitigation measures for new development in proximity to stationary sources of noise.

Table 3.3a: Noise Control Measures for New Development in Proximity to Stationary Noise Sources

Primary Mitigation Measure in order of preference	Secondary Mitigation Measures	
	Landscape plantings and/or non-acoustic fence to obscure noise source	Warning Clauses
1. Insertion of noise insensitive land uses between the source and sensitive receptor		
2. Blank walls of new development facing the source	Required	Warning clause to include additional reference to specific noise mitigation measures in the development, what the stationary source is and that there is a need to maintain mitigation in the development. Class 4 development is to include description of Class 4 receptor based measures (e.g. closed windows)
3. Orientation of buildings to provide quiet zones in rear yards, interior spaces (room and corridor arrangement) and amenity areas.		
4. Construction techniques, Enhanced construction quality (e.g. brick veneers, multipane windows)		
5. Earth berms (sound barriers)		
6. Class 4 Only - Enhanced Construction techniques and materials, air conditioning and ventilation, high STC materials and/or • only a shared outdoor amenity area (indoor isolation)		
7. Class 4 Only – considered to have no formal outdoor amenity areas, closed windows (indoor isolation)		
8. Acoustic barriers (noise walls) – the measure must be used in concert with measures listed above as well as additional prescribed measures and is only applicable to the outdoor amenity area.		

Where a noise-sensitive development precedes the construction of designated or zoned industrial land the City may require noise control measures as a condition of approval. This mitigation may include, but is not necessarily limited to, measures in the table above; with the exclusion of acoustic barriers which will not be permitted under this circumstance.

The following table provides a list of preferred noise mitigation measures for new or expanded stationary noise sources in order of preference by the City.

Table 3.3b: Noise Control Measures for New Stationary Noise Sources in Order of Preference

Primary Mitigation Measure	Secondary Mitigation Measures: Landscape plantings and/or non-acoustic fence to obscure noise source / facility
Required Source Control Measures as condition of Provincial Approval	Required
1. Earth berms (sound barriers)	
2. Development of non noise producing and insensitive land uses between the source and sensitive receptor within facility (e.g. Storage / Warehouse).	
3. Development of additional related uses (e.g. Offices) with enhanced construction and materials within facility between source and sensitive receptor.	
4. Acoustic barriers (noise walls) – this measure must be used in concert with measures listed above as well as additional prescribed measures.	

4.0 Aircraft/Airport Noise

Noise impact due to air traffic is distinct from other forms of environmental noise assessment. For instance, aircraft may emit low frequency sound which is difficult to mitigate for a prolonged period and the perceived sound is much more difficult to mitigate for a receptor. The sound level may also vary significantly between types of aircraft and under different atmospheric conditions. Noise impacts from aircraft must therefore be evaluated separately from all other sources of noise.

4.1 When a Study is Required for Airport / Aircraft Noise

Noise originating from aircraft is addressed by the City and the Ottawa International Airport Authority using the Noise Exposure Forecast (NEF) and Noise Exposure Projection (NEP) methods. The methods predict the potential degree of community annoyance from aircraft noise based on the sound levels of various aircraft and the operation considerations such as the number of flights and time of day (night being weighted more strongly). The resulting noise contours have been used to define the Airport Operating Influence Zone (AOIZ) and Airport Vicinity Development Zone (AVDZ) as illustrated on Schedule K of the Official Plan. Annex 10 of the Official Plan further details the 25 and 30 NEP areas of the Macdonald-Cartier Airport for planning purposes.

Based on the Official Plan new noise-sensitive development is prohibited in the AOIZ. Outside the 30 NEP noise contour and AOIZ, new noise sensitive land uses are permitted, with conditions, subject to a detailed noise impact study and based on the Ottawa Airport zoning regulations and the Aeronautics Act. Elsewhere in the Airport Vicinity Development Zone (AVDZ) and outside the AOIZ area development may be permitted subject to a noise study or the Prescribed Measures for Aircraft Noise in Part 6 of the Environmental Noise Control Guidelines.

Under the Official Plan new land uses with noise-sensitive outdoor living areas are not permitted within the 30 NEF/NEP contours of the Carp and Rockcliffe Airports. Outside of this 30 NEP contours noise sensitive development requires a noise impact study.

Because of the operation of associated land uses around an Airport it is noted that a noise impact study may also be required within the Airport Vicinity Development Zone to address stationary noise sources.

4.2 Sound Level Criteria for Aircraft Noise

The outdoor noise impact and the indoor sound level criteria and policies due to aircraft are addressed in the Ministry of Environment document NPC-300. Unless otherwise noted, the City requires development to be consistent with the NPC-300 guidelines as reproduced in Table 7 below.

Table 4.2a: Sound Level Limits for Aircraft Noise (from NPC-300 table C-4)

Outdoor Limit

Time Period	NEF/NEP
24-hour	30

Indoor Limit – 24 hour period

Type of Space	Indoor NEF/NEP*
Living/dining/den areas of residences, hospitals, schools, nursing/retirement homes, daycare centres, etc.	5
Sleeping quarters	0

* The indoor NEF/NEP values are used to determine acoustical insulation requirements based on the NEF/NEP contour maps.

Note that Outdoor Living Areas are not defined in new development between the 30 and 35 NEP contour. Development in this area therefore would be subject to an additional warning clause provision stating that the outdoor environment is subjected to aircraft noise.

The province also provides for supplementary indoor sound level limits for land uses not generally considered sensitive to aircraft noise (see Table 4.2b below). These good practice design objectives should be addressed in any noise study prepared for the City. These supplementary sound level limits are based on the windows and doors to an indoor space being closed.

Table 4.2b: Supplementary Indoor Sound Level Limits for Aircraft Noise (adapted from NPC-300 table C-10)

Applicable over 24-hour period

Type of Space	Indoor NEF/NEP*
General offices, reception areas, retail stores, etc.	15
Individual or semi-private offices, conference rooms, etc.	10
sleeping quarters of hotels/motels, theatres, libraries, places of worship	5

4.3 Noise Control Measures for Aircraft Noise

The foremost noise control procedure for aircraft noise is to locate noise-sensitive land use away from the NEF/NEP 30 contour line and the Airport Operating Influence Zone.

Other measures include the prescribed measures for aircraft noise (see Part 6 of the Environmental Noise Control Guidelines and, where a noise study may be required, additional measures designed to achieve sound levels limits in the indoor environment.

While not a specific measure for noise attenuation a warning clause may be required for new noise sensitive development within the Aircraft Vicinity Development Zone and for any development within the Airport Operating Influence Zone.

* The indoor NEF/NEP values are used to determine acoustical insulation requirements based on the NEF/NEP contour maps.

Appendix A: Approved Class 4 Stationary Noise Areas in the City

Number	Date of Decision	Schedule Attached
24A	City Council - November 9, 2022	By-law no. 2022-355
24B	City Council - October 5, 2022	By-law no. 2022-391

PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

Part 2:
ENVIRONMENTAL NOISE CONTROL GUIDELINES FOR SURFACE TRANSPORTATION PROJECTS

January 2016

This revised guideline is the result of a partial review of Section 2 of the May 10, 2006 City of Ottawa Environmental Noise Control Guidelines that has been undertaken to address adjustments made by regulatory bodies (such as the Province of Ontario). These guidelines will be subject to further review by the City's Infrastructure Services Department and revisions to ensure full compliance with the City's Standard Tender Documents and renewal policies.

Contents

Tables

1.0 Introduction

The City requires a detailed noise control study for the widening or construction of an arterial road, collector, major collector road or a rapid-transit corridor on areas identified on Schedules D, E, F, G and H of the Official Plan. These guidelines provide criteria and direction for these detailed noise control studies.

Accompanying the guidelines is the companion document Technical Requirements: Environmental Noise Control Studies for Surface Transportation Projects (Document 7 of the Environmental Noise Control Guidelines. When preparing a noise study for surface transportation projects both the guidelines and technical requirements documents should be used.

2.0 Area of Study

The areas of influence containing noise-sensitive land uses are measured 100 metres from the right-of-way of:

- an arterial road;
- collector or major collector;
- light rail transit corridor; or
- bus transitway.

A larger influence area may be necessary depending on the various corridor and traffic parameters and the significance of the ambient sound levels.

3.0 Sound Level Criteria for Surface Transportation Projects

Based on Provincial guidelines, the City has adopted specific sound level criteria for levels in outdoor living areas. The table below summarizes the criteria.

Table 3.0: Summary of Sound Level Criteria for Surface Transportation Projects

Future Sound Level, Leq 16hr (07:00 - 23:00)	**Change Above Ambient, dBA**	**Impact Rating**	**Mitigation**
Greater than 55 dBA and less than or equal to 60 dBA	0-3	Not generally noticeable	None
	3-5	Generally noticeable	
	5-10	Significant	Investigate noise control measures and mitigate to achieve retrofit criteria (minimum attenuation is 6 dBA)
	10+	Very Significant	
Greater than 60 dBA	0-3	Not generally noticeable	Investigate noise control measures and mitigate to achieve retrofit criteria (minimum attenuation is 6 dBA)
	3-5	Generally noticeable	
	5-10	Significant	
	10+	Very Significant	

Additional Notes:

- The objective for outdoor sound levels is the higher of the Leq_{16hr} 55 dBA or the Leq_{16hr} ambient sound level that may prevail at the start of project construction (referred to as the "established ambient").
- If the future sound level is greater than Leq16hr 60 dBA and the excess or change in sound level above the established ambient is less than 5 dBA, the feasibility of noise control measures within the right-of-way will be investigated under the City's Local Improvements policy and guidelines.
- Noise control measures will be maintained within the City's ROW wherever possible.
- The City prefers retrofit sound barrier walls at the flanking ends to be on City owned lands, however if required, property owners at the termination points of the noise abatement wall will be asked to register an easement to the City for the construction and maintenance of a acoustic barrier along a side lot line. The side lot line acoustic barrier will provide protection for the rear yard area of the adjacent property. If the landowner refuses to transfer the easement, the City will not attempt to purchase or expropriate the easement but will delete this section of wall from the noise abatement construction project.
- Where the dominant noise source is due to transit activities within an LRT or a Transitway terminal, a rail yard facility to accommodate the LRT service yard, or a terminal building containing mechanical systems then the City will use the "Stationary Sources" criteria.

4.0 Noise Control Measures for Surface Transportation Projects

There are a number of potential geometric and physical noise control alternatives available. Measures that may be considered by the City include:

- selection or alteration of a horizontal alignment;
- depressed or elevated corridor profiles;
- earth berms;
- a combination of earth berms plus acoustic barrier,
- traffic management,
- reduction or establishment of suitable vehicle speed limits
- acoustic barriers.

Consistent with Official Plan policy, use of acoustic barriers (noise walls) is to be avoided if at all feasible.

Where construction or expansion of a City roadway or a Transitway is planned, and where future noise-sensitive development is likely to materialize, non-structural noise controls will be investigated, e.g. with control of vertical and horizontal alignments, to minimize noise impacts provided that significant increases in project costs or subsequent maintenance costs will not be incurred. Notwithstanding the above, it will still be the responsibility of the developer to meet the City requirements for new noise sensitive developments.

For light rail, there are a number of improvements that may include the use of all welded rail sections, construction details related to future concrete rail structures that accommodate noise control parapet walls, vibration isolation of certain track sections and the choice of low sound emission LRT vehicles,

PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

Part 3:
ENVIRONMENTAL NOISE CONTROL GUIDELINES FOR LOCAL IMPROVEMENT ALONG EXISTING SURFACE TRANSPORTATION CORRIDORS

January 2016

This revised guideline is the result of a partial review of Section 3 of the May 10, 2006 City of Ottawa Environmental Noise Control Guidelines that has been undertaken to address adjustments made by regulatory bodies (such as the Province of Ontario). These guidelines will be subject to further review by the City's Infrastructure Services Department and revisions to ensure full compliance with the City's Standard Tender Documents and renewal policies.

Contents

1.0 Introduction

This guideline addresses the need for study and potential mitigation when considering the retrofitting of noise abatement measures into existing neighbourhoods.

Consideration for undertaking noise abatement measures as a Local Improvement Project are contingent upon the provisions of the City's Local Improvement Policy which identify additional implementation requirements based on economic, administrative and technical factors, including but not limited to, site topography and physical limitations. In some cases consideration of noise attenuation into an existing neighbourhood is not practicable. For example, the City will not consider Local Improvements that are likely to negatively impact land drainage or interfere with the preservation of significant natural areas.

1.1 Process

All administrative and financial procedures shall conform to the Regulations under the Municipal Act. When the attenuation of traffic noise from an existing City transportation corridor is requested from within an existing neighbourhood, the City will review the area of concern through the process for petition-based Local Improvements, in accordance with the City's Local Improvement Policy, and as per the requirements set out in this part (Part 3). The City's review will include, as necessary, investigation of possible contributing abnormal/temporary conditions, such as the presence of pot holes, temporary construction detours, etc. and any other transient condition that is not normally associated with the City corridor within distances of 200m from the area of concern. The City will update traffic data (volumes, speed, truck percentages, day/night split, etc.), as/if necessary. The technical feasibility of a noise barrier installation within the subject corridor will also be reviewed.

Should the subject area meet all of the requirements for a noise barrier retrofit under this part (Part 3) and the installation of such a noise barrier is determined to be financially and technically practicable/reasonable, the City will prepare the Local Improvement information for the affected homeowners, which will include details on both the expected cost collect-back, and the sound level assessment for the subject area.

2.0 Scope

This guideline establishes the technical noise-related requirements to be met by residential properties to be considered by the City for a noise abatement, as a Local Improvement, for the purpose of reducing noise from existing City surface transportation corridors in Outdoor Living Areas.

Existing residential properties with noise concerns expressed due to railway or provincial highway sources are not eligible for consideration as a noise abatement as a Local Improvement because the City does not have authority over such noise sources. In such a case these concerns will be referred to the appropriate agency or authority.

In situations where detailed plans are in place which deal specifically with noise issues such as a Community Design Plan or an Environmental Assessment study for a transportation corridor, then the study or plan will take precedence over the provisions of this guideline.

Notwithstanding anything in this guideline, the requirements of the Environmental Assessment Act or the Municipal Class Environmental Assessment process for municipal transportation projects shall apply.

3.0 Eligibility for Consideration

3.1 Areas Eligible for Study and Potential Mitigation

To be considered for study for noise abatement as a Local Improvement all of the following criteria shall be met:

- Residential areas adjacent to a City transportation corridor that have ground surface level Outdoor Living Areas (OLA's) associated with the residential unit such as a backyard. For the purpose of noise assessment, the usual distance from the residential dwelling unit is 3.0 metres within the middle of the dwelling unit with the vertical height being 1.5 metres above the existing ground surface. The OLA must be clearly defined, as it will be subject to further technical analysis and;
- Only residential areas with a potential for an acoustic barrier of at least 100 metres in length will be eligible for consideration. Acoustical barriers of less than 100 metres will not be considered
- Reverse frontage lots or blocks including flanking units where the outdoor living areas are directly or partially exposed to noise from an adjacent transportation corridor.
- The following are not considered Outdoor Living Areas for retrofit purposes:
    - paved areas of properties
    - the front yard
    - balconies,
    - raised decks

For residential properties that do not qualify as noise sensitive points of reception, the cost of noise attenuation within an individual dwelling or an outdoor area is the sole responsibility of the landowner. Furthermore, the homeowner is responsible for all noise abatement features required to the indoors of the dwelling building such as air conditioning, double-glazed windows and brick veneer walls.

3.2 Sound Level Criteria for Local Improvement

The method for calculating noise levels will be in accordance with the City and MOE Guidelines, i.e. Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT) Technical Document, Ontario Ministry of Environment, ISBN 0- 7729-6376, 1989 and Sound from Trains Environmental Analysis Method (STEAM), 1990, ISBN-7729-6376-2 as modified by the City to suit the local conditions and other technical adjustments prescribed by the City.

The area/site specific sound levels, as established by the City in accordance with the technical procedures specified by the City, will be based on traffic parameters such as traffic volume, percentage of trucks, posted speed limit, road gradient, etc. Special consideration may be given by the City if the corridor is not and will not be subject to future capital works improvements such as widening, where future volume or traffic composition may result in increased sound levels. In all cases, noise abatement as a Local Improvement consideration is to be based on the existing situation while its design parameters for retrofit are to be based on future corridor and traffic conditions

To be considered for noise abatement as a Local Improvement an outdoor living area which is classified as a noise sensitive point of reception must meet all the following requirements:

- The Leq 16 Hour daytime (7:00 a.m. to 11:00 p.m.) for the existing surface transportation conditions must be over 60 dBA with the detailed sound level calculations for the subject area based on a minimum of one calculation for each group of three adjacent receptors, or as required, and;
- Mitigation must provide a minimum sound Insertion Loss of 6 dBA when averaged over the first rows of the points of reception.

If the above are met, the calculated levels shall show the sound levels for the existing and ultimate cases without and with the proposed sound barrier. The Leq analysis shall also show the resulting sound levels with various barrier height alternatives. For specific situations, the City may conduct actual field monitoring of sound levels where deemed necessary (such as difficult topographic situations and the presence of numerous sources of transportation noise.

4.0 Mitigation and Design

4.1 Acoustic Barrier Design

- Barriers will be designed and constructed consistent with the City's technical requirements for acoustic barriers (Part 5 of the Environmental Noise Control Guidelines) The noise barrier must be installed in a continuous line to ensure its effectiveness.
- Barriers will be constructed on the City's right-of-way (ROW), where feasible.

- The preferred barrier height is 2.5 metres high, but the maximum height of a noise barrier wall for retrofit purposes is 3 metres as measured from the barrier base elevation. Higher noise barrier walls may be allowed by the City subject to investigation of the aesthetics of the installation and depending on the availability of a wide right-of-way and deep residential lots.
- In preparing the design for the acoustic barrier, consideration shall be given to the inclusion of openings through the wall for fire protection to adjacent homes if the hydrants are located within the City Road allowance. Openings in the wall are also required for fire protection for vehicles using the City Road from hydrants located on adjacent local streets.
- If required, property owners at the termination points of the noise abatement wall will be asked to register an easement to the City for the construction and maintenance of a acoustic barrier along a side lot line. The side lot line acoustic barrier will provide protection for the rear yard area of the adjacent property. If the landowner refuses to transfer the easement, the City will not attempt to purchase or expropriate the easement but will delete this section of wall from the Local Improvement project and reassess the impact on the effectiveness of the proposed works, as required.

PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

Part 4:
TECHNICAL REQUIREMENTS FOR ENVIRONMENTAL NOISE CONTROL STUDIES AND IMPLEMENTATION

January 2016

Contents

Tables

1.0 Introduction

The Official Plan and Environmental Noise Control Guidelines define when a noise study is required in the City. There are three types of Noise Study: a Phase 1 Noise Control Feasibility Study, a Phase 2 Noise Control Detailed Study and an Acoustical Audit.

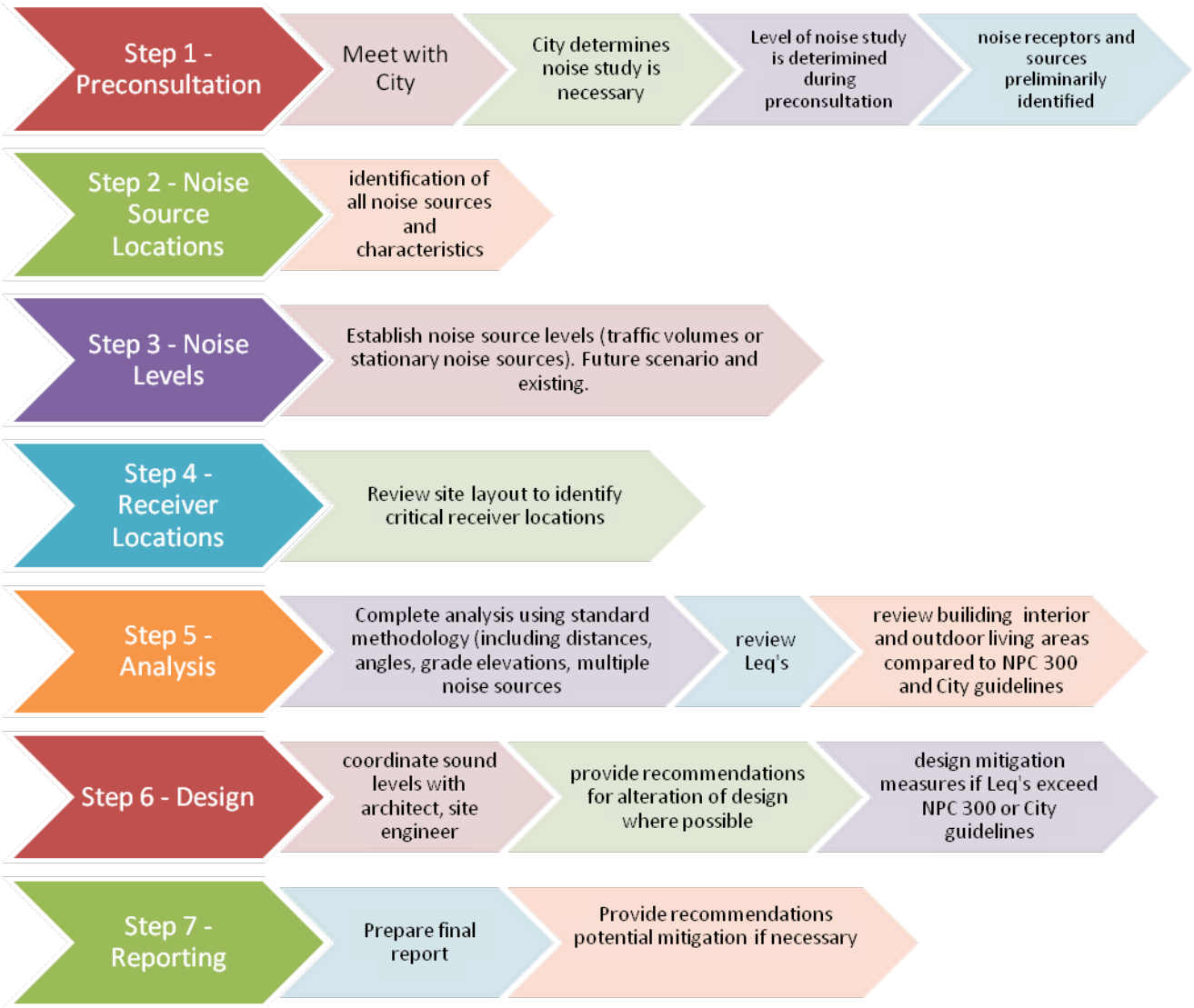
A Phase 1 Noise Control Feasibility Study is a study used to scope the potential impacts of noise on a development. The intent to this study is to complete the preliminary identification and modelling of noise issues so that urban design and potential mitigation measures can be implemented early in the planning and design process of development.

A Phase 2 Noise Control Detailed Study provides detailed modelling of noise impacts and details the specific mitigation measures that are required to meet or exceed City and provincial guidelines. When a condition of environmental noise is clearly evident for a proposed development a proponent may opt to prepare a detailed study directly in support of an application rather than both a phase 1 and phase 2 study separately.

An Acoustical Audit is a study used to determine the impacts and potential mitigation associated with a new or expanded stationary noise source.

2.0 Steps in a Typical Noise Study

The preparation of a noise study in support of a private development should generally follow a typical process as illustrated below.



3.0 Study Requirements

All Environmental Noise studies must be prepared consistent with the methods described in this document and where applicable those described in NPC-300. Where there are other relevant documents, methods or criteria these should be referenced in the noise study. The noise study report must note any variations or exceptions to Provincial or City criteria or methods.

Environmental noise studies should be prepared as early as possible in the application process. In most cases the Official Plan requires the study as part of a complete application under the Planning Act. The reason that the study is required so early in the process is because the outcome of the study is intended to contribute directly to site design and consequent decisions of committee, council and staff on the planning application. As with other technical studies prepared in support of an application, preconsultation with the City is required. At the preconsultation phase the source(s) and receptors of noise will be defined by the applicant and the City will indicate the level of study.

The City requires that noise studies of any type be prepared by qualified individuals. A qualified individual is a Professional Engineer with experience in acoustical engineering and noise studies as defined by the Ontario Society of Professional Engineers.

In the following subsections are additional details for preparation of a noise study.

3.1 Phase 1 Noise Control Feasibility Study Requirements

The objective of a Phase 1 Noise Control Feasibility Study is to identify if noise will be an issue for the proposed development and to explore possible alternatives if noise levels are expected to be near or exceed Provincial guidelines. The level of detail in a feasibility study may vary depending on complexity of the project and is largely dependent on the outcome of the preconsultation with the City and the results of initial observations and analysis by the engineer.
There are a number of requirements to every Phase 1 Noise Control Feasibility Study as summarized in the checklist below.

Checklist of Required Information for a Phase 1 Noise Control Feasibility Study

1. Scale plan(s) identifying:
   a) Locations of noise sources;
   b) Receptor locations;
   c) Distance and angles between sources and receptors;
   d) Existing grade elevations used;
   e) Noise contour map (optional).
2. Assessment of the site layout including:
   a) noise sources in relation to building orientations;
   b) outdoor amenity areas;
   c) indoor environment;
   d) potential locations for source and/or receptor noise mitigation;
   e) Identification of potential land use conflicts.

3. Evaluation of:
   a) Noise control model results;
   b) alternative site designs and;
   c) alternative methods of noise mitigation.
4. Recommendations:
   a) For preferred noise control measures or strategies;
   b) alternatives for Site Plan design;
   c) For the content of the Phase 2 Noise Control Detailed Study including further data requirements, analysis and implementation of proposed noise control measures.
   d) Recommendations:
5. Other information as described in preconsultation with the City

Following the completion of a Phase 1 Noise Control Feasibility Study the City and development team should have sufficient information to determine the acoustic environment of the proposed development. If the development is determined not to require noise control measures then a Phase 2 Study may be determined by the City to not be necessary. If however noise control measures or additional design considerations are found to be necessary to meet City or Provincial guidelines then a Phase 2 study will be required as a condition of planning approval.

3.2 Phase 2 Noise Control Detailed Study Requirements

The objective of a Phase 2 Noise Control Detailed Study is to assess and recommend with precision the impact and mitigation of environmental noise sources. In most cases a noise feasibility study will have been prepared for the development as part of the initial application. The Phase 2 Noise Control Detailed Study includes substantively more information on the noise sources and mitigation than that contained in a Phase 1 study.

Typical conditions under which detailed noise studies are required include:

- The proposed development meets the Official Plan criteria for a detailed noise study;
- The Phase 1 noise control feasibility study did not include detailed information such as:
  - final grade elevations,
  - source/receptor distances,
  - updated traffic volumes and classifications, etc;
- a detailed study is a condition of the feasibility study approval;
- sound levels affecting the proposed development are expected to exceed the City noise objectives without mitigation; or
- the development layout has changed after the feasibility study was approved.

The requirements of a typical Phase 2 Noise Control Detailed Study fulfill the information requirements above and will also include the measures listed in the following checklist:

Checklist of Required Information for a Phase 2 Noise Control Detailed Study

1. Scale plan identifying:
    a. Locations of all noise sources (up to 500 metres) or with the prescribed area of influence as applicable;
    b. Receptor locations;
    c. Distance and angles between sources and receptors;
    d. grade elevations used (existing and post development);
    e. for aircraft noise the location of the subject property in relation to the 25 and 30 NEF/NEP and the AOIZ if aircraft noise is of concern.
2. A copy of the previously approved draft plan, site plan, etc.
3. The proposed grading plan submitted for engineering approval incorporating the necessary outdoor noise control features details.
4. Discussion of proposed mitigation measures and justification for the preferred noise mitigation alternatives (if any). Demonstration that proposed mitigation will achieve City and Provincial guidelines.
5. Building component acoustic specifications based on the best available project drawings.
6. All lots, blocks, units, locations requiring noise control measures named and referenced in the study.
7. Specific recommendations for each lot, block, unit, etc. documented in clear concise summary form for implementation purposes.
8. Traffic to be based on City (or responsible agency) approved corridor and traffic data. Attach details to the study.
9. Warning clauses using City standard wording.
10. Clearly written recommendations and implementation procedures.
11. Costs for mitigation measures for financial securities (sound barriers, special provisions for building components, air conditioning, etc.). The engineer may rely on the expertise of other specialist consultants for determining reasonable cost estimates for the various specified mitigation measures.
12. Addition information as described in the noise feasibility study and/or in preconsultation with the City

Since the development plans would be registered based on site specific details (final approval and registration of a Draft Plan of Subdivision or through a Site Plan Agreement), it is essential that the detailed noise control study identify the details of the preferred alternative noise control measures, if any (subject to mutual approval by the proponent and the City). Optional or alternative solutions will not be accepted in a Phase 2 Noise Control Detailed Study.

Sound measurement procedures should be conducted in accordance with the technical procedures and practices developed by the Ontario Ministry of the Environment. The details for using actual field measurements, including the procedures, instrumentation, results and analysis should be documented in the applicable detailed noise study report.

If acoustic barriers or berms are recommended, then cross sections at vertical and horizontal scales should be provided to clearly illustrate the proposed berm and/or wall configuration in relation to existing and future grades as indicated by the proposed Lot Grading Plan.

Cross sections and/or the data in the report must include all information required to calculate the expected sound levels (such as the location and elevation of the noise source(s), receiver(s), building(s), acoustic barrier(s), berm(s), berm slopes, sidewalks, ditches, roadway and/or railway elevations and centerlines and property lines).

3.3 Acoustic Audits for New Noise-Generating Sources

Where an Acoustic Audit is specified as a condition in an ECA (Air) issued by the MOE under Section 9 of the Environmental Protection Act for a new Stationary Source, the proponent will be required to prepare the necessary "Acoustic Audit" in accordance with the MOE procedures outlined in NPC-300. If an ECA is not required by the MOE for a new Stationary Source, then the City may either request that the NPC-300 Acoustic Audit procedures be followed by the proponent, or alternatively, the City may request the proponent follow the certification procedures of final construction as summarized in the Acoustical Audit.

3.4 Exceedance of Provincial Criteria

The City may, under extraordinary circumstances and solely at its discretion, consider minor exceedance (up to 5 dBA) of the provincial guidelines for surface transportation and stationary noise in the outdoor environment.

It is a requirement from the City that any noise analysis submission to the City that exceeds the City's criteria must be accompanied by a technical submission by the Site Engineer to justify excess(s) including analysis of the sound levels for various alternative planning and engineering options (including setbacks, grades and calculated barrier height options in increments of 1 dB from Leq ($_{16hr}$) 55 to 60 dBA.

If it is shown that there is no technically or economically feasible way to achieve the City's outdoor sound level criterion, a tolerance of not more than 5 dBA above the stated criteria may, at the City's sole discretion be allowed. Such an exceedance will require specific mention in a warning clause. There is no discretion on the part of the City with respect to indoor sound level criteria. In the indoor acoustic environment, excesses above the provincial criteria will not be accepted.

3.5 Optional Noise Contour Mapping

An emerging technology in acoustical engineering is the preparation of noise contour maps. A noise contour map is a thematic representation of predicted noise levels based on a model of the terrain, structures and noise sources. The model and the maps have great potential to visualize the effect of urban design alternatives to decision makers and the community.

The City supports the preparation of noise contour mapping in noise feasibility and/or detailed noise studies in order to convey the effect of various urban design and mitigation alternatives. Because this is an emerging technology the City does not require noise contour maps but nevertheless encourages the submission of noise contour mapping to help substantiate recommendations in the Phase 1 and Phase 2 Noise Control Studies.

Noise contour maps do not negate the requirement for STAMSON prediction of noise levels for traffic noise prediction but may be used to corroborate conclusions of the STAMSON model calculation. Where a noise contour map is submitted the modelling should be based on a 5 metre or less grid at a height of 1.5 metres using applicable model algorithms such as the United States Federal Highway Administration Traffic Noise Model (TMN 2.5 or later) and those in general usage for rail and/or aircraft noise modelling.

4.0 Impact Assessment of Transportation Noise

The following table provides a number of additional requirements to be followed when completing a transportation noise study.

Table 4.0 Requirements for Transportation Noise Studies

- Traffic data should be consistent with the table of Traffic And Road Parameters To Be Used For Sound Level Predictions (see Appendix B)
- The City shall be consulted with regards to the choice of traffic data and corridor details.
- The assessment of road traffic noise impact should use the AADT (Annual Average Daily Traffic). Where recommended consideration may be given to situations where the weekend traffic or Summer Average Daily Traffic (SADT) may be more dominant.
- ORNAMENT (Ontario Road Noise Analysis Method for Environment and Transportation), STEAM (Sound from Trains Environment Analysis Method), and the computerized version STAMSON (as updated from time to time) are the required prediction methods.
- Primary descriptors are the 16-hour day-time and the 8-hour night-time equivalent sound levels, Leq16hr and Leq8hr for City roads and Transitway.
- In certain situations, the preferred approach may include a combination of actual field sound measurements supplemented by calculations and prediction procedures. Examples of special cases requiring the use of supplementary noise measurements include difficult site and/or topographic conditions, the presence of numerous acoustical obstructions/barriers, unusual vehicular traffic conditions and presence of other extraneous sources of noise that cannot be predicted.

Table 4.0 Requirements for Transportation Noise Studies

- Impact may need to be established separately for:
  - The outdoor noise impact due to air traffic
  - Indoor noise impact shall be assessed separately for road, rail and aircraft noise.
    - Indoor noise impact for aircraft noise is established based on the overall impact due to aircraft noise and sources of surface transportation noise.
- The required indoor noise control measures for the multiple source impact are then defined by a combined acoustical insulation parameter; Acoustic Insulation Factor*, (AIF) (a logarithmic descriptor) that is evaluated by combining the acoustical insulation parameters determined for each of the sources.
- For the purposes of noise impact assessment in an Outdoor Living Area,
  - Assessment should be performed in terms of a "free-field" sound level which is the sound level not affected by the presence of the building under assessment.
  - The presence of major reflecting surfaces near-by the point of reception should be accounted for based on the use of good acoustic engineering practices.
- For the purposes of noise impact assessment in the plane of a bedroom window,
  - the point of assessment is typically 1.5 m for ground floor rooms and 4.5m for second storey rooms (or higher as appropriate for the site specific case) above ground unless the dwelling is a multi-storey building.
  - For multi-storey buildings, noise assessment should be conducted at several levels including the upper levels.
- When predicting the sound levels due to surface transportation sources, the following points should be adhered to in the analysis and assessment:
  - For improved accuracy, curved road or rail sections, roads with varying grade elevations, 4 and more lane roadways and surface transportation corridors with sound barriers are to be assessed on the basis of multiple segments.
  - Where sound barriers are involved in the analysis and especially where the existing and/or proposed grade elevations change considerably, sound level calculations should be performed at more frequent locations (preferably at every third dwelling unit/lot or less).
  - Every effort should be made to secure reliable grade elevations at the receptors, barrier base and source and to be included in the study. For preliminary noise assessments, it is important to establish the feasibility of noise control measures, where required, based on the existing grade elevations for relatively flat conditions. For sites involving difficult topographies (source, barrier or receptor locations), preliminary grade elevations must be used. It is only in the final stages of the planning approval process that noise assessments be updated to a greater detail based on reasonably accurate proposed grade elevations.

* The preferred method is the AIF method. Detailed alternate procedures using the STC method may be accepted.

Table 4.0 Requirements for Transportation Noise Studies

- The receptors, where segments of sound barriers are involved, should be in the acoustic "shadow zone". The use of acoustic "bright zones" is not acceptable except for the remote segments.
- For roads and bus transit traffic, the "posted speed" limit should be used in calculation of the sound levels. Where it could be demonstrated by any of the concerned parties that the actual operating speed is significantly different than the posted speed limit (i.e. by over 5 km/hour for the 85% percentile of the speed), additional analysis may be included in the study to deal with this change. For LRT, the system speeds shall be obtained from the transit authority in the City.
- For roads where heavy truck percentage exceed 5% of the total traffic volume and where sound barrier(s) is (are) warranted, additional and supplementary analysis should be included in the study by separating the analysis (sound level calculations) of each vehicle class separately prior to combining the sound levels of all vehicle categories to arrive at the overall sound levels due to all vehicle classes.
- All receptors (residential and non-residential) that may have an outdoor noise sensitive land use component are to be identified and addressed in the study. The impact on noise-sensitive non-residential buildings that do not include central air conditioning are to be addressed in the noise assessment.

- Consideration should be given to future sound levels.
  - For City roads, this is the Mature State of Development based the Traffic and Road Parameters to be Used for Sound Level Predications in Appendix B
  - For rail traffic, bus Transitway/LRT traffic, the railway company or the City transit authority respectively should be consulted and approved data by such agencies are to be used.
  - In the absence of information from the railway companies on the future rail traffic volume, the existing data should be increased at annual rate of 2.5% for a minimum of 15 years after the expected construction completion date.
- Noise Control Measures are to be evaluated based on the preferred mitigation measures (see Environmental Noise Guidelines Section 1 Land Use Planning) and Noise Control Measures in NPC-300

4.1 Additional Procedures for Surface Transportation Corridors Sound Level Predictions

The report will detail information on all adjustments where applicable. Where there is more than one noise source, the calculation of the combined sound levels is required.

To determine the noise impact from a City Road or a Transitway, for each route alternative the smallest study area should be defined using one or more of the following methods:

i. using 5 dBA contour lines extending from the source to a noise-sensitive area where there is no increase above the ambient sound level; or,

ii. a noise-sensitive area where there is no increase above the ambient sound level; or,

iii. a perpendicular distance of 100m from the closest edge of pavement from arterial or collector roadway or Transitway ROW .

iv. 250 metres from LRT ROW

There is no minimum number for residences that define a noise sensitive area. Therefore, all noise sensitive land uses, regardless of size or location, are to be assessed for potential application of noise control measures.

The ambient sound levels will be based on the corridor design capacity.

Ambient sound levels due to other sources of noise (such as Highways under the MTO jurisdiction or major commercial or industrial areas) will be established by procedures acceptable to the City. A combination of prediction and/or measurement procedures may be required by the City of Ottawa depending on the source of noise.

Future sound levels from the project will be based on traffic projections corresponding to the mature state of development designated in the City's Official Plan.

Off right-of-way noise control measures and night-time (11:00 p.m. - 7:00 a.m.) assessment of the noise impact will not be considered as part of these City guidelines.

Notwithstanding the criteria for mitigation and the warrants for sound barriers, additional mitigation may be recommended to rectify inconsistencies such as surface repairs, speed reduction and repairs to manholes/catch basins.

Where the receptors are outfitted with existing sound barrier(s), the study should address the sound levels with such barrier(s). The general condition of the barrier(s) that affects their acoustic performance should be included in the noise study together with appropriate conclusions and recommendations.

Where the study is concerned with detailed construction of a Capital Works project, the study should contain additional and comparable details related to the construction phase noise including:

- Prevailing ambient noise
- Prediction of the noise due to various phases of construction (demolition/clearing, earth work, placement of sub base, paving, etc.) based on knowledge of the construction equipment to be used, various crew sizes, number of equipment to be used, etc.

- Applicable provisions/sections in the City's noise-by-law and applicable restrictions.
- Special Provisions (SP) to be included in the contract documents to address construction noise and its mitigation, if required.

Bus stops, other than stations, do not have to be separated from the general noise produced by the bus movements between stations.

Transitway buses are considered "medium trucks" for Transitway sound level predictions except where it is demonstrated that the specific bus emissions are similar to that of heavy trucks.

While the use of the AADT for noise assessments of road traffic is the common practice, special consideration may be given to situations where the weekend traffic or summer traffic (SADT) may be more dominant. Appropriate adjustments to the calculated sound level should, then be applied in such situations. The results and recommendations in this respect should be implemented.

Criteria for Using the Stamson Modeling Program

- For vehicular traffic and/or bus traffic on City roads the relevant vehicular, truck and bus traffic data should be entered with their appropriate parameters directly into the STAMSON program (using the "Road" template).
- For dedicated bus Transitway, the relevant traffic data should be entered with their appropriate parameters directly into the STAMSON program using the "RT/Custom" template".
- For light rail traffic employing diesel prime moving engines/locomotives, where used as City transit vehicles, the rail traffic data (available from the City) should be entered with their appropriate parameters directly into the STAMSON program (using the "Rail" template). The appropriate parameters from the City includes the "number of trains for time period", "number of locomotives per train", "number of cars per train", and the "speed".
- For light rail traffic (LRT) employing electric prime moving engines, which is used as City transit vehicles, the LRT traffic data (available from the City) should be entered with their appropriate parameters directly into the STAMSON program (using "RT/Custom" template). The appropriate parameters from the City includes the LRT "emission level for custom type", the "source height", "number of vehicles for time period", and the "speed".
- The report will detail information on all adjustments where applicable. Where there is more than one noise source, the calculation of the combined sound levels is required
- Actual field measurements may be used subject to City's prior approval to deal with situations that may not be feasible to predict such as:
    - unusual traffic patterns or the presence of high percentages of vehicle classifications beyond those reported by the City.

- traffic or corridor parameters that are outside of the limitations of the prediction model;
- downtown core areas;
- presence of large reflecting buildings in dense urban areas;
- highly irregular topography;
- the presence of other stationary sources of noise; and,
- the presence of complicated geometrics for calculation purposes.

- Ambient sound levels due to other sources of noise (such as Highways under the MTO jurisdiction or major commercial or industrial areas) will be established by procedures acceptable to the City. A combination of prediction and/or measurement procedures may be required by the City depending on the source of noise.
- Reference should be made to applicable MOE guideline publications and procedures.
- Mitigation will attempt to achieve sound levels as close to the objective level as is technically, economically and administratively feasible.
- Alternative noise control measures shall be considered prior to making the decision to use barriers.

5.0 Implementation of Noise-Sensitive Development

5.1 Development Agreements for New Noise-Sensitive Developments

All types of development, regardless of noise impact, are required to enter into various development agreements with the City. If noise is a concern that warrants recognition or mitigation, then the specific noise attenuation measures and a warning clause should be included into the development agreement. The development agreement may also include, but is not necessarily limited to components as noted in the following table.

Table 5.1 Additional Components of Development Agreements

Provision for Maintenance, replacement and repair	Noise control mitigation measures may require maintenance from time to time. Where necessary, the development agreement should contain provisions to require the owner to maintain the range of noise control measures as approved by the City in a good and safe condition to the satisfaction of the City. The agreement may also include the necessary procedures for repairs and remedies at the owner's expense in accordance with the City's property standards practices.

Table 5.1 Additional Components of Development Agreements

Financial Securities	In order to secure the fulfillment of the required internal and external noise control measures, the City requires Letters of Credit to cover the actual implementation of the necessary work. The proponent will be required, prior to receipt of final approval, to enter into a Financial Agreement with the City and to deposit the necessary Letters of Credit satisfactory to the Solicitor and the Treasurer of the City. The principal sum of the Letter of Credit required will be in an amount equal to One Hundred Percent (100%) of the total estimated cost of the internal and external noise control measures as certified by the proponent's Consulting Engineer(s) and to the satisfaction of the City. The conditions for the Letter of Credit release will be directly connected with the engineer's certification process for exterior and interior noise mitigation features.
Letters of Credit for Transportation Noise	Noise control measures to be covered by the Letter of Credit may include, but are not limited to the following: • Berm construction and/or specific modifications to the Grading Plan(s) to achieve the stipulated elevation(s). • Acoustic barrier construction. • Installation of the necessary duct work to accommodate central air conditioning. • Installation of the central air conditioning system, as required. • Installation of special building components to meet specific acoustic criteria including windows, doors and walls. It is important to note that complementary work to the above noted noise control measures, which is essential to the completion of the development, should also be covered by other financial guarantee(s) with the City, such as the grade elevations, landscaping, building locations, outdoor amenity areas, and drainage. For noise-sensitive developments affected by stationary sources of noise where the noise control measures are to be implemented within the development itself, the above provisions will also apply.

Table 5.1 Additional Components of Development Agreements

Letters of Credit for Stationary Noise	Where noise control measures are planned at the sources of noise, the development proponent will be firstly required to enter into a separate legal agreement with the owner(s) of the source to undertake such external work at the source and secondly, the Letter of Credit should also cover all the additional costs to undertake such noise control measures which may include, but are not limited to the following: • Construction of sound barriers or enclosures to surround the noisy equipment, parts of the site, etc. • Control of equipment noise • Noise control devices (silencers, mufflers, acoustic louvers, acoustic hoods, etc.) • Noise control materials (lagging, absorptive treatment, etc.) • Building acoustic treatment • Relocation of noise sources In lieu of the Letter(s) of Credit for control of stationary sources of noise only, the proponent may produce an ECA under Section 9 of the Environmental Protection Act together with a certified copy of the legal agreement with the owner(s) of the source to undertake such work. The City may reserve its right to also receive a Letter of Credit to cover the costs of such work.

5.2 Requirements for Building Permits for New Noise-Sensitive Developments

For building permit approval, the agreed upon acoustical objectives such as (dBA and AIF levels) need to be translated into actual building components, physical measurements, dimensions, and specific materials. The following Table 5.2 includes points assisting with finalizing the plans for building permit approval for noise-sensitive developments:

Table 5.2 Building Permit Plan Requirements

General requirements	• To be prepared and signed by a Professional Engineer • To refer to specific building permit drawings by number and date. • The use of acoustic terminology such as sound levels, decibels, STC, etc. is not accepted. Instead, reference to specific building components is required, such as thickness of glazing, material specifications, details of walls and doors. • supplementary construction details, e.g. window/glazing specifications
Matters from the Detailed Noise Study	• Building layout/orientation • Glazing/windows, etc. • Air conditioning requirements, where permitted (location and sound rating)

5.3 Confirmation of Final Construction and Release of Funds for New Noise-Sensitive Developments

Upon completion of the project, the acoustical engineer will visit the site; inspect the installed noise control measures and landscaping to confirm that the noise study recommendations as approved have been implemented. The acoustical engineer should then prepare a letter to the City confirming that the development is in compliance with all requirements in the approved noise study and the applicable conditions in the development agreement.

The Confirmation Letter must be unconditional and address all requirements (not just some requirements) as well as provide all relevant information such as the project name, lot numbers, building identification, drawing numbers, noise study report number, dates of relevant documents and in particular reference to the documents used for building permits and site grading applications. The confirmation letter(s) must be signed and bear the Professional Engineer's stamp.

The confirmation Letter shall request the release of the relevant parts of the Letter of Credit. The amount of the Letter of Credit may be reduced or completely released subject to the satisfaction of the City and confirmed by letter.

6.0 Implementation of New Noise Generating Developments

6.1 Development Agreements for New Noise- Generating Developments

All types of development are required to enter into various development agreements with the City. If noise is a concern that warrants mitigation, then the specific noise attenuation measures and a warning clause will be included into the development agreement. In addition, future maintenance of noise control measures will also be included in the development agreement, as summarized below.

Table 6.1 Additional components of Development agreements for New Noise Generating Developments

Provision for Maintenance, replacement and repair	The development agreement should contain provisions to require the owner to maintain the range of noise control measures, as approved by the City in a good and safe condition to the satisfaction of the City. The agreement should also include the necessary procedures for repairs and remedies at the owner's expense in accordance with the City's property standards practices and the MOE Certificate of Approval (Air) process. Planned noise control features that must be maintained and not tampered with by the owner or occupant(s) of the development are architectural and mechanical elements (such as silencers, mufflers and specific fans) and all other noise control measures and operations included in the noise study reports.
Letters of Credit	The City requires Letters of Credit to cover the implementation of the required noise control measures. The proponent of the new stationary source will be required, prior to receipt of final approval, to enter into a Financial Agreement with the City and to deposit the necessary Letters of Credit satisfactory to the Solicitor and the Treasurer of the City. The principal sum of the Letter of Credit required will be in an amount equal to One Hundred Percent (100%) of the total estimated cost of the noise control measures as certified by the proponent's Consulting Engineer(s) and to the satisfaction of the City. The conditions for the Letter of Credit release will be directly connected with the engineer's confirmation process for noise mitigation features. The proponent of a land use project involving a potential stationary source of noise that may affect existing near-by noise-sensitive land uses will be required to provide the City with Letter(s) of Credit to ensure the implementation of the required noise control measures prior to receipt of final approval or approval to commence construction. The Letter of Credit should cover all the costs to undertake the necessary noise control measures as designed by an acoustical engineer which may include, but are not limited to the following: • Construction of sound barriers or enclosures to surround the noisy equipment or parts of the site. • Control of equipment noise • Noise control devices and contraptions (such as silencers, mufflers, acoustic louvers and acoustic hoods)

Table 6.1 Additional components of Development agreements for New Noise Generating Developments

- Noise control materials (such as acoustic lagging and absorptive treatment)
- Building acoustic treatment
- Relocation of noise source(s)

In lieu of the Letter(s) of Credit for control of stationary sources of noise, the proponent may produce a Certificate of Approval under Section 9 of the Environmental Protection Act to undertake such work. The City may reserve its right to also receive a Letter of Credit to cover the costs of such work.

6.2 Building Permit Requirements for New Noise-Generating Sources

For building permit approval, the agreed upon acoustical objectives need to be translated into actual building components, physical measurements, dimensions, and specific materials. The Table 6.2 assists with finalizing the plans for building permit approval for noise-generating sources.

Table 6.2 Building Permit Plan Requirements

General Requirements	• To be prepared and signed by a Professional Engineer • To refer to specific building permit drawings by number and date (this may include the Architectural and Mechanical drawings). • The use of acoustic terminology such as sound levels, decibels, STC, etc. is not acceptable. Instead reference to specific building components and equipment specifications is required, such as thickness of glazing, material specifications, details of walls, doors, maximum size of equipment, equipment make and model, location of equipment, ductwork, and openings.

Matters from the Detailed Noise Study and Approved Site Plan	• To cover all matters of concern as approved in the Detailed Noise Control Study and the approved Site Plan. Some points of concern include but are not necessarily limited to:
	  ○ building layout/orientation
	  ○ mechanical and Electrical requirements (location, rating, etc)
	  ○ non-conditional approval and certification of the relevant plans and drawings.
	  ○ supplementary construction details.

6.3 Confirmation of Final Construction and Release of Funds for new Noise-Generating Sources

Upon completion of the project, the acoustical engineer will visit the site, inspect the installed noise control measures and be satisfied that the installed work conforms to the noise study recommendations as approved earlier by the City and/or the approval agencies and authorities (MOE). The engineer should then prepare a letter to the Construction Services Manager of the City stating confirming acoustical compliance with all requirements in the approved noise study and the applicable conditions in the development agreement.

The Confirmation Letter must be unconditional and address all requirements (not just some) as well as all relevant information such as the project name, lot numbers, building identification, drawing numbers, noise study report number, dates of relevant documents and in particular reference to the documents used for building permits and site grading applications. The Confirmation Letter(s) must bear the Professional Engineer's signature.

The Confirmation Letter(s) shall then be submitted to the City with a request to release the relevant parts of the Letter of Credit. The amount of the Letter of Credit may be reduced or completely released by the City subject to their satisfaction of the submission, based on the following:

- actual site visits, inspection, testing, including taking actual sound level readings at the receptors;
- reference to previously approved Detailed Noise Control Studies, Site Plan and the relevant approved Certification Letters (ECA);
- non-conditional final approval for release for occupancy.

Appendix A: Warning Clauses

Under the Official Plan and this guideline warning clauses may be required to be incorporated into development through development agreements, registration on title and inclusion in Agreements of Purchase and Sale. This requirement may be included in any development, regardless of whether it is considered a noise sensitive land use.

A warning clause provides recognition for the City, Province landowner or tenants that noise may be a concern, that noise may be audible at times or even quite loud, and, depending on the type of development, provincial guidelines for noise may be exceeded. Warning clauses also recognize that environmental noise is a potential health hazard that does impact people and neighbourhoods. It is for this reason that, unless a non-noise sensitive land use is established, a warning clause should also include noise mitigation.

A warning clause is not considered a form of noise mitigation. It is not acceptable therefore to use warning clauses in place of physical noise control measures to identify an excess over the MOE or City noise limits. The reason for a warning clause on all development is twofold. Firstly, it is important to note that a land use that although the development may not be considered noise sensitive it may include employees or tenants that are personally sensitive to noise. A warning clause provides protection against complaints to the ministry of Environment should provincial guidelines be exceeded. Secondly, a warning clause on title could obviate the need for a new noise study in the future. In a redevelopment scenario the warning clause would provide recognition of the extent noise conditions.

Given the variation in potential intensity and impact of noise it will often be necessary to amend warning clauses to recognize the site specific conditions in each development. Final wording of any warning clause is to be approved by the City.

The following subsections provide example text to be adapted into warning clauses.

Surface Transportation Warning Clauses

Table A1 Surface Transportation Warning Clauses

Type	Example	Notes
Generic	*Purchasers/tenants are advised that sound levels due to increasing road/rail/Light Rail/transitway traffic may occasionally interfere with some outdoor activities as the sound levels may exceed the sound level limits of the City and the Ministry of the Environment.* *To help address the need for sound attenuation this development has been designed so as to provide an outdoor amenity area that is within provincial guidelines. Measures for sound attenuation include:* • *A setback of buildings from the noise source and* • *An acoustic barrier.* *To ensure that provincial sound level limits are not exceeded it is important to maintain sound attenuation features.* *The acoustic barrier shall be maintained and kept in good repair by the property owner. Any maintenance, repair or replacement is the responsibility of the owner and shall be with the same material or to the same standards, having the same colour, appearance and function of the original.* *Additionally this development includes trees and shrubs to screen the source of noise from occupants.*	The generic warning clause outlines that MOE sound levels may be exceeded but the indoor environment and outdoor amenity areas are within guidelines. Mitigation measures are described including urban design features. Mention is also made of landscaping to screen the development visually from the source of noise.
Extensive mitigation of indoor and	*"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units,*	The warning clause makes reference to MOE sound levels

Table A1 Surface Transportation Warning Clauses

Type	Example	Notes
outdoor amenity area	*sound levels due to increasing road/rail/Light Rail/transitway traffic may, on occasion, interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the City and the Ministry of the Environment.* *To help address the need for sound attenuation this development includes:* • *multi-pane glass;* • *double brick veneer;* • *an earth berm; and* • *an acoustic barrier.* *To ensure that provincial sound level limits are not exceeded it is important to maintain these sound attenuation features.* *The acoustic barrier shall be maintained and kept in good repair by the property owner. Any maintenance, repair or replacement is the responsibility of the owner and shall be with the same material or to the same standards, having the same colour, appearance and function of the original.* *This dwelling unit has also been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of the Environment.*	being exceeded from time to time and that there are sound attenuation features and landscaping within the development that should be maintained. An option for air conditioning is noted as well as landscaping to screen the source of noise.

Table A1 Surface Transportation Warning Clauses

Type	Example	Notes
	Additionally this development includes trees and shrubs to screen the source of noise from occupants.	
No outdoor amenity area	*Purchasers/tenants are advised that sound levels due to increasing road/rail/Light Rail/transitway traffic will interfere with outdoor activities as the sound levels exceed the sound level limits of the City and the Ministry of the Environment.* *To help address the need for sound attenuation this development includes:* • *multi-pane glass;* • *double brick veneer;* • *high sound transmission class walls.* *To ensure that provincial sound level limits are not exceeded it is important to maintain these sound attenuation features.* *This dwelling unit has been supplied with a central air conditioning system and other measures which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of the Environment*	This warning clause notes that only an indoor environment is being provided for.

Stationary Source Warning Clauses

The Province notes that it is not acceptable to use warning clauses in place of physical noise control measures to identify an excess over the MOE sound level limits for stationary sources. The generic warning clause for stationary sources (called Type E in NPC-300) may identify a potential concern due to the proximity of the facility but it is not possible to justify exceeding the sound level limits.
The wording of the generic stationary noise warning clause may also be used as the basis for new development adjacent to areas licensed for mineral aggregate extraction.

Table A2 Stationary Source Warning Clauses

Type	Example	Notes
Generic – urban design features for outdoor amenity and shelter of indoor environment	*Purchasers/tenants are advised that due to the proximity of the adjacent industry (facility) (utility), noise from the industry (facility) (utility) may at times interfere with outdoor activities.* *To address potential impacts of noise from the adjacent industry (facility) (utility) this development has been designed to provide for specific outdoor amenity areas and a quieter indoor environment. Landscaping has also been provided to screen the source of noise.*	This stationary source warning clause is intended for new development in proximity to existing stationary noise sources where urban design features (blank walls, specifically located outdoor amenity areas) have been provided. The warning clause is based on the MOE Type E warning clause.
Extensive mitigation of indoor and outdoor amenity area	*Purchasers/tenants are advised that sound levels due to the adjacent industry (facility) (utility) may interfere with outdoor activities as the sound levels exceed the sound level limits of the City and the Ministry of the Environment.* *Purchasers/tenants are further advised that sound levels due to the adjacent industry (facility) (utility) are required to comply with sound level limits that are protective of indoor areas and are based on the assumption that windows and exterior doors are closed. This dwelling unit has been supplied with a ventilation/air conditioning system which will allow windows and exterior doors to remain closed.*	This clause is suitable for areas where extensive mitigation is necessary as well as Class 4 areas.

Aircraft Noise Warning Clauses

Aircraft warning clauses are required for all development within the Airport Vicinity Development Zone and in the Carp and Rockcliffe Airport areas. In addition the City may consider addition of a warning clause to any other lands in the city where recommended by the Airport Authority.

Table A3 Aircraft Noise Warning Clauses

Area	Example
Noise Sensitive Development outside of NEP 25 and within Airport Vicinity Development Zone And Non-noise sensitive development within the Airport Vicinity Development Zone	*Purchasers/tenants are advised that due to the proximity of the airport, noise from the airport and individual aircraft may at times interfere with outdoor or indoor activities.*
Noise Sensitive Development: outside the AOIZ but within NEP 25; or within the Carp or Rockcliffe Airport areas and outside of the AOIZ boundary	*Purchasers/building occupants are forewarned that this property/dwelling unit is located in a noise sensitive area due to its proximity to Ottawa Macdonald-Cartier International Airport / Carp / Rockcliffe Airport. In order to reduce the impact of aircraft noise in the indoor spaces, the unit has been designed and built to meet provincial standards for noise control by the use of components and building systems that provide sound attenuation. In addition to the building components (i.e. walls, windows, doors, ceiling-roof), since the benefit of sound attenuation is lost when windows or doors are left open, this unit has been fitted with a forced air heating system, all components of which are sized to accommodate the future installation of central air conditioning-by the owner/occupant.* *Despite the inclusion of noise control features within the dwelling unit, noise due to aircraft operations may continue to interfere with some indoor activities and with outdoor activities, particularly during the summer months. The purchaser/building occupant is further advised that the Airport is open and operates 24 hours a day, and that changes to operations or expansion of the airport facilities, including the construction of new runways, may affect the living environment of the residents of this property/area.* *The Ottawa Macdonald-Cartier International Airport Authority, its acoustical consultants and the City of Ottawa are not responsible if, regardless of the implementation of noise control features, the*

Table A3 Aircraft Noise Warning Clauses

Area	Example
	purchaser/occupant of this dwelling finds that the noise levels due to aircraft operations continue to be of concern or are offensive.
Noise Sensitive Development between AOIZ boundary and NEP 35 contour (only limited development permitted)	*Purchasers/building occupants are forewarned that this property/dwelling unit is located in a noise sensitive area due to its proximity to Ottawa Macdonald-Cartier International Airport / Carp / Rockcliffe Airport. In order to reduce the impact of aircraft noise in the indoor spaces, the unit has been designed and built to meet provincial standards for noise control by the use of components and building systems that provide sound attenuation. In addition to the building components (i.e. walls, windows, doors, ceiling-roof), since the benefit of sound attenuation is lost when windows or doors are left open, this unit has been fitted with a forced air heating system, all components of which are sized to accommodate the future installation of central air conditioning-by the owner/occupant.* *Despite the inclusion of noise control features within the dwelling unit, noise due to aircraft operations may continue to interfere with some indoor activities and with outdoor activities, particularly during the summer months. The purchaser/building occupant is further advised that the Airport is open and operates 24 hours a day, and that changes to operations or expansion of the airport facilities, including the construction of new runways, may affect the living environment of the residents of this property/area.* *The Ottawa Macdonald-Cartier International Airport Authority, its acoustical consultants and the City of Ottawa are not responsible if, regardless of the implementation of noise control features, the purchaser/occupant of this dwelling finds that the noise levels due to aircraft operations continue to be of concern or are offensive.*

Appendix B: Table of Traffic and Road Parameters To Be Used For Sound Level Predictions

Table B1 Traffic And Road Parameters To Be Used For Sound Level Predictions

Row Width (m)	Implied Roadway Class	AADT Vehicles/Day	Posted Speed Km/Hr	Day/Night Split %	Medium Trucks %	Heavy Trucks % [1]
NA [2]	Freeway, Queensway, Highway	18,333 per lane	100	92/8	7	5
37.5-44.5	6-Lane Urban Arterial-Divided (6 UAD)	50,000	50-80	92/8	7	5
34-37.5	4-Lane Urban Arterial-Divided (4-UAD)	35,000	50-80	92/8	7	5
23-34	4-Lane Urban Arterial-Undivided (4-UAU)	30,000	50-80	92/8	7	5
23-34	4-Lane Major Collector (4-UMCU)	24,000	40-60	92/8	7	5
30-35.5	2-Lane Rural Arterial (2-RAU)	15,000	50-80	92/8	7	5
20-30	2-Lane Urban Arterial (2-UAU)	15,000	50-80	92/8	7	5
20-30	2-Lane Major Collector (2-UMCU)	12,000	40-60	92/8	7	5
30-35.5	2-Lane Outer Rural Arterial (near the extremities of the City) (2-RAU)	10,000	50-80	92/8	7	5
20-30	2-Lane Urban Collector (2-UCU)	8,000	40-50	92/8	7	5

[1] The MOE Vehicle Classification definitions should be used to estimate automobiles, medium trucks and heavy trucks.

[2] The number of lanes is determined by the future mature state of the roadway.

PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

Part 5:
TECHNICAL REQUIREMENTS FOR ACOUSTIC BARRIER SYSTEMS

January 2016

This technical requirement document is a partial review of text of the May 10, 2006 City of Ottawa Environmental Noise Control Guidelines. This review was undertaken to address adjustments made by regulatory bodies (such as the Province of Ontario). This document will be subject to further review by the City's Infrastructure Services Department and revisions to ensure full compliance with the City's Standard Tender Documents and renewal policies.

Contents

1.0 Introduction

Acoustic Barrier System or noise walls, noise barriers or acoustic walls encompasses all components of an acoustic barrier system. This includes the base berms, the barrier itself and all other associated components such metal or concrete supports and finishes.

This technical requirements document outlines specifications for the design and installation of acoustic barrier systems approved or constructed by the City. By necessity acoustic barriers are high mass, tall, physical barriers that may cross neighbourhoods and obscure the streetscape. While effective for noise attenuation, these barriers have the potential to fragment neighbourhoods, disrupt wildlife movements, create potentially unsafe public spaces and discourage pedestrian use of the street and sidewalk. Acoustic barriers are expensive and the long term maintenance of these structures may represent a long term financial burden for the City and private land owners. For these reasons acoustic barriers may only used as a last resort to attenuate noise in outdoor living spaces. Wherever possible, acoustic barriers must be used in concert with other noise and visual attenuation measures so as to reduce the negative impact of acoustic barriers to neighbourhoods and the environment.

Within the city acoustic barriers may be installed in connection with:

- New development approved under the Planning Act;
- Transportation corridors and transit corridor capital works projects that may be subject to the Environmental Assessment process;
- The City's Local Improvement process.

The following summarizes the principles of the acoustic barrier requirements:

- To introduce acoustic barriers to the neighbourhood as an mitigation measure only if other mitigation measures are not feasible;
- To use acoustic barriers in combination with other appropriate mitigation measures;
- To combine acoustic barrier design with appropriate landscaping to obscure the noise source from the receiver;
- Where appropriate to provide for an active and attractive pedestrian streetscape which is safe and accessible;
- To provide uniform design and construction parameters for the approval and installation of durable and high quality acoustic barrier systems.
- To ensure that barriers have a life expectancy of at least 20 years;
- To understand the lifecycle cost of barriers prior to their installation;
- To maintain connectivity of pedestrian and cycling walkways through neighbourhoods;
- Encourage the use of friendly, but durable, products that homeowners can relate to or maintain, where necessary;

- Provide realistic warranties that focus on the barrier system, and not only on the panels or materials;
- Provide effective implementation procedures for barrier design and installation.

The specific requirements described in this document are not to be considered all inclusive. Any new design, material or installation technique not specifically addressed in this document should be evaluated with the general fundamentals of acoustics, durability, safety, and functionality in mind.

2. 0 Applicable Standard for Acoustic barriers

The City does not maintain a list of approved suppliers. Rather, the City requires acoustic barrier systems to meet, as a minimum, the technical requirements for an acoustic barrier as defined in NPC-300.

3.0 Planning, Materials, Design and Construction of Acoustic Barrier Systems

Should the use of acoustic barriers be found necessary, the following describes the design and components required by the City for Acoustic barriers system.

3.1 Submission Document Requirements

The following documents shall be submitted to the City for approval for each acoustic barrier wall project:

1. Shop drawings, signed and sealed by a qualified Professional Engineer licensed by the Professional Engineers of Ontario, showing the details of acoustic barrier system components, including material specifications (see 3.1.1 below).
2. Structural drawing(s), signed and sealed by a qualified Professional Engineer licensed by the Professional Engineers of Ontario, showing foundation details and specifying design criteria, climatic design loads, as well as applicable geotechnical data used in the design.
3. Layout plan, and wall elevations, showing proposed colours and patterns.
4. A covering letter stating deviations or exceptions to the City requirements and the reasons/justification for the deviations.

3.1.1 General Submission Information Requirements

In order for the acoustic barrier system design, and materials, to be qualified and be considered for installation at a specific site, the submission should provide the following information:

1. The manufacturer's name and address and trade name of the product (if applicable);
2. A general statement as to the composition of the materials;

3. An estimate of life cycle cost over the period of installation, maintenance and repair through replacement in 20 or more years;
4. Certification by a Geotechnical Engineer (calculations may be requested);
5. Certification by a Structural Engineer (calculations may be requested);
6. Detailed drawings of the entire acoustic barrier system and all its components including detailed material specifications;
7. Specifications regarding installation requirements as well as sequence of construction;
8. Noise Reduction Coefficient (NRC) report if the acoustic barrier is to be considered as sound absorptive; if required by the noise study;
9. Sound Transmission Class (STC) and/or the material surface density.

Any new design, material or installation technique for a acoustic barrier system will be evaluated for acceptability of use in the City with a view to safety, durability, functionality, esthetics and cost effectiveness.

The design drawings and calculations shall be signed, sealed and dated by a Professional Engineer licensed in the area of expertise for which the approval is being sought.

3.1.2 Plan Requirements

Typical and all worst case cross sections (and additional cross sections as may be necessary) at a reasonable vertical and horizontal scale should be provided to clearly illustrate the proposed berm and/or wall configuration in relation to the future grade at the Outdoor Living Area based on the proposed Lot Grading Plan (for a Noise Feasibility Study, use the existing grades. For a Detailed Study, existing and proposed future grades at the site must be indicated). Cross sections and/or the data in the report must include the location of the noise source, the location and elevation of the receiver, top elevation of the acoustic barrier, ground elevations of the berm, berm slopes, sidewalks, boulevards, ditches, roadway or railway elevations and property limits of the lands in question. Cross sections must provide all information (distances and heights) required to calculate the sound level reductions due to barriers.

The location of the cross sections must be indicated on a copy of the submitted plan. Preliminary grading plans should identify and make reference to all information shown on the cross sections (Corridor ground elevations, ground elevation at noise receivers, ground and top elevations of the berm, elevations of the rear yards, sidewalks, ditches, boulevards and ground elevation at the building face).

Height of receiver to be used is 1.5m above the ground at a point located 3.0m from the rear and/or closest wall within the identified Outdoor Living Area of the dwelling unit. If the house or development

design shows other alternative locations for the Outdoor Living Area, such as a common Outdoor Living Area, then the receiver location(s) should be shown on the applicable project drawings.
Other suitable and acoustically effective Outdoor Living Area locations may be selected in consultation with the City based on site specific cases.

3.2 Design

3.2.1 System Design

The details presented below refer to acoustic barriers as a system of various components including the base berm, the wall, and all other associated components.

- The design of acoustic barriers should have regard for applicable urban design guidelines, landscaping requirements and aesthetic principles.
- Each design must include drainage, grading and landscaping design.
- The design of the barrier should be complimentary with nearby existing barriers.
- All individual components shall be designed to be capable of being assembled on site and to conform to the drawings and specifications. The panels to also be designed to facilitate ease of on-site replacement.
- The design of the system shall be site-specific and in accordance with the Canadian Highway Bridge Design Code (CHBDC), prepared by qualified Professional Engineers and Acoustic Consultants. Input will be required from Geotechnical and/or Structural Engineers.
- The acoustic barrier shall be designed to withstand all possible forces and loads encountered during the design life of the barrier and remains serviceable. The design shall be site specific with reference to the wind pressure, earthquake load, freezing depth and soil conditions.
- The foundation of the barrier wall shall be designed to be founded on undisturbed soil, and at required depth of embedment as per the design requirements, but not less than the depth of freezing of the area.
- The acoustic barrier is to be designed and installed so as to accommodate movement of the acoustic barrier panel during the weather cycle without placing undue stress on any structure and the acoustic barrier installation, or reducing acoustical attenuation. The joints in the acoustic barrier are to match the size and location of the structure joints.
- Acoustic barrier elements should be designed and oriented to minimize entrapment and ponding of water, and accumulation and infiltration of dirt and debris inside and on any surface

of any component. Corrugated, or ribbed panels, should be mounted such that the features are oriented vertically.

- Acoustic barrier panels with fire hose access openings, if required, shall be designed with additional reinforcement and protective coating around the opening, as necessary, to maintain structural integrity.
- The acoustic barrier is continuous or is turned through appropriate angles away from the source at both ends to protect the receivers from the flanking sides.
- The City may approve the use of an acoustic gate on the development under consideration where the installation of the gate is advantageous in order to allow for access to a rear yard amenity area and a shortened length of acoustic barrier
- sufficient measures are to be taken to prevent drumming of the panels caused by wind or ground vibration.
- Where the use of a sound barrier is approved by the City, landscaping for aesthetic purposes will be required to the satisfaction of the City. This landscaping should include trees, shrubs and vines
- City policies pertaining to access to roads and transit systems must be fully considered as part of the barrier design.

3.2.2 Barrier Design

Location

An acoustic barrier wall and berm should be located entirely on the development under consideration; on the side of the property line which is on private property. Its location should be a minimum of 0.3m from the City right-of-way. The location of the acoustic barrier wall should take into account requirements for future roadway widening.

Under exceptional cases, the City may accept a portion of the berm on the City or railway company right-of-way subject to acceptance and approval by the authorities having jurisdiction prior to making any commitment to this effect. The design of the berm could be affected by future roadway widening. The proponent and/or their Consultants should prepare the necessary details related to the berm design and address all matters of concern such as compaction, grade elevations, drainage, safety, cover and landscaping, side slopes, maintenance,…etc.

In all cases, the acoustic barrier wall should be located in an approved location relative to the berm. Only in exceptional cases, the portion of the berm facing the road transportation facility on private property may have to be dedicated to the City at no cost where requested by the City.
Where a barrier is required, the receptors should be located within its acoustical “shadow zone”.

For roadways and bus Transitways, the acoustic barrier shall be located to conform to the ultimate roadway width and cross section to prevent future barrier relocation.

Information on acoustic barriers, berms and berm/wall combinations must include location and height of the barrier relative to final grade.

Height

The maximum height of berm/barrier allowed is to be determined in each case by the City.
The minimum acceptable barrier wall height is 2.2m for a flat grade case. In all cases, the acoustic barrier wall for new development should not exceed 2.5m in height unless approved by the City.

Should the result of the analysis indicate the need for a barrier up to 2.2m high to protect the Outdoor Living Area, there is no need to consider the use of an additional setback to accommodate the planned acoustic barrier. For situations where the barrier wall height exceeds 2.2m additional setbacks will apply (see berm setbacks below).

In general, the maximum combined barrier height (i.e. berm and wall) above the road or bus Transitway centre line or the ground-oriented Outdoor Living Area should be 4.5m. Otherwise, the proponent should investigate other lot grading possibilities. For railway corridors, the minimum acceptable heights of the berm-wall combination should be consistent with the railway requirements for noise and safety.

The acoustic barrier system design should provide details of methods and materials to be used to accommodate varying wall heights above the top of footing.

Berm Design

For single family, detached or semi-detached and townhouse residential development, a minimum of 6.0m depth of a relatively flat rear yard is required as measured from the rear face of the building and containing no slope in excess of 4%.

For roadway and bus Transitways, a maximum slope of 3:1 will be required for any earth-work (i.e. berm) adjacent to the boulevard. Slopes steeper than 3:1 will be tolerated on the lot side of the earthwork by the use of retaining walls, where accepted by the City for drainage and landscaping (the 3:1 ratio on the lot side may only be modified at the discretion of the City). For railways, the slope on the railway side should be 2.5:1.

In cases where the attenuation facility is interrupted, barrier returns or parallel screens may be required and the detailed design and calculations of the treatment in such cases will have to be incorporated into the acoustical report. The report and the grading plan must include a detailed plan and appropriate cross sections of such cases.

Berm setbacks

The following table provides guidance on the additional setbacks required to accommodate a base berm and a wall on top of the berm. The berm must be placed entirely within the property line of the proposed development. The City will not accept any berming on its r.o.w. Maintenance of the barrier, including the side facing the road, is the responsibility of the property owner. Additional setbacks required for berms

BERM HEIGHT	ADDITIONAL SETBACK
0.5m	3.5m
1.0m	6.5m
1.5m	9.5m
2.0m	12.5m
2.5m	15.5m

3.4 Materials

3.4.1 Material - General

Type and surface density of the barrier should be specified and the manufacturer and/or supplier described, if known. The City recommends that the barrier design parameters be similar to those developed by the City with respect to structural specifications, wind loading, footing design, reinforcement, rust protection, warranty requirements,…etc.

Acoustic barriers should have the following general characteristics:

- Have no holes or gaps.
- the manufacturer should demonstrate to the City that the material has a minimum predicted maintenance free lifespan of 20 years.
- Provide the desired minimum sound level reduction and protect all receiver locations (3m from building face closest to transportation facility) subject to the guidelines.
- All materials should have a flame spread classification less than, or equal to, 140 and smoke developed classification less than, or equal to, 180 when tested in accordance with the ULC standards.
- Be generally resistant to graffiti or include a graffiti resistance coating conforming to relevant ASTM standards

3.4.2 Material – Metal

- Metal and non-metallic components of acoustic barrier systems, including their performance, such as corrosion and weathering, to be in accordance with the applicable CSA, ASTM, CAN/L1LC, ULC, CSA/CAN and ANSI standards.

- Coatings refer to all paints, stains and laminates. All coated components to be rated for accelerated weathering. All coated steel components to be resistant to corrosion.
- Components which are hot dip galvanized, or coated with a polyvinyl chloride (PVC) plastisol using an epoxy primer using no adhesives for bonding, need not have accelerated weathering test data
- All steel reinforcing to be free from rust, scale, or other substances, that will prevent bonding.
- All reinforcing bars should be epoxy coated, conforming to ASTM Standards. The concrete cover over the steel reinforcing should in no case be less than 50mm.
- All bare metal components to be either fabricated of nonferrous materials, or hot dip galvanized after fabrication.
- Steel panels, exposed to traffic and snow removal operations, to be minimum nominal 0.91 mm galvanized steel (20 gauge). All other panels to be of minimum nominal 0.76 mm galvanized steel (22 gauge). All steel sheeting components to be coated with a material meeting the requirements of this standard.
- Acceptable products include galvanized panels and then coated with an organic polyvinyl chloride (PVC) plastisol using an epoxy primer using no adhesives for bonding. The coating system thickness must be 200 um on the surfaces exposed to traffic and snow removal operations, and 100 um thick on all other panel surfaces.
- Pop-rivets shall be either aluminum, with an aluminum mandrel, or aluminum, with a stainless steel mandrel.
- Other composites or metal panels, such as aluminum, may be used as panels for sound barriers, provided that such products are corrosion resistant and meet the acoustic and other performance criteria in this document.

3.4.3 Material – Concrete, Brick, Granular

- All granular materials shall be free from deleterious materials, debris and organic materials. When used, it shall be compacted to 98% of Standard Proctor Dry Density .

3.4.4 Material -Wood

For wooden acoustic barriers, the following are the minimum acceptable features to qualify as an acceptable acoustic barrier system:

- All wood products to be made out of graded lumber (conforming to National Lumber Grading Association or Standard Grading Rules of Canadian Lumber 2000) and to be either naturally resistant to decay for a minimum of 20 years, or to be pressure treated. The panel must be composed of tightly fitted wood boards so as to avoid warping, splitting and loosening of particles, knots and imperfections. All boards must be tightly butted and secured.

- All wood shall be selected for good appearance and free of defects and large/heavy knots. In addition, all torn grain and surface stains shall be eliminated by appropriate surface refinishing.

- All skirts, coming in contact with the ground/soil, shall be pressure treated with finished cut edges treated or protected from moisture penetration, and to be buried 100 to 150mm below the finished ground level.
- All exposed panels to be dressed with beveled edges on both sides.
- All wooden posts (metal posts are also acceptable) to have minimum dimensions of 140 x 140mm, or larger, as required by the governing code, dressed to pattern.
- Double posts are required on all directional changes greater than 20°.
- Install coping on top of panels using one piece wood (or other acceptable metal products)
- The use of decorative elements such as pilasters, curved (scalloped) top rail, post caps, wood designs, etc. is preferable. In all cases, the decorative elements should not affect the minimum barrier height requirements, the density, or any other acoustic/structural requirements.
- Wood, and/or metal frames, to be used to support the wood panels in place, and to be designed to allow expansion/contraction of the wood panels/elements, and for making the necessary field adjustments, where required.
- All metal components, if any, used in a wooden sound barrier to conform to the metal or steel component specifications in this document.
- The use of board-on-board panels to meet the stated density/acoustic criteria is acceptable provided that the boards are thoroughly secured. In addition, board-on-board panels shall have tightly butted joints that are staggered, with provision to allow for expansion/contraction, and for making the necessary field adjustments (e.g. for tightening up of developed gaps), where required.
- The use of Tongue and Groove, and V-joints for joining panels is acceptable provided that the tongue or V -joint extent is not less than 19mm (3/4") long.
- Nails, and other fastening devices, must be either hot dip galvanized steel, or made of nonferrous or stainless steel.
- When there is ground contact with wood, the wood must be pressure treated and cut ends to be treated also, or protected from moisture penetration.

3.5 Acoustic Characteristics

3.5.1 Sound Transmission Class

Acoustic barriers should have one or more of the following acoustic characteristics:

- The Sound Transmission Class (STC) of the panel material to be 20, or greater, when tested in accordance with ASTM-E90 (a test report to be submitted for approval).
- The Sound Transmission Class (STC) of the panel material has historically been demonstrated to be 30 or greater.
- Surface mass density not less than 20 kg/sq. m (4 lbs/sq.ft.) in order to ensure that the sound component transmitted through the barrier material is at least 10 dB below the sound component diffracted across the top of the barrier.

3.5.2 Sound Absorption

If the acoustic barrier system is specified by the Acoustical Consultant to be sound absorptive, the average Noise Reduction Coefficient (NRC) shall be not less than 0.70 (70%). Sound absorptive materials used to fill cavities in double walled acoustic barrier systems, to increase sound absorption, shall be semi-rigid type.

If the acoustic barrier system is specified by the Acoustical Consultant to be sound absorptive, the barrier panels should be tested to determine the Noise Reduction Coefficient (NRC) in accordance with ASTM-C423. A panel or an assembly of panels should be tested, as required, in accordance with the ASTM Procedures for free-standing screens.

The use of alternate methods of providing the necessary sound absorptive qualities by a barrier system should be subject to special approval by the City based on qualified technical data to be submitted by the proponent. This may include the use of double walled acoustic barrier panels (sandwich construction with perforated facing) or the use of substantial landscaping designs along the barrier faces by a Landscape Architect.

4.0 Installation and Construction

All work and acoustic barrier materials for specific installations are subject to field certification by the design professionals to ensure adherence to the requirements in this specification.
All materials delivered to the construction site should be visually inspected by the owner, and/or their representative, for proper dimensions, cracks, voids, surface defects, inconsistency in colour and texture, and any other damage or imperfections.

4.1 Height and Alignment

The acoustic barrier to be constructed to the height and alignment as specified by the Acoustical Consultant. The minimum specified height of the acoustic barrier to be maintained at all times.

4.2 Footings, Posts And Panels

The foundation, footing and post design, shall meet the objective of constructing a durable sound barrier that meets or exceeds the objectives of this document of a 20-year life expectancy and the set minimum guarantee of 5 years for material and installation of the acoustic barrier system.

4.2.1 Footings

The footing shall be founded on undisturbed soil at the design embedment length as required but shall be minimum below freezing depth of the area. The founding surface shall be confirmed by a Geotechnical Engineer. All the soft spots to be removed and bottom of the footing protected from freezing. In case of solid rock encountered at a depth less than the freezing depth, foundation shall be carried minimum 300mm in the rock.

The concrete of footing shall be as follows:

1. Minimum 28 days compressive strength to be 20 Mpa
2. Ready mix concrete or site mix concrete to confirm CSA-A23.2
3. All site placed concrete to be protected from freezing and to be protected in excessive summer temperature from drying.
4. The concrete in the footing shall be cured for a minimum period of 5 days before the installation of panels.

Footing In Earth

If drilled footing is used, it shall be cast entirely against undisturbed soil. Footing other than drilled caisson to be formed and the excavation shall be backfilled with granular material. The backfilled material to be compacted to 98% Standard Proctor Dry Density of the granular material.

Footing In Rock

When rock is encountered within the excavation depth of the footing, the footing depth to be embedded minimum 300 mm into the solid rock.

All excavation into rock shall be back filled entirely with concrete. The excavation above the top of rock may be formed to the required dimensions and the remainder of the excavation backfilled with granular materials.

4.2.3 Post

The barrier shall be constructed to the line and grades specified with the tolerance of ± 10mm. The post shall be plumb within a tolerance of ± 10mm in 5m. In all cases for wood posts, the minimum dimension shall be 150mm square.

4.2.4 Panels

The profile of the barrier shall be installed to match the ground profile up to the maximum grade specified on the drawings. To accommodate ground profiles greater than the maximum grade, the barrier shall be stepped in accordance with manufacturer's recommendations.

4.3 Site Grading and Preparation

Earth grading and berm construction associated with the barrier installation shall be completed to within 25mm of the proposed elevation of the bottom of the barrier. Grading shall be completed and approved prior to construction of the barrier footings.

To prevent openings from occurring under the barrier an additional timber, not less than 5mm x 20mm in section, shall be securely fastened horizontally to the bottom of the barrier, and shall extend the full width of each barrier panel between adjacent vertical posts. This additional timber shall be buried to a depth equal to one-half its width during the final grading operation. Earth and pavement grading shall be sloped at a minimum of 2% and a maximum of 50% away from the barrier.

Frozen earth shall not be used for embankment. Where imported fill is required for backfill or for minor grading, the fill material should be comprised of granular material, select sub-grade material, or other approved fill and to be compacted to at least 98% Standard Proctor Maximum Dry Density (SPMDD). All graded earth to be compacted to at least 98% Standard Proctor Dry Density.

The earth area surrounding the barrier wall shall be sloped away in order to prevent water ponding and water filtration to the barrier footings.

Changes in alignment to occur at the posts, by suitable means, to avoid acoustical degradation.

4.3.1 Masonry Walls

Masonry walls to be installed in accordance with the requirements of AASHTO Guide Specifications for Structural Design of Sound Barriers.

Bricks to be installed on a suitable foundation not less than 500 mm above the final ground line.
The top row of all masonry walls and posts to be protected with coping and/or flashing.

4.3.2 Fire Hydrant Access

When the installation of a acoustic barrier interferes with the access to existing, or proposed fire hydrants, the acoustic barrier installation should include fire hose access openings and associated identification signs. Location and demand for these openings to be established in cooperation with the local fire department.

4.3.3 Overhead High Voltage Lines

Where the potential of arcing exists, due to the close proximity of existing overhead high voltage lines, each metal panel and girt must be grounded in accordance with the local Hydro/Utility company.

4.4 Installation

4.4.1 Proponent Responsibilities

- Site preparation and grading
- Foundations
- Delivery, handling, storage and protection
- Erection / installation of acoustic barrier
- Clean up
- Testing, inspection and quality assurance

An Initial Certification by the proponent's Project Engineer is to be prepared and submitted to the City following completion of the project.

4.4.2 Guarantee and Maintenance Period

The material and installation of the acoustic barrier system, including landscaping materials, is to be guaranteed for a minimum period of five (5) years from the date of the initial Certification and Performance Acceptance. A Letter of Credit in the amount of 15% of the sound barrier total cost shall be deposited with the City to cover the warranty.

After 3 years from Certification, an inspection is to be carried out by the proponent's Engineer with a report to be submitted to the City. Any components which exhibit defects that are likely to affect the longevity of the barrier shall be replaced and/or repaired by the proponent.

To obtain release of the noted Letter of Credit, a final unconditional warranty inspection shall be prepared by the proponent's Engineer after five (5) years from the date of original Initial Certification and Performance Acceptance of the barrier to certify that there are no deficiencies of any component of the barrier system; this includes but is not necessarily limited to grading, berm, posts, panels, landscape materials and soil condition.

PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

Part 6:
PRESCRIBED MEASURES FOR AIRCRAFT NOISE

January 2016

Contents

Tables

1.0 Introduction

The following are the prescribed measures to mitigate the impact of aircraft noise on residential communities proposed between the 25 NEF/NEP and the OAOIZ have been prepared for the guidance of landowners and residential developers and builders, for implementation by the City. These measures include the components of building design necessary to meet the Ministry of Environment and Energy's indoor noise criteria for aircraft noise (LU131 dated October 1997); the ventilation requirements; and the warning clause required to address aircraft noise. The prescribed measures pertain to typically built track housing in this Region, for low to mid-rise residential units. They may be used for residential development of this nature, in lieu of an aircraft noise study. If the prescribed measures are selected as the mechanism for addressing aircraft noise, they will apply to all residential units between the 25 NEF/NEP and the OAIOZ, regardless of the contour location. They are based on the minimum requirements for the 30 NEF/NEP contours.

The developer/builder may opt to conduct an aircraft noise impact assessment rather than following the measures outlined herein.

The prescribed measures do not apply to high-rise apartment type dwellings, nor to other noise-sensitive development such as schools, hospitals, homes for the aged, or other such similar facilities. The prescribed measures are not to be used for commercial development or for any potential infilling of residential land use within the OAOIZ. In the above-noted cases, approval of the proposed development would be conditional to the completion of an aircraft noise study to determine the requirements on a case by case basis.

It is the responsibility of the landowner/developer/builder to ensure compliance with the prescribed measures. Where there is any deviation from the assumptions used to calculate the acoustical building components identified (for example, an increase in the ratio of window area to total floor area, or exterior wall to floor area) or if changes are proposed to the prescribed measures, a reassessment of building components is necessary, as well as certification by a qualified acoustical consultant demonstrating compliance with the Ministry of Environment and Energy's indoor noise criteria for aircraft noise (LU131, dated October 1997). These measures are to be used in relation to aircraft noise associated with flyover activities. A separate assessment may be required for ground based noise, depending on the location of the proposed development in relation to the Airport.
If the proposed development is potentially affected by other noise sources (road and/or rail), a separate assessment must be conducted to determine the combined impact and the noise attenuation features required in building design.

2.0 Building Components

Table 2.0a Exterior Wall Components

	Percentage of Exterior Wall Area to Total Floor Area of Room (% maximum)
• 12.7 mm gypsum board; • vapour barrier; • 38 mm x 139 mm studs at 400 mm o.c.; • Batt or blown insulation in the inter-stud cavities; • 7.9 mm exterior sheathing; • building paper; • wood siding; vinyl siding; or metal siding with fibre backer board; or 20 mm stucco.	Bedrooms (110 %) Living / Dining (150%)
or	
With the same exterior wall construction and the mounting of the interior gypsum board on resilient chips/channels, the percentage of exterior wall area to floor area can be increased	All Rooms (160%)

Table 2.0b Window and Patio Door Components

	Percentage of Window Area to Total Floor Area of Room (% maximum)
Double-glazed, well-fitted, weather-stripped units with dimensions to fit 25 mm [i.e. 4 (16) 4; 6 (13) 6]	Bedrooms (16 %)
4 (16) 4 = 4 mm glass, 16 mm space, 4 mm glass.	Living / Dining (40%)

Table 2.0b Window and Patio Door Components

	Percentage of Window Area to Total Floor Area of Room (% maximum)
Double-glazed, well-fitted, weather-stripped units with dimensions to fit 25 min [i.e. 3 (16) 6].	Bedrooms (20 %) Living / Dining (50%)

Family rooms, breakfast nooks and similar rooms are included in the living-dining classification for the purpose of window/patio doors.

If the percentage of window area to floor area is to exceed 20 in the case of bedrooms, and/or 50 in the case of dining and/or living rooms, a certification from the acoustical consultant will be required.

Table 2.0c Roof and Ceiling Components

- asphalt shingles;
- sheathing;
- typical (pre-engineered) wood trusses at 600 mm o.c. with ventilated attic;
- 75 mm (or thicker) batts/blown insulation;
- vapour barrier;
- 12.7 gypsum board.

Table 2.0d Exterior Door Components

- 44 mm steel door with foam or glass fibre/polyurethane insulated core (dining-living rooms) with unlimited glazing; or
- 44 mm glass fibre reinforced plastic door with foam or glass fibre insulated core (up to 20% of area glazed) (kitchens).

3.0 Ventilation Requirements

Forced air heating system with the fans, ducts, etc. sized to accommodate the installation of a central air conditioning system.

4.0 Implementation

The building components and details regarding ventilation must be clearly identified on the drawings/plans submitted to the municipalities at the time of application for building permits. Certification by a registered architect and/or a professional engineer of compliance with the Prescribed Measures is required.

The warning clause will be included in all subdivision agreements and/or development agreements, and all Offers of Purchase and Sale and/or lease agreements.

5.0 Warning Clauses

Aircraft warning clauses are required for all development within the Airport Vicinity Development Zone and in the Carp and Rockcliffe Airport areas. In addition the City may consider addition of a warning clause to any other lands in the city. The following warning clauses are to be uses as the basis for warning clauses in the areas noted in Table 5.0a below.

Table 5.0a Aircraft Noise Warning Clauses

Area	Example
Noise Sensitive Development outside of NEP 25 and within Airport Vicinity Development Zone	*Purchasers/tenants are advised that due to the proximity of the airport, noise from the airport and individual aircraft may at times interfere with outdoor or indoor activities.*

Table 5.0a Aircraft Noise Warning Clauses

Area	Example
And Non-noise sensitive development within the Airport Vicinity Development Zone	
Noise Sensitive Development: outside the AOIZ but within NEP 25; or within the Carp or Rockcliffe Airport areas and outside of the AOIZ boundary	*Purchasers/building occupants are forewarned that this property/dwelling unit is located in a noise sensitive area due to its proximity to Ottawa Macdonald-Cartier International Airport / Carp / Rockcliffe Airport.* *In order to reduce the impact of aircraft noise in the indoor spaces, the unit has been designed and built to meet provincial standards for noise control by the use of components and building systems that provide sound attenuation. In addition to the building components (i.e. walls, windows, doors, ceiling-roof), since the benefit of sound attenuation is lost when windows or doors are left open, this unit has been fitted with a forced air heating system, all components of which are sized to accommodate the future installation of central air conditioning-by the owner/occupant.* *Despite the inclusion of noise control features within the dwelling unit, noise due to aircraft operations may continue to interfere with some indoor activities and with outdoor activities, particularly during the summer months. The purchaser/building occupant is further advised that the Airport is open and operates 24 hours a day, and that changes to operations or expansion of the airport facilities, including the construction of new runways, may affect the living environment of the residents of this property/area.* *The Ottawa Macdonald-Cartier International Airport Authority, its acoustical consultants and the City of Ottawa are not responsible if, regardless of the implementation of noise control features, the purchaser/occupant of this dwelling finds that the indoor and/or outdoor noise levels due to aircraft operations are of or are offensive.*
Noise Sensitive Development between AOIZ boundary and NEP 35 contour	*Purchasers/building occupants are forewarned that this property/dwelling unit is located in a noise sensitive area due to its proximity to Ottawa Macdonald-Cartier International Airport.* *In order to reduce the impact of aircraft noise in the indoor spaces, the unit has been designed and built to meet provincial standards for noise control by the use of components and building systems that provide sound attenuation. In addition to the building components (i.e. walls, windows, doors, ceiling-roof), since the benefit of sound attenuation is lost when windows or doors are left open, this unit has been fitted with a forced air heating system, all components of which are sized to accommodate the future installation of central air conditioning-by the*

Table 5.0a Aircraft Noise Warning Clauses

Area	Example
	owner/occupant. *Despite the inclusion of noise control features within the dwelling unit, noise due to aircraft operations may continue to interfere with some indoor activities and with outdoor activities, particularly during the summer months. The purchaser/building occupant is further advised that the Airport is open and operates 24 hours a day, and that changes to operations or expansion of the airport facilities, including the construction of new runways, may affect the living environment of the residents of this property/area.* *The Ottawa Macdonald-Cartier International Airport Authority, its acoustical consultants and the City of Ottawa are not responsible if, regardless of the implementation of noise control features, the purchaser/occupant of this dwelling finds that the indoor and/or outdoor noise levels due to aircraft operations are of concern or are offensive.*

PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

Part 7:
TECHNICAL REQUIREMENTS: ENVIRONMENTAL NOISE CONTROL STUDIES FOR SURFACE TRANSPORTATION PROJECTS

January 2016

This technical requirement document is a partial review of text of the May 10, 2006 City of Ottawa Environmental Noise Control Guidelines. This review was undertaken to address adjustments made by regulatory bodies (such as the Province of Ontario). This document will be subject to further review by the City's Infrastructure Services Department and revisions to ensure full compliance with the City's Standard Tender Documents and renewal policies.

Contents

1.0 Introduction

This document has been prepared, consistent with the Official Plan and the Provincial Policy Statement and the Environmental Protection Act, in order to protect the public from exposure to adverse effects due to environmental noise and to help maintain a healthy livable city.

The intent of this document is to provide directions for noise assessment during the planning, design and construction of surface transportation corridors. This document should be read in conjunction with Part 2 of the Environmental Noise Control Guidelines: Surface Transportation Projects. Projects completed under this reference include construction, reconstruction and widening of existing and new city roads and Transitways as well as Light Rail Transit systems in proximity to existing and future noise-sensitive land uses.

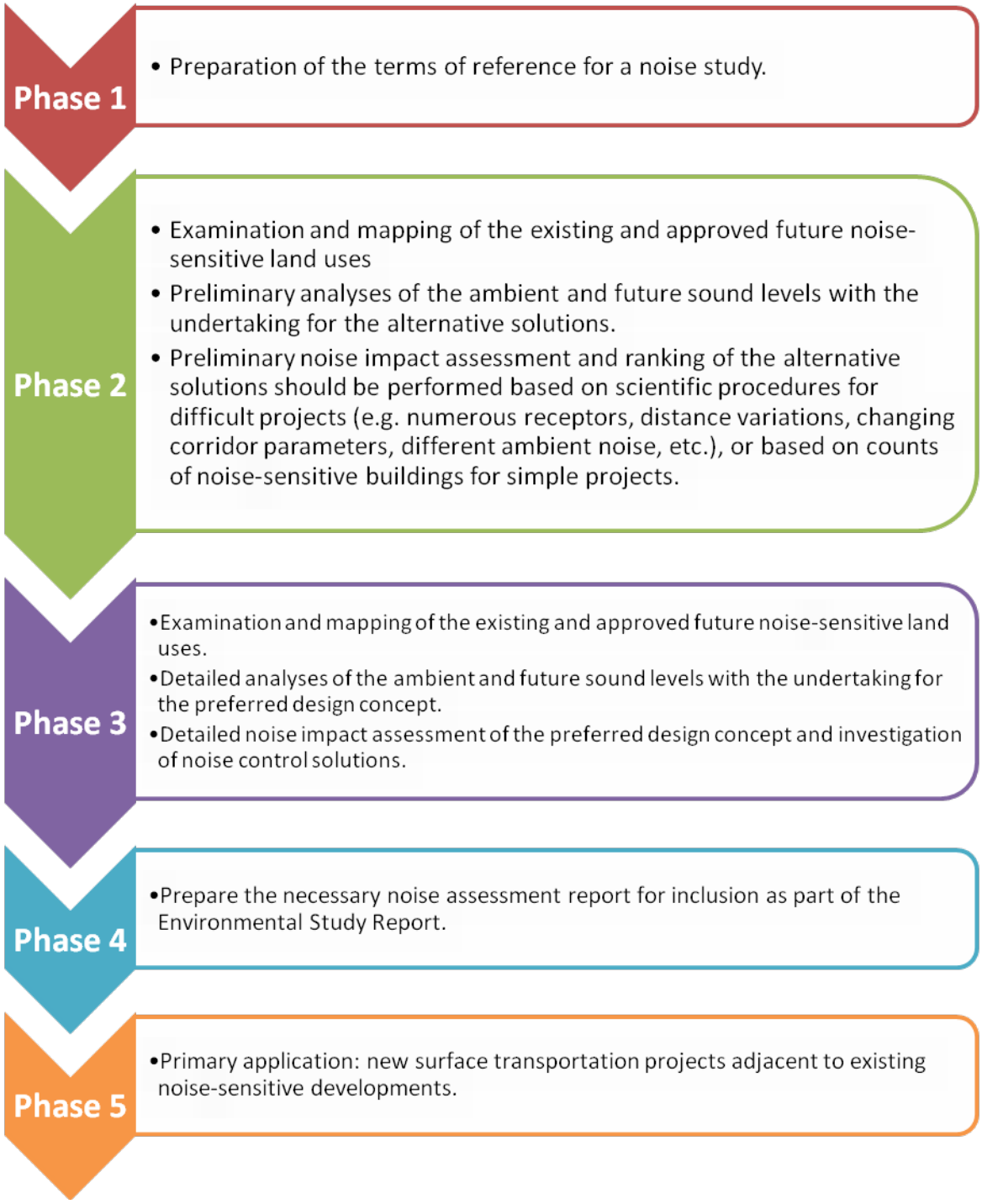
2.0 Noise Study Process for Surface Transportation Projects

In addition to the Ministry of Environment Guidelines for full Environmental Assessments, the Municipal Engineers' Association (MEA), in co-operation with other Provincial agencies has developed a guideline document to assist in the planning and design process for Class Environmental Assessment type municipal projects. The MEA document has been used extensively by the City of Ottawa and the Consulting Engineers when preparing City E.A.'s for roadway projects.

For environmental noise assessment purposes, it is expected that the same Class EA assessment process for road projects is also suitable for full assessments of Light Rail Transit (LRT) undertakings under the authority of the Environmental Assessment Act; the technical assessment procedures will remain unchanged.

The planning and design process for Class Environmental Assessment for Municipal Road Projects prepared by the Municipal Engineer's Association recommends several phases for undertaking the assessments. Some of the phases will have linkages with the noise assessment process for roadway and Transitway projects undertaken by the City of Ottawa. The following diagram summarizes the key elements of a noise assessment study of a typical surface transportation corridor project, which may be linked with the overall EA process:

Figure 1 Noise Study Process - Surface Transportation Projects



Documentation of the above noted phases of a noise assessment should closely follow that required by the Class EA process for each phase.

3.0 Study Requirements

Noise studies prepared for surface transportation projects will be prepared based on established Municipal Engineers Association (MEA) and City and Provincial guidelines, standards and procedures. This includes prediction methods such as that outlined in the Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT), Sound from Trains Environment Analysis Method (STEAM), or a computerized version such as STAMSON. All Environmental Noise studies must be prepared consistent with the methods described in this document and where applicable those described in NPC-300. Where there are other relevant documents, methods or criteria these should be referenced in the noise study. The noise study report must note any variations or exceptions to Provincial or City criteria or methods.

A primary requirement of every noise study is that it be prepared by a qualified Professional Engineer with experience in acoustical engineering and noise studies as defined by the Ontario Society of Professional Engineers.

In the course of preparation of a noise study for surface transportation projects information on existing development applications and approved development in proximity to the proposed City Road and/or Transitway undertaking must be reviewed. The information should include:

- copies of the relevant plans;
- status of approvals by the approval authorities;
- existing or proposed grade elevations of the proposed development;
- copies of noise study reports that may have been submitted by the proponent to the approval authorities; and
- other relevant information such as that found in the City's Development Application Search web tool.

Of particular interest is information such as the road and traffic data used by the proponent and/or their consultants, predicted sound levels and their recommended noise control measures. The results of the information review should be compared with the relevant technical details related to noise assessment of the subject undertaking. Differences or inconsistencies, if any, should be noted and reported.

The City should be advised of any discrepancies in the resulting sound levels and the extent of noise mitigation for both the development side and the subject undertaking.
Actual field measurements may be used subject to City of Ottawa's prior approval to deal with situations that may not be feasible to predict such as:

- unusual traffic patterns or the presence of high percentages of vehicle classifications beyond those reported by the City.
- traffic or corridor parameters that are outside of the limitations of the prediction model;
- downtown core areas;
- presence of large reflecting buildings in dense urban areas;
- highly irregular topography;
- the presence of other stationary sources of noise; and,
- the presence of complicated geometrics for calculation purposes.

Actual field measurements, if deemed necessary, are to be performed in accordance with the MOE procedures and generally accepted acoustic and traffic engineering principles.

The following points should also be considered:

- To determine the noise impact from a City Road or a Transitway, for each route alternative the smallest study area should be defined using one or more of the following methods:
    - using 5 dBA contour lines extending from the source to a noise-sensitive area where there is no increase above the ambient sound level; or,
    - a noise-sensitive area where there is no increase above the ambient sound level; or,
    - a perpendicular distance of 100m from the closest edge of pavement from arterial or collector roadway or Transitway r.o.w. (reference: Section 4.8.8 in the 2003 Official Plan).
    - 100 metres from LRT r.o.w.;
- The noise impact on noise-sensitive areas is to be determined for outdoor spaces;
- There is no minimum number for residences that define a noise sensitive area. Therefore, all noise sensitive land uses, regardless of size or location, are to be assessed for potential application of noise control measures;
- The ambient sound levels will be based on the expected road and traffic data at the commencement date of project construction;
- Future sound levels from the project will be based on traffic projections corresponding to the mature state of development designated in the City of Ottawa's Official Plan;
- Off right-of-way noise control measures and night-time (11:00 p.m. - 7:00 a.m.) assessment of the noise impact will not be considered as part of these City guidelines;

- Notwithstanding the criteria for mitigation and the warrants for sound barriers, additional mitigation may be recommended to rectify inconsistencies such as surface repairs, speed reduction and repairs to manholes/catch basins;
- For road reconstruction or expansion projects which have existing reverse frontage/flanking, noise abatement features will be considered as part of the public consultation process under the Environmental Assessment Act or the Planning Act. The noise abatement features will be designed to abate noise generated from the future traffic projections of the "Horizon Year" established by the City of Ottawa.
- Impact assessment ratings should be interpreted based as per applicable tables.