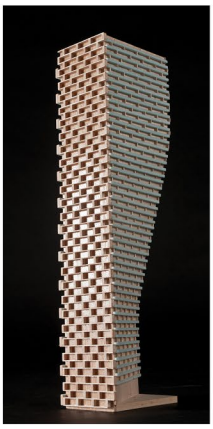
GRADIENTWIND
ENGINEERS & SCIENTISTS

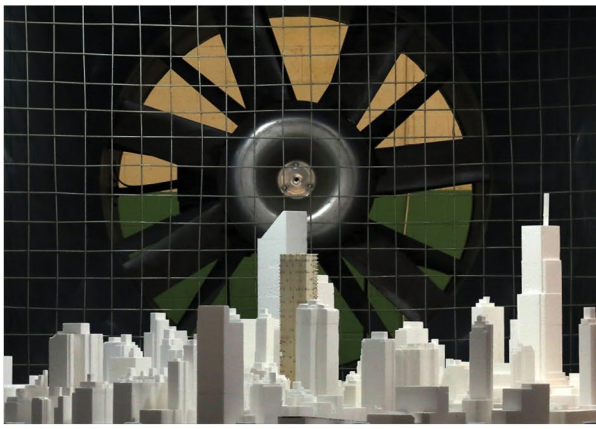
ENVIRONMENTAL NOISE ASSESSMENT

5205 King Street
Lincoln, Ontario

Report #: 24-125–Environmental Noise







November 18, 2024

PREPARED FOR

UrbanLink Developments (Beamsville) Ltd.
5-5205 King Street
Beamsville, ON L3J1P6

PREPARED BY

Efser Kara, MSc, LEED GA, Acoustic Scientist
Joshua Foster, P.Eng., Lead Engineer

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

EXECUTIVE SUMMARY

This report describes an environmental noise assessment undertaken for a proposed residential development located at 5205 King Street in Lincoln, Ontario. The proposed development comprises a 7-storey 'L' shaped mixed-use residential building (Building 1), a 6-storey rectangular mixed-use residential building (Building 2), and a 2-storey amenity building. The major source of traffic noise impacting the residential subdivision is King Street.

This assessment also includes a stationary noise study investigating the noise impacts of the car repair shop, known as Uniroyal, located at 5249 King Street to the west of the study site.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) NPC-300 and Ministry of Transportation Ontario (MTO); (ii) future vehicular traffic volumes corresponding to roadway classification and theoretical maximum capacities of the roadways; (iii) Gradient Wind's experience to assess nearby stationary sources of noise; and (iv) site plan drawings provided by UrbanLink Developments (Beamsville) Ltd. in October 2024.

The results of the current analysis indicate that noise levels will range between59 and 65 dBA during the daytime period (07:00-23:00) and between 51 and 59 dBA during the nighttime period (23:00-07:00) at Plane of Window (POW) receptors. The highest noise level (65 dBA) occurs at the south façades of Blocks 1 and 2, which are directly exposed to the noise generated by King Street. Noise contours for the roadway traffic noise calculations are shown in Figures 4 and 5 for the daytime and nighttime periods, respectively.

As the noise levels do not exceed 65 dBA criterion of NPC-300 at Plane of Window (POW) receptors, OBC compliant exterior building components will be sufficient for the development. The results of the analysis showed that forced air heating with provision for central air conditioning will be required for the development. However, it is anticipated a central air conditioning, or a similar mechanical system, will be provided in Buildings 1 and 2. The proposed mechanical system would be required to comply with MECP's Publication NPC-216 Residential Air Conditioning Devices. Therefore, a Type D warning clause will be required on all Lease, Purchase and Sale Agreements as summarized in Section 9.

The noise levels at the Outdoor Living Areas (OLA) of the development will be below NPC-300 criterion of 60 dBA. Therefore, mitigation measures are not required for these areas, however since noise levels are above 55 dBA, a Type A warning clause will be required on all Lease, Purchase and Sale Agreements as summarized in Section 9.

The noise levels due to nearby commercial facilities (existing stationary noise sources) will be compliant with the NPC-300 exclusionary limits at the façades of the development. However, given the proximity to existing commercial facilities, a Type E Warning Clause is recommended on all purchase, sale, and lease agreements, as summarized in Section 9. It should be noted that under NPC-300 guidelines, noise sources associated with agricultural activities are exempt form the requirements of the noise guidelines. Therefore, the existing winery and farms opposite the development along Kings Street were considered insignificant sources of noise.

The stationary noise impacts from the proposed development on the surroundings can generally be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be incorporated into the design. It is recommended to place the large mechanical equipment away from noise-sensitive areas.

TABLE OF CONTENTS

1. INTRODUCTION 1

2. TERMS OF REFERENCE 1

3. OBJECTIVES 3

4. METHODOLOGY 3

4.1 Background 3

5. ROADWAY TRAFFIC NOISE 3

5.1 Criteria for Roadway Traffic Noise 3

5.2 Theoretical Roadway Noise Predictions 5

5.3 Roadway Traffic Volumes 6

6. Stationary Noise 6

6.1 Stationary Noise Source Assessment and Criteria 6

6.2 Stationary Noise Sources Impacting the Proposed Development 7

6.3 Stationary Noise Assessment Assumptions 7

7. ROADWAY TRAFFIC NOISE RESULTS 8

7.1 Roadway Traffic Noise Levels 8

8. STATIONARY NOISE IMPACT ASSESSMENT CONCLUSION 9

9. CONCLUSIONS AND RECOMMENDATIONS 9

FIGURES

APPENDICES

Appendix A: Stationary Noise Calculations

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by UrbanLink Developments (Beamsville) Ltd. to undertake an environmental noise assessment for a proposed development located at 5205 King Street in Lincoln, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise levels generated by local roadway traffic and stationary noise sources.

This assessment is based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP) NPC-300[1], and the Ministry of Transportation Ontario (MTO)[2] guidelines. Noise calculations were based on site plan drawings provided by UrbanLink Developments (Beamsville) Ltd. in October 2024, with future traffic volumes corresponding to roadway classification and theoretical roadway capacities, and recent satellite imagery. Stationary noise levels of the car repair shop at 5249 King Street based on Gradient Wind's previous experience and measurements conducted for a similar facility for other projects.

2. TERMS OF REFERENCE

The focus of this environmental noise assessment is a proposed residential development located at 5205 King Steet in Beamsville in the Town of Lincoln. The proposed subdivision is located on a nominally L-shaped parcel of land.

The subject site is located at 5205 King Steet in Lincoln, to the northwest of the intersection of King Street East and Lincoln Avenue. The proposed development comprises a 7-storey 'L' shaped mixed-use residential building (Building 1), a 6-storey rectangular mixed-use residential building (Building 2), and a 2-storey amenity building.

[1] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guideline, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013
[2] Ministry of Transportation Ontario, "*Environmental Guide for Noise*", February 2022

The proposed development includes one level of underground parking, with access points located at the northwest corner of the site and to the north of Building 2. At the P1 Parking floor, the 2-storey amenity building features a gym, lobby space and access to the exterior pool located to the north. An exterior amenity area is located in the northern portion of the site. The ground floor includes retail and market space along the south elevation of Building 1 and restaurant area to the east. The northern façade includes additional retail space, building service/garbage areas, and a vestibule. The remaining of the ground floor of Building 1 is reserved for residential use. Building 2 includes retail and restaurant space to the south, an outdoor patio to the east and residential space to the north.

An access driveway provides access from King Street, running between Buildings 1 and 2 connecting to the surface parking lot and drop off area located to the north of Building 1. The surface parking lot to the north of Building 2 is accessible from Lincoln Avenue. The remaining floors of both buildings are reserved for residential use, with outdoor amenities included at the rooftop level.

There are no associated outdoor living areas (OLA) with the development. Balconies or private terraces having less than 4 metres in depth are not considered OLA, as per the NPC-300. Figure 2 shows the location of all receptors used in this study.

The subject site is surrounded by low-rise residential dwellings from the north clockwise to the southeast with a low-rise restaurant with surface parking lot to the southeast and disperse low-rise buildings and green spaces in the remaining directions.

Gradient Wind considered all relevant noise sources affecting the site, such as roadway traffic noise and stationary noise. The major source of traffic noise impacting the residential subdivision is King Street to the south. A car repair/tires shop located at 5249 King Street to the west of the study site. A winery is located to the south of the study site, across King Street. The stationary noise impacts on the development from the car repair shop is assessed in this study. The winery located across the study site was not assessed as a stationary noise source as NPC-300 does not apply to the stationary sources associated with agricultural operations during the course of normal farm practice. Figure 1 illustrates the site location with the surrounding context.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study buildings produced by local roadway traffic, (ii) calculate stationary noise impacts on the proposed development generated by the car repair shop located at 5249 King Street, and (iii) ensure that interior and exterior noise levels do not exceed the allowable limits specified by the Environmental Noise Guideline (NPC-300) of the Ministry of the Environment, Conservation and Parks (MECP) as outlined in Section 4.2 of this report.

4. METHODOLOGY

4.1 Background

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level (2×10^{-5} Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

5. ROADWAY TRAFFIC NOISE

5.1 Criteria for Roadway Traffic Noise

For surface roadway traffic noise, the equivalent sound energy level, L_{eq}, provides a measure of the time-varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time-varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. MECP's Environmental Noise Guideline (NPC-300) specifies that the recommended indoor noise limit range (that is relevant to this study) is 45 and 40 dBA for living rooms and sleeping quarters, respectively, as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD) [3]

Type of Space	Time Period	L_{eq} (dBA)
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50
Living/dining/den areas of **residences**, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	45
Sleeping quarters of hotels/motels	23:00 – 07:00	45
Sleeping quarters of **residences**, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[4]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[5]. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the need for having windows and doors closed, which triggers the need for forced air heating with provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, air conditioning will be required and building components will require higher levels of sound attenuation[6].

The sound level criterion for outdoor living areas (OLA) is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA but are less than 60 dBA, mitigation should be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion. Where noise levels exceed 60 dBA noise mitigation is required. If these measures are not provided, prospective purchasers or tenants should be informed of potential noise problems by a warning

[3] Adapted from NPC-300 – Table C-2
[4] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[5] MOECP, Environmental Noise Guideline, NPC 300 – Part C, Section 7.8
[6] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

clause. As per NPC-300, balconies or terraces, which are not defined as amenity areas and are not deeper than 4 metres, and parks are not considered as Outdoor Living Areas.

5.2 Theoretical Roadway Noise Predictions

The impact of transportation noise sources on the development was determined by computer modelling. Transportation noise source modelling is based on the software program *Predictor-Lima* which utilizes the United States Federal Highway Administration's Traffic Noise Model (TNM) to represent the roadway line sources. The TNM model has been accepted in the updated Environmental Guide for Noise of Ontario, 2022 by the Ministry of Transportation (MTO)[7]. The Ministry of Environment, Conservation and Parks has also adopted the TMN model as per their "Draft Guideline Noise Pollution Control Publications 306 (NPC-306)[8]. The *Predictor-Lima* computer program can represent three-dimensional surfaces and the first reflection of sound waves over a suitable spectrum for human hearing. A total of eleven receptor locations were identified around the site, as illustrated in Figure 2.

Roadway noise calculations were performed by treating each road segment as separate line sources of noise, and by using existing and proposed building locations as noise barriers. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per NPC-300 requirements for noise level predictions.
- The day/night split was taken to be 92% / 8% respectively for all streets.
- The Outdoor Living Area (OLA) receptor heights are taken to be 1.5 m above grade or above the walking surface of the related terrace.
- The ground surface was modelled as absorptive where grass and foliage (soft ground) are present, and as reflective where pavement and concrete are present (hard ground).
- The study site was treated as having flat or gently sloping topography.
- Massing associated with the study site were included as potential noise-screening elements.
- A car repair shop is located at 5249 King Street, the stationary noise impact from the shop is also assessed in this study.

[7] Ministry of Transportation Ontario, "*Environmental Guide for Noise*", February 2022
[8] Ministry of Environment, Conservation and Parks, Ontario, "Methods to determine Sound Levels Due to Road and Rail Traffic", Draft February 12, 2020

- Eleven (11) receptors were strategically placed throughout the subject site. The receptor locations are described in Table 5 and illustrated in Figure 2.

5.3 Roadway Traffic Volumes

The NPC-300 dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications and the theoretical roadway capacities for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
King Street	2-Lane Urban Arterial	60	**15,000**

6. STATIONARY NOISE

6.1 Stationary Noise Source Assessment and Criteria

The equivalent sound energy level, L_{eq}, provides a weighted measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a selected period of time. For stationary sources, the L_{eq} is commonly calculated on an hourly interval, while for roadways, the L_{eq} is calculated on the basis of a 16-hour daytime/8-hour nighttime split.

Noise criteria taken from the NPC-300 apply to points of reception (POR). A POR is defined under the NPC-300 as "any location on a noise-sensitive land use where noise from a stationary source is received". A POR can be located on an existing or zoned for future use premises of permanent or seasonal residences, hotels/motels, nursing/retirement homes, rental residences, hospitals, campgrounds, and noise-sensitive buildings such as schools and daycares. As the site is bordered by an arterial road, the area is considered as a Class 1 area as per the NPC-300. The applicable sound level limit is the higher of the exclusionary limit outlined in Table 3, or background noise levels generated by other sources, such as roadway traffic. For this study, the sound level limits outlined in Table 3 were applied.

TABLE 3: EXCLUSIONARY LIMITS FOR CLASS 1 AREA

Time of Day	Outdoor Points of Reception	Plane of Window
07:00 – 19:00	50	50
19:00 – 23:00	50	50
23:00 – 07:00	N/A	45

6.2 Stationary Noise Sources Impacting the Proposed Development

The stationary noise levels of the car repair shop located at 5249 King Street, are based on Gradient Wind's previous experience and measurements conducted for a similar facility for another project. Table 4 summarizes the sound power levels used for the noise source in the analysis. Three repair shop doors were assumed in the assessment. Location of the stationary noise sources can be seen in Figure 3.

TABLE 4: STATIONARY NOISE SOURCES SOUND POWER LEVELS (DBA)

Source ID	Description	Dimensions of the Car Repair Shop Doors (m)	Number of Sources	Sound Power of Individual Sources (dBA ref 1 picowatt)	Total sound Power all Sources (dBA)
S1, 2, 3	Repair Shop Door	4x4*	3	86	91

6.3 Stationary Noise Assessment Assumptions

Besides the stationary noise source levels listed in Table 4. Calculations were conducted based on the assumptions listed below:

- The car repair shop was assumed to operate during the daytime and closed during the nighttime.
- The closest repair shop door was assumed to be directly impacting the development as a conservative approach.
- Repair shop door was assumed as a point source located at the centre of the door area (dimensions of the door are as shown in Table 4).
- The receptor was assumed to be Level 2 window ad 4.5 metres high.

7. ROADWAY TRAFFIC NOISE RESULTS

7.1 Roadway Traffic Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 5. The results of the current analysis indicate that noise levels will range between59 and 65 dBA during the daytime period (07:00-23:00) and between 51 and 59 dBA during the nighttime period (23:00-07:00) at Plane of Window (POW) receptors. The highest noise level (65 dBA) occurs at the south façades of Blocks 1 and 2, which are directly exposed to the noise generated by King Street. Noise contours for the roadway traffic noise calculations are shown in Figures 4 and 5 for the daytime and nighttime periods, respectively.

TABLE 5: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC SOURCES

Receptor ID	Receptor Type / Location	Receptor Height (m)	PREDICTOR-LIMA Noise Level (dBA)	
			Day	Night
R1	POW / Building 1 West Façade Level 7	22.5	59	51
R2	POW / Building 1 West Façade Level 7	22.5	62	55
R3	POW / Building 1 South Façade Level 7	19.5	65	58
R4	POW / Building 1 East Façade Level 7	19.5	59	51
R5	POW / Building 2 West Façade Level 6	19.5	61	54
R6	POW / Building 2 South Façade Level 6	19.5	65	59
R7	POW / Building 2 East Façade Level 6	19.5	61	54
R8	OLA / Building 1 Outdoor Rooftop Amenity	25.7	45	N/A*
R09	OLA / Building 2 Outdoor Rooftop Amenity	22.5	45	N/A*
R10	OLA / Building 2 Terrace (East)	13.1	58	N/A*
R11	OLA / At-grade Outdoor Amenity	1.5	39	N/A*

*As per NPC-300, noise levels at OLA during nighttime are not considered.

8. STATIONARY NOISE IMPACT ASSESSMENT CONCLUSION

The calculations on the impact of the car repair shop at 5249 King Street were conducted to determine the noise levels at the closest receptor on the façade of the proposed building. The calculations, which were performed based on the International Standards Organization (ISO) standard 9613 Parts 1 and 2, showed that the noise levels at the closes building façade from the car repair facility will be 50 dBA, compliant with NPC-300 exclusionary limits outlined in Table 3. The facility is not expected to operate during the evening or nighttime periods.

9. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between59 and 65 dBA during the daytime period (07:00-23:00) and between 51 and 59 dBA during the nighttime period (23:00-07:00) at Plane of Window (POW) receptors. The highest noise level (65 dBA) occurs at the south façades of Blocks 1 and 2, which are directly exposed to the noise generated by King Street. Noise contours for the roadway traffic noise calculations are shown in Figures 4 and 5 for the daytime and nighttime periods, respectively.

As the noise levels do not exceed 65 dBA criterion of NPC-300 at Plane of Window (POW) receptors, OBC compliant exterior building components will be sufficient for the development. The results of the analysis showed that forced air heating with provision for central air conditioning will be required for the development. However, it is anticipated a central air conditioning, or a similar mechanical system, will be provided in Buildings 1 and 2 of the development. The proposed mechanical system would be required to comply with MECP's Publication NPC-216 Residential Air Conditioning Devices. Therefore, a Type D warning clause will be required on all Lease, Purchase and Sale Agreements as summarized below:

Type D

> *"This dwelling unit has been supplied with a central air conditioning system 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 Municipality and the Ministry of the Environment."*

The noise levels at the Outdoor Living Areas (OLA) of the development will be below NPC-300 criterion of 60 dBA. Therefore, mitigation measures are not required for these areas. A Type A warning clause will be required on all Lease, Purchase and Sale Agreements as summarized below:

Type A

> *"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."*

The noise levels due to nearby commercial facilities (existing stationary noise sources) will be compliant with the NPC-300 exclusionary limits at the façades of the development. However, given the proximity to existing commercial facilities, a Type E Warning Clause is recommended on all purchase, sale, and lease agreements, as summarized below. It should be noted that under NPC-300 guidelines, noise sources associated with agricultural activities are exempt form the requirements of the noise guidelines. Therefore, the existing winery and farms opposite the development along Kings Street were considered insignificant sources of noise.

Type E

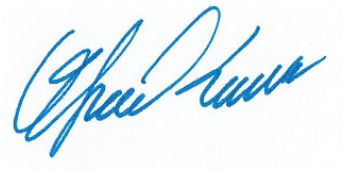
> *"Purchasers/tenants are advised that due to the proximity of the adjacent car repair shop, noise from the facility may at times be audible."*

The stationary noise impacts from the proposed development on the surroundings can generally be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be incorporated into the design. It is recommended to place the large mechanical equipment away from noise-sensitive areas.

This concludes our environmental noise assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

Gradient Wind Engineering Inc.

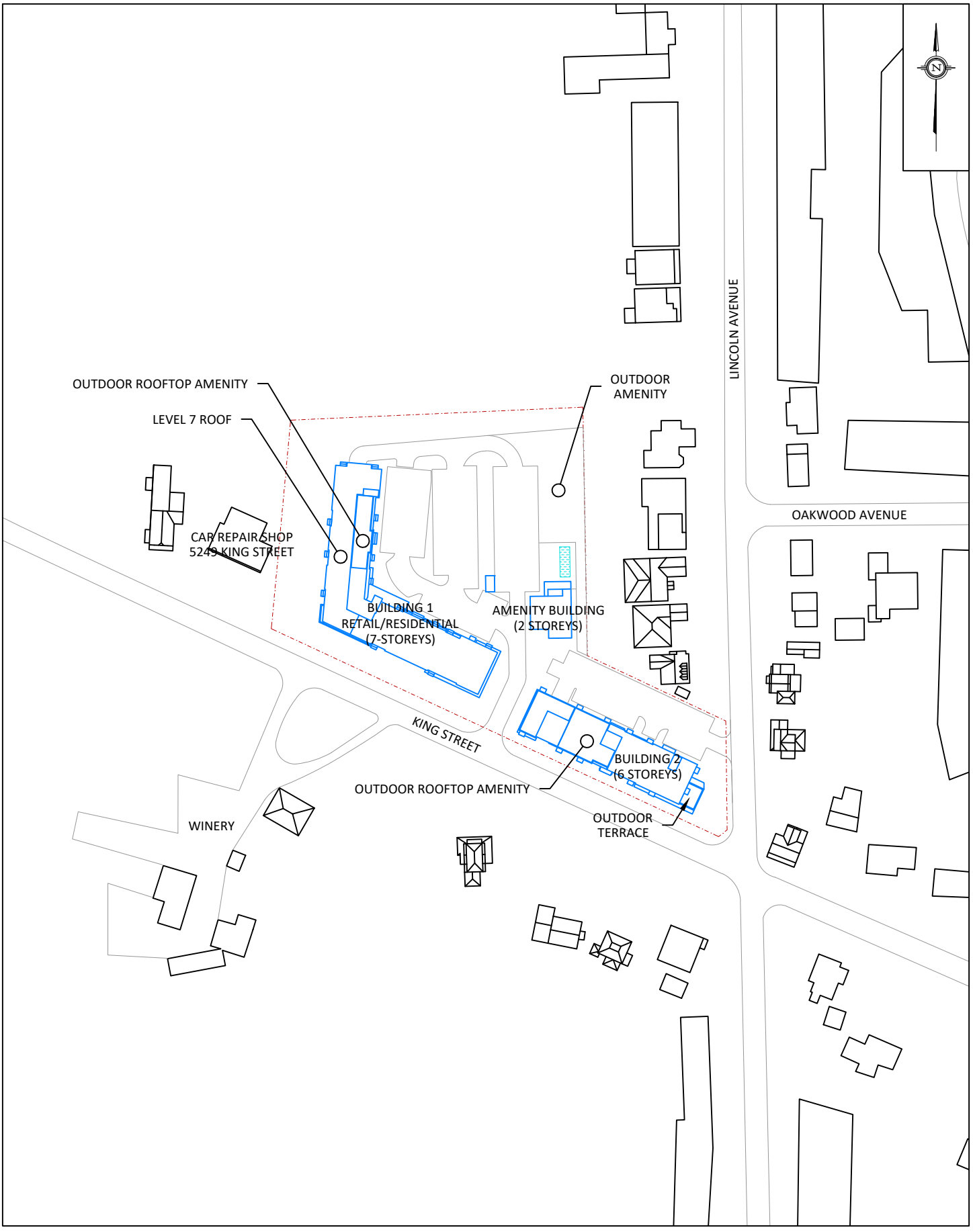


Efser Kara, MSc, LEED GA
Acoustic Scientist



Joshua Foster, P.Eng.
Lead Engineer

GW24-125 – Environmental Noise

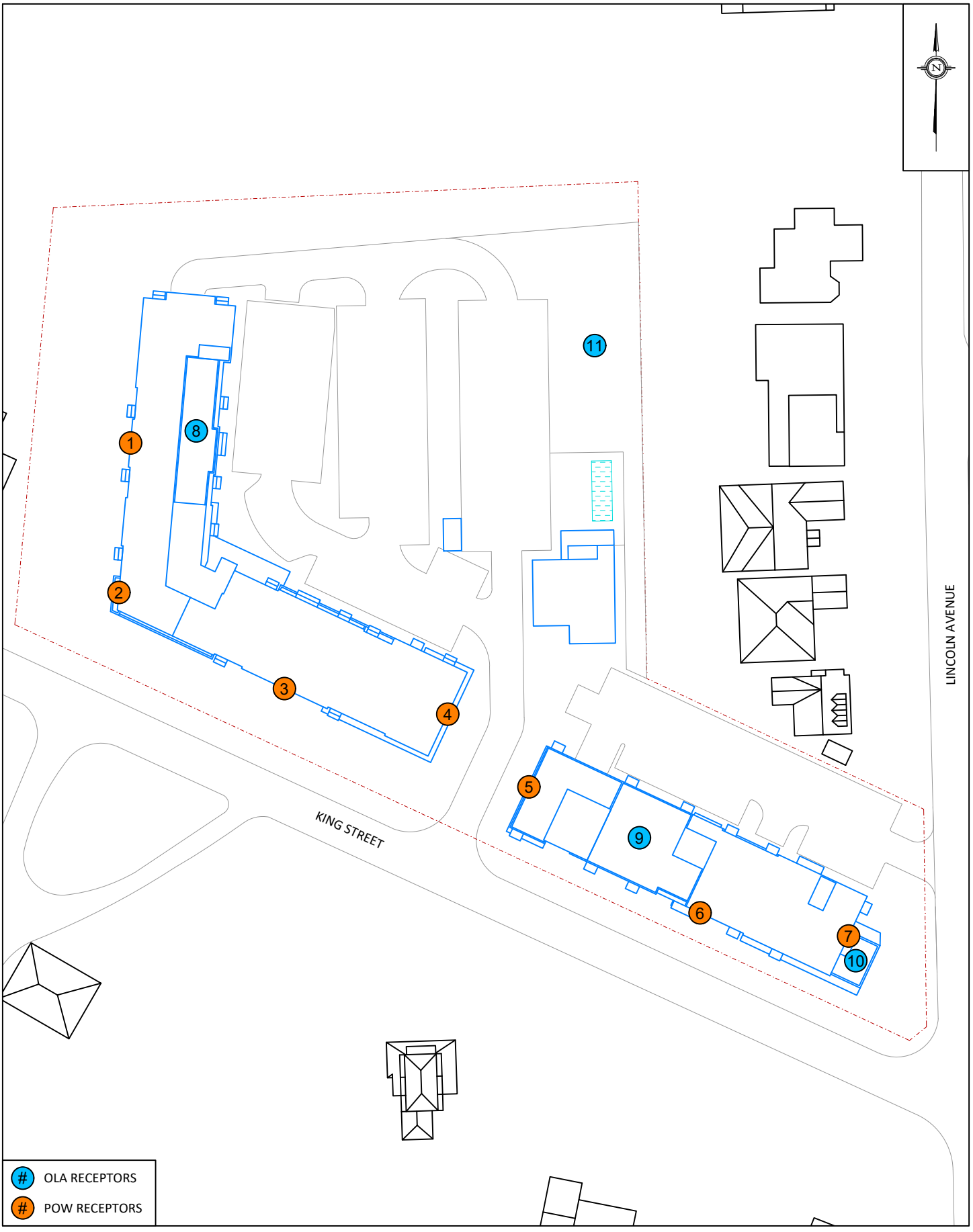


GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD, OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	5205 KING ST, BEAMSVILLE, ONTARIO ENVIRONMENTAL NOISE ASSESSMENT		DESCRIPTION
SCALE	1:2000 (APPROX.)	DRAWING NO.	24-125-1
DATE	OCTOBER 24, 2024	DRAWN BY	T.K.

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

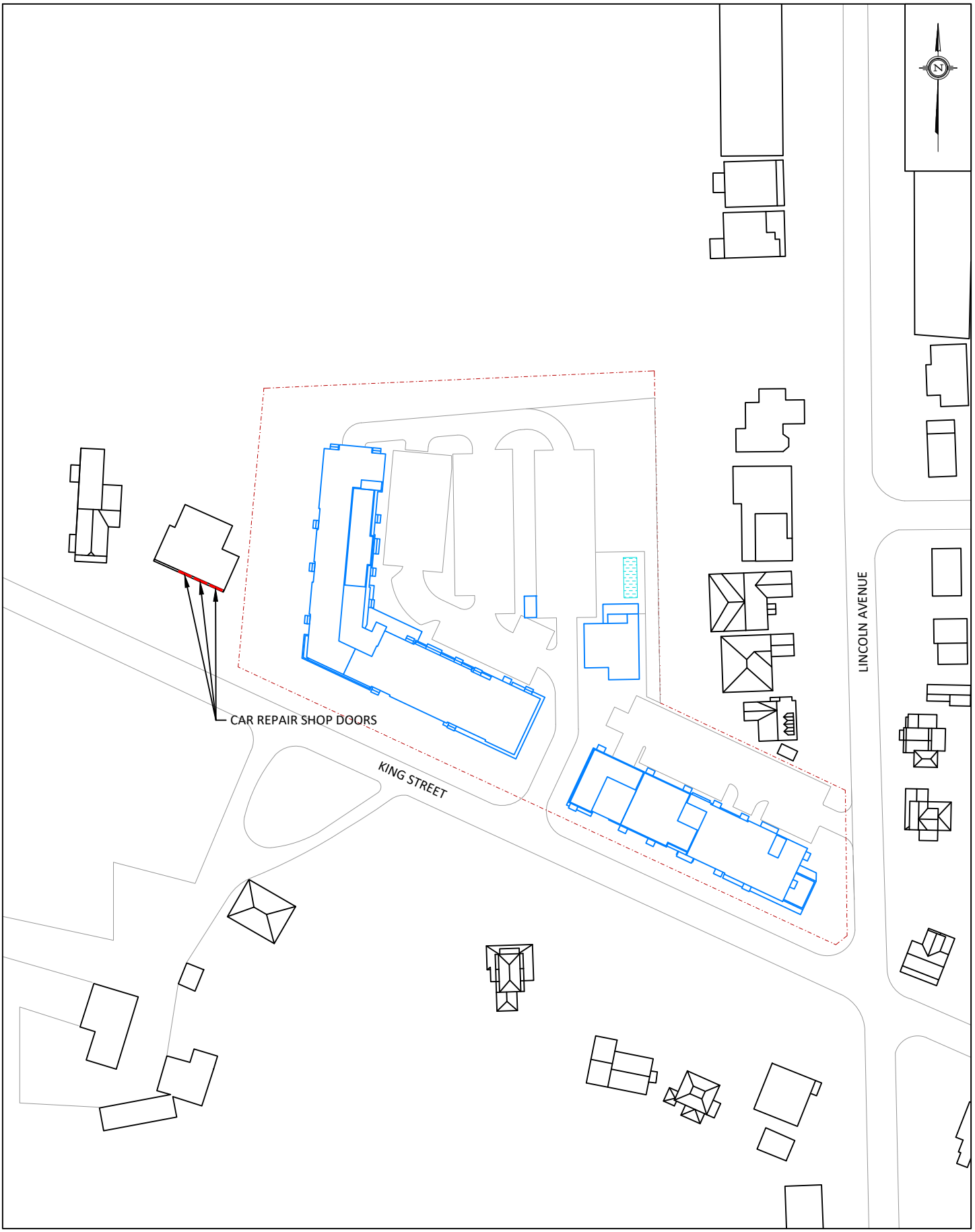


GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD, OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	5205 KING ST, BEAMSVILLE, ONTARIO ENVIRONMENTAL NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	24-125-2
DATE	NOVEMBER 13, 2024	DRAWN BY	E.K.

FIGURE 2:
RECEPTOR LOCATIONS



GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD, OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	5205 KING ST, BEAMSVILLE, ONTARIO ENVIRONMENTAL NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	24-125-3
DATE	NOVEMBER 15, 2024	DRAWN BY	E.K.

FIGURE 3:
STATIONARY NOISE SOURCE LOCATIONS

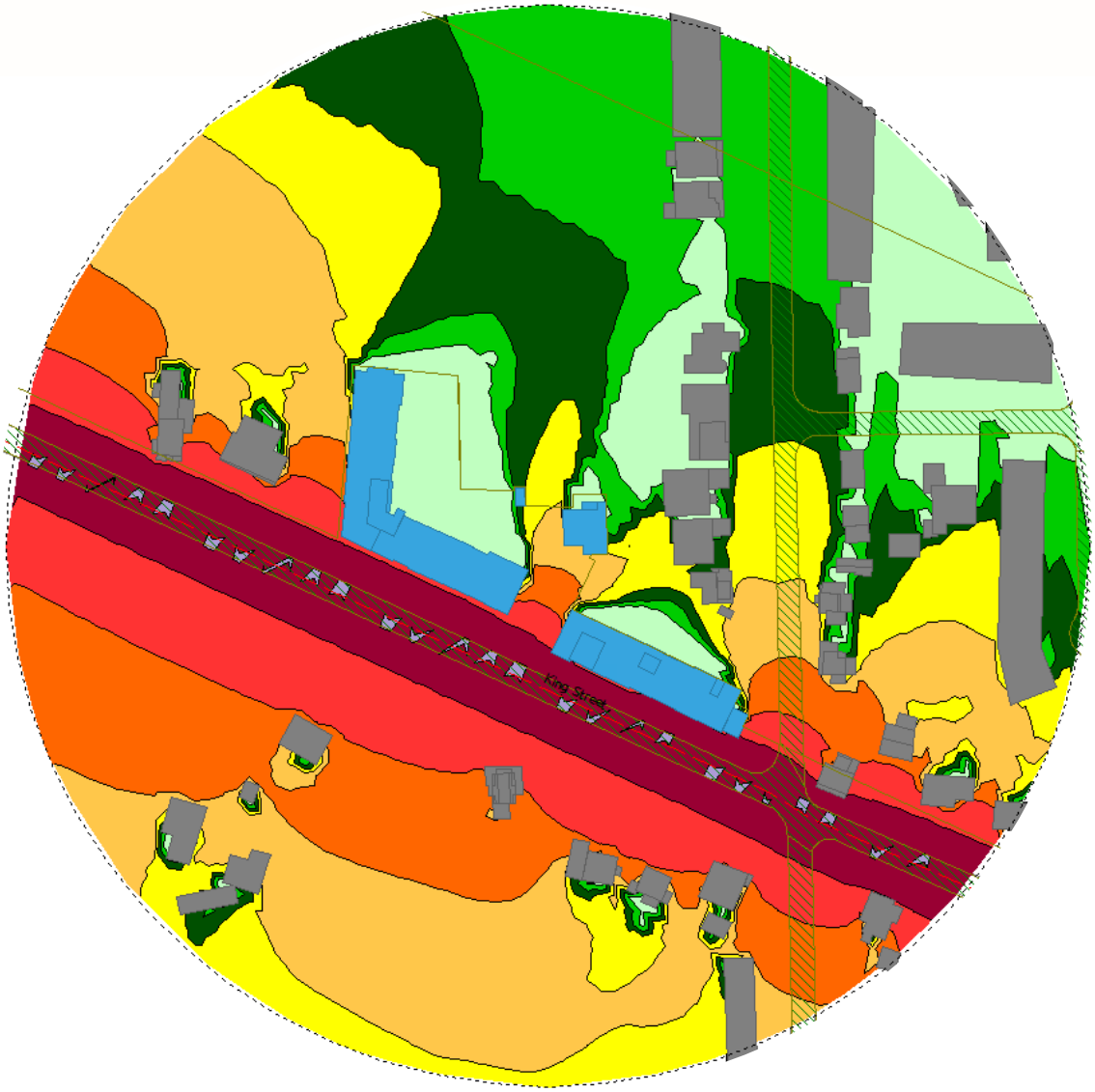


FIGURE 4: DAYTIME TRAFFIC NOISE CONTOURS (4.5 M ABOVE GRADE)

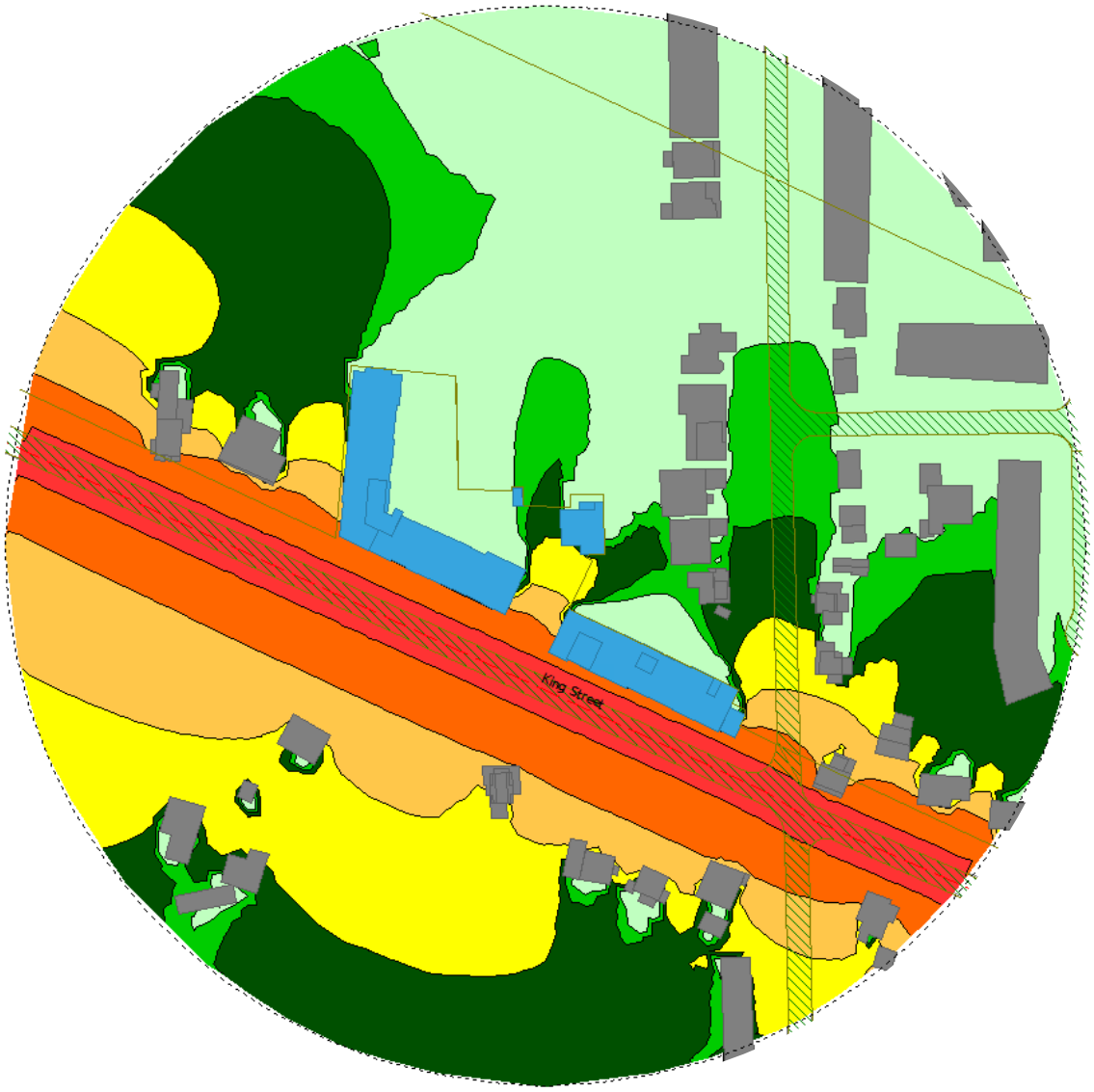


FIGURE 5: NIGHTTIME TRAFFIC NOISE CONTOURS (4.5 M ABOVE GRADE)

- *80 – 85 dB*
- *75 – 80 dB*
- *70 – 75 dB*
- *65 – 70 dB*
- *60 – 65 dB*
- *55 – 60 dB*
- *50 – 55 dB*
- *45 – 50 dB*
- *40 – 45 dB*
- *35 – 40 dB*
- *0 – 35 dB*



APPENDIX A

STATIONARY NOISE CALCULATION

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

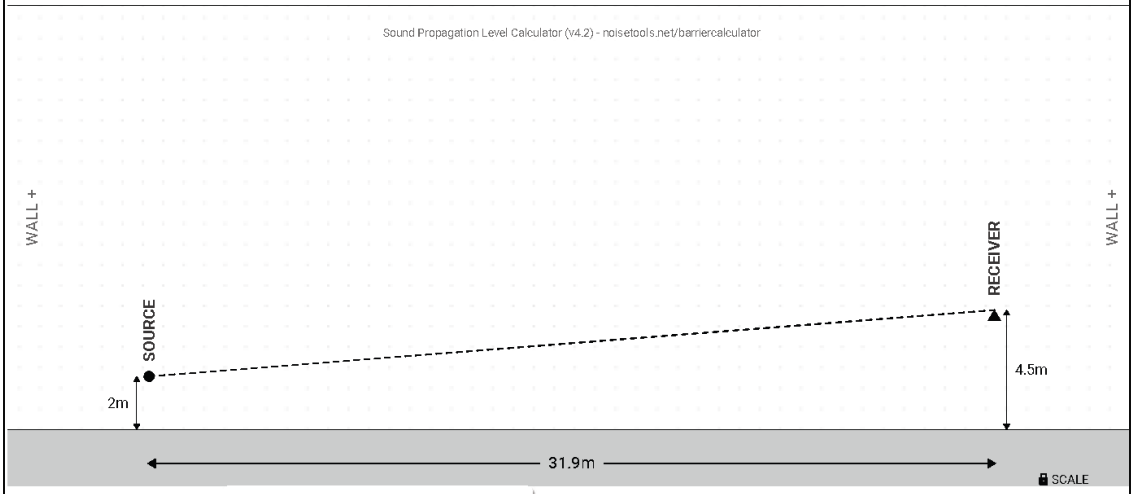
NOISE TOOLS.NET

Sound level calculators that work in your browser.

Free to use

Sound Propagation Level Calculator

Interactive noise source and receiver diagram with barrier calculations (includes 2024 update)



Single Frequency | Multi-Spectrum (Octave Bands)

Source

63	125	250	500	1k	2k	4k	8k	Hz
82	82	82	82	82	82	82	82	dB

Total Sound Power Level 91 dB

Receiver A-Weighted

63	125	250	500	1k	2k	4k	8k	Hz
17.6	27.7	35.2	40.6	43.7	44.7	43.8	38.9	dB(A)

Resulting Sound Pressure Level 50 dB(A)

Barriers

No barriers | Single barrier | Double barrier | Building

Display

Off | Grid (m) | Distance (m) | Wavelength (λ)

Parameters

10 °C Temperature

70 % Humidity

0 Ground Factor (G) Hard Soft Disable

ISO9613-2:2024 (Recommended) Calculation Method

Options

Reset all values

Link to this calculation

Copy results to clipboard

Save results as an image

Assumptions

- No significant sound transmission **around** the barrier sides. The total level around the sides of the barrier must be at least 10dB below that from over the top of the barrier.
- No significant sound transmission **through** the barrier. The total level through the barrier must be at least 10dB below that from over the top of the barrier.
- There are **no reflections** from the barrier. In reality when dealing with short distances and many reflective surfaces the "canyon effect" may occur with repeating reflections.
- There are minimal affecting weather conditions, such as wind or temperature inversion, as these will affect the propagation path of a noise source and diffraction around the barrier.
- The noise source behaves as a point source and is far-field, where inherent directivity is minimal.
- Walls used in the model are considered to be perfectly reflecting and at 1 metre distance (facade level).
- Conditions are free-field and there is no reverberant field.

Sound Attenuation due to Propagation ("Geometrical Divergence")

Sound waves propagate as a sphere and follow the "inverse square law" of level reduction.

A general rule is that the level reduces by 6dB per doubling of distance.

Sound Attenuation due to a Barrier using ISO9613-2:2024

Sound waves are reduced by a barrier depending upon the frequency of the sound waves with lower frequencies less affected. The greater the path difference, the more effective the barrier is.

A general rule is that a single barrier at eye level with a source and receiver will reduce the level by approx 5dB.

The barrier attenuation calculation in the guidance is limited to 20dB for a single barrier and 25dB for two barriers. Toggle this with the "Apply limit" checkbox.

Ground Effect (reflection and absorption) using ISO9613-2:2024

Sound waves are reflected or absorbed by the ground depending upon the frequency of the sound wave and how porous the ground is (indicated by the "Ground Factor" value G).

- For **"Hard Ground"** G = 0. Hard ground reflects sound waves. Examples include roads and paved areas.
- For **"Soft Ground"** G = 1. Soft ground is porous and absorbs sound waves. Examples include grass, trees and other vegetation.
- For **"Mixed Ground"** use a value for G between 0 and 1 that represents the fraction of the ground that is soft.

Air Absorption using ISO9613-1:1993

As sound waves travel through the air a small portion of the energy is converted into heat depending upon the atmospheric temperature and humidity, however the amount is only significant with high frequencies and long distances.