BURNSIDE

ACK Architects Studio Inc.
Detailed Environmental Noise Assessment

Proposed Residential Development
St Paul Development, Niagara Falls

ACK Architects Studio Inc.
Detailed Environmental Noise Assessment

Proposed Residential Development
St Paul Development, Niagara Falls

R.J. Burnside & Associates Limited
1465 Pickering Parkway
Pickering ON L1V 7G7 CANADA

February 2024
300057018.0000

Distribution List

No. of Hard Copies	PDF	Email	Organization Name
0	Yes	Yes	ACK Architects Studio Inc.

Record of Revisions

Revision	Date	Description
0	December 2023	Draft Submission to the City of Niagara Falls
1	January 24, 2024	Initial Submission to the City of Niagara Falls
2	February 22, 2024	Second Submission to the City of Niagara Falls

R.J. Burnside & Associates Limited

Report Prepared By:

Brent Miller, P.Eng.
Air & Noise Engineer
BM:ei

Report Reviewed By:

Kristina Zeromskiene, Ph.D., LEL
Senior Air & Noise Scientist

Executive Summary

R.J. Burnside & Associates Limited (Burnside) was retained by ACK Architects Studio Inc. to prepare a Detailed Environmental Noise Assessment for the St Paul Development Condominium Development. The property is located at 2430 St. Paul Avenue in Niagara Falls, Ontario.

The road traffic noise sources include St. Paul Avenue and Mountain Road. Sound levels from both roads were modelled based on the future traffic volumes.

The rail traffic noise source of concern from CN Rails Grimsby Subdivision was analyzed. Sound levels from this railway were modeled based on the future traffic volumes.

The respective road and rail traffic sound levels were combined and assessed together where appropriate. In order to determine whether any noise control measures are required, resulting sound levels were compared to the applicable Ministry of the Environment, Conservation and Parks (MECP) limits.

Although the subject development is in proximity to Niagara Falls International Airport, the proposed development is located outside of the expected NEF/NEP 25 noise contour. As Niagara Falls International Airport is an American airport which does not publish NEF/NEP contours, Burnside has therefore considered it equivalent to Pearson Airport.

The assessment revealed that transportation noise mitigation measures are required for this development. Required measures include:

- Provision for the installation of central air conditioning – Towers A and B.
- Warning clause Type A for potential purchasers – Tower B.
- Warning clause Type C for potential purchasers – Towers A and B.

Sound levels at the new development will meet the MECP noise guideline requirements after all suggested noise mitigation measures listed above are implemented.

There are no stationary noise sources of concern surrounding the development.

The proposed development will contain stationary noise sources with potential to impact noise sensitive land uses in the vicinity, specifically the proposed development itself. The proposed stationary noise sources will include HVAC, garage exhaust and emergency generator testing. Sound levels from these sources were modelled based on proxy manufacturer data. The resulting future sound levels were compared to the applicable MECP limits for a Class 1 Area in order to determine whether any noise control

measures are required. The ambient noise conditions predicted for the proposed development were also considered.

The assessment revealed that the stationary sound levels from the proposed sources within the development, at all points of reception on the proposed development are above the MECP limits; therefore, internal stationary noise mitigation measures will be required.

Table of Contents

Tables

Figures

Appendices

Disclaimer

Other than by the addressee, copying or distribution of this document, in whole or in part, is not permitted without the express written consent of R.J. Burnside & Associates Limited.

In the preparation of the various instruments of service contained herein, R.J. Burnside & Associates Limited was required to use and rely upon various sources of information (including but not limited to reports, data, drawings, observations) produced by parties other than R.J. Burnside & Associates Limited. For its part R.J. Burnside & Associates Limited has proceeded based on the belief that the third party / parties in question produced this documentation using accepted industry standards and best practices and that all information was therefore accurate, correct, and free of errors at the time of consultation. As such, the comments, recommendations, and materials presented in this instrument of service reflect our best judgment in light of the information available at the time of preparation. R.J. Burnside & Associates Limited, its employees, affiliates and subcontractors accept no liability for inaccuracies or errors in the instruments of service provided to the client, arising from deficiencies in the aforementioned third-party materials and documents.

R.J. Burnside & Associates Limited makes no warranties, either express or implied, of merchantability and fitness of the documents and other instruments of service for any purpose other than that specified by the contract.

Aerial Photography taken from Google Earth Professional, 2015.

1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) was retained by ACK Architects Studio Inc. to prepare a Detailed Environmental Noise Assessment for the new St Paul Development Condominium Development. The property is located at 2430 St. Paul Avenue, Niagara Falls, Ontario.

The purpose of this assessment is to examine potential noise impacts relating to the proposed condominium buildings in Niagara Falls.

1.1 Objective

This report has been prepared in support of the new St Paul Development Condominium Development. This report will be included in a submission for the Site Plan Approval. The potential noise impacts and ambient noise calculations were assessed using the Ministry of the Environment, Conservation and Parks (MECP) traffic and rail noise prediction models ORNAMENT and STEAM, implemented through the STAMSON (version 5.04) computer program. Sound levels were predicted based on 20-year future traffic forecast for St. Paul Avenue and Mountain Road (see Table 2). The potential noise impacts were evaluated by comparing predicted sound levels at the representative points of reception with the MECP sound level limits. The potential noise impact from Niagara Falls International Airport was also considered.

1.2 Study Area

The proposed St Paul Development is located St. Paul Avenue in Niagara Falls, Ontario. The site location map is provided in Figure 1.

The Site Plan is shown in Figure 2. The proposed development is in an area currently zoned by Niagara Falls as R5B Residential Apartment 5B Density. The zoning map is shown in Figure 3.

2.0 Applicable Noise Criteria

The proposed St Paul Development is located in a Class 1 Urban Area.

2.1 MECP Noise Policies

Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning (NPC-300) is the MECP Publication which provides advice, sound level limits and guidance that maybe used when land use planning decisions are made under the Planning Act, and the Niagara Escarpment Planning and Development Act. This guidance is for land use planning authorities, developers, and consultants. It is intended to minimize the potential conflict between proposed noise sensitive land uses and sources of noise emissions.

2.1.1 Transportation Noise

2.1.1.1 Outdoor Living Areas

NPC-300 indicates that the sound level should be assessed in an outdoor living area (OLA). Where the noise exceeds the applicable sound level limits, mitigation measures may be required. Noise control measures are not required if the sound level estimated in the OLA is 55 dBA or less during the daytime hours.

NPC-300 indicates that if the 16-hour equivalent sound level in the OLA is between 55 dBA and 60 dBA, noise control measures may be applied to reduce the sound level to 55 dBA; otherwise, a warning clause Type A should be issued. If the sound level in the OLA is greater than 60 dBA, noise control measures should be implemented to reduce the level to 55 dBA. Only in cases where the required noise control measures are not feasible for technical, economic, or administrative reasons would an excess above the limit (55 dBA) be acceptable with a warning clause Type B.

2.1.1.2 Plane of a Window

If the sound level in the plane of a bedroom or living / dining room window is between 55 dBA and 65 dBA during daytime or between 50 dBA and 60 dBA during nighttime, the dwelling should be designed with a provision for the installation of central air conditioning in the future. Warning clause Type C is also recommended. If the sound level in the plane of a bedroom or living / dining room window is greater than 65 dBA during daytime or 60 dBA during nighttime, installation of central air conditioning should be implemented with a warning clause Type D.

The location and installation of any required outdoor air conditioning devices must comply with the MECP's publication: Residential Air Conditioning Devices (NPC-216). NPC-216 requires that the sound levels of the condensing units not exceed the maximum sound level of 55 dBA[1] at the neighbour's closest point of reception.

[1] 55 dBA is permissible for new land use developments when air conditioning is a mandatory requirement.

Applicable points of reception are defined as the closest window or ground based outdoor living areas. Air conditioning units with a maximum Air-conditioning Refrigeration Institute (ARI) standard sound rating of greater than 7.6 Bels are also prohibited.

2.1.1.3 Indoor Living Areas

For road noise, the indoor sound level limit is 45 dBA for living / dining areas at any time and during daytime in the sleeping quarters. The sound level in the sleeping quarters should not exceed 40 dBA during nighttime.

For rail noise, the indoor sound level limit is 40 dBA for living / dining areas at any time and during daytime in the sleeping quarters. The sound level in the sleeping quarters should not exceed 35 dBA during nighttime.

2.1.1.4 Aircraft Noise

For aircraft noise, if the outdoor Noise Exposure Forecast / Noise Exposure Projection (NEF/NEP) value is less than 25, further assessment is not required. If the receptor is located between the NEF/NEP contours of 25 and 30, the dwelling should be designed with a provision for central air conditioning, along with warning clause Type C. In addition, the building components should be designed to achieve the indoor sound level limit of 0 NEF/NEP for sleeping quarters and 5 NEF/NEP for all other indoor living areas.

If the NEF/NEP value is greater than 30, municipal approval is required for a residential development proposal to proceed. If the municipality grants approval, then central air conditioning must be implemented, along with warning clauses Type B and Type D. In addition, the building components should be designed to achieve the indoor sound level limit of 0 NEF/NEP for sleeping quarters and 5 NEF/NEP for all other indoor living areas[2].

2.1.2 Stationary Noise

The applicable stationary noise criteria are dependent on the Class Area as well as the ambient sound levels present at each point of reception. The applicable criteria are the greater of the exclusion limits, provided in the MECP tables in Appendix B, or the lowest hourly ambient sound level predicted for a given point of reception.

The proposed St Paul Development Condominium Development is located in a Class 1 Urban Area.

---

[2] The indoor NEF/NEP values are not obtained from NEF/NEP contour maps. The values are representative of the indoor sound levels and are used as assessment criteria for the evaluation of acoustical insulation requirements (MECP, NPC-300, Section C-6). Since NEF = $L_{eq\ (24)}$ – 32 dBA, NEF 0 corresponds to $L_{eq\ (24)}$ of 32 dBA and NEF 5 corresponds $L_{eq\ (24)}$ of 37 dBA.

The MECP criteria for the outdoor receptors considered in this report are 50 dBA from 07:00 – 23:00.

The MECP criteria for the plane of window receptors considered in this report are 50 dBA from 07:00 –23:00 and 45 dBA from 23:00 – 07:00.

MECP tables showing all criteria for all Classes of Urban Areas and all time periods are shown in Appendix B.

2.2 Regional and Municipal Policies

In addition to the preceding MECP noise criteria from NPC-300, the proposed development is also subject to the following regional and municipal requirements:

Niagara Region's Regional Road Traffic Noise Control Policy PW5.NO1.0:

Prediction of noise from regional road shall be based on a 20-year future traffic forecast.

2.2.1 Guidelines for New Development in Proximity to Railway Operations

The Federation of Canadian Municipalities (FCM) and Railway Association of Canada (RAC) have together released a document entitled "Guidelines for the New Development in Proximity to Railway Operations". FCM is a non-profit corporation founded to influence the public discourse and higher levels of governments to enhance the exposure of municipal level concerns. RAC is a private company created to represent the interests of railway companies in Canada. The recommendations set out by FCM and RAC in their 2013 guidelines are not government policies but do present design guidelines which, if followed, increases the favourability of a development in the opinion of any rail company which is a member of the RAC. It is in the interest of the developer of a property in proximity to railways to consider these recommendations as railways can slow the municipal approval processes by raising concerns when these guidelines are ignored.

Municipalities may choose to adopt the "Guidelines for the New Development in Proximity to Railway Operations" as requirements for their jurisdiction. RAC keeps a list of municipalities which have adopted in part or full their guidelines[3]. The City of Niagara Falls and Niagara Region both do not appear on this list.

Burnside has reviewed the Official Plan for the Niagara Falls for policies relating to rail noise and vibration analysis and assessment. In the Official plan, the "Guidelines for the New Development in Proximity to Railway Operations" are not mentioned.

[3] https://www.proximityinitiative.ca/guidelines-adoption/

Burnside furthermore reviewed the Official Plan for the Region for policies relating to rail noise and vibration analysis and assessment. In the Regional Official plan, the "Guidelines for the New Development in Proximity to Railway Operations" are not mentioned. Therefore, there are no municipal or provincial requirements for enforcing the "Guidelines for the New Development in Proximity to Railway Operations" on the subject development.

Nevertheless, the following noise and vibration specific recommendations are made in the "Guidelines for the New Development in Proximity to Railway Operations":

- *Standard mitigation designs including a 3.0 m high acoustical fence located atop a 2.5 m earthen berm. The berm being fully located within the minimum 30 m setback from the right-of-way to the building edge.*
- *Standard mitigation measures are desired as a minimum requirement[4].*
- *Other land uses should be considered in cases where standard mitigation measures are not possible.*
- *Mitigation solutions should not create an onerous highly engineered condition that overwhelms the aesthetic quality of an environment.*
- *Consultation with all stakeholders, including the railways, at the outset of the planning process.*
- *The following building setbacks are recommended:*
    - *Freight Rail Yard: 300 m*
    - *Principal Main Line: 30 m*
    - *Secondary Main Line: 30 m*
    - *Principal Branch Line: 15 m*
    - *Secondary Branch Line: 15 m*
    - *Spur Line: 15 m*
- *Designs with backyards shielded from rail noise by the dwellings themselves or garages are preferable.*
- *Outdoor and indoor noise predictions should be completed in a Noise Study as part of the initial submission for a development.*
- *Though determined by an acoustic engineer acoustic barrier heights are typically at least:*
    - *Principal Main Line: 5.5 m above top of rail*
    - *Secondary Main Line: 4.5 m above top of rail*
    - *Principal Branch Line: 4.0 m above top of rail*
    - *Secondary Branch Line: no minimum*
    - *Spur Line: no minimum*

[4] Note that as "Guidelines for the New Development in Proximity to Railway Operations" is not government regulation, requirements of the document are better understood as recommendations, as the issuing body does not have the authority to require their implementation.

- *Acoustic barriers should mitigate the noise transmission by at least 10 dBA compared to the noise traveling over the barrier. Barriers should have at least 20 kg per square meter of surface area. Concrete or specialized materials are preferred over wood.*
- *Non noise sensitive room uses should be preferred on the sides of the buildings facing the railway, such as kitchens, bathrooms, and laundry rooms.*
- *Reduced sized windows should be considered facing the railway. Windows should have a high STC rating.*
- *Exterior Doors should be acoustically designed.*
- *Site specific vibration mitigation is highly recommended.*

The “Guidelines for the New Development in Proximity to Railway Operations” makes other recommendations which fall outside of the scope of noise and vibration assessment.

3.0 Transportation Noise Sources and Receptors

3.1 Road Noise Sources

The road traffic noise source assessed for the potential impact on the new St Paul Development Condominium Development are St. Paul Avenue and Mountain Road.

Traffic volume data was received as an Average Annual Daily Traffic (AADT) from the Municipality. The traffic volumes are presented in Table 1 and Table 2. Table 1 shows a summary of the current traffic volumes while Table 2 shows a breakdown of the 10-year predicted road traffic volumes. The road traffic data provided to Burnside for this report is included in Appendix A.

The truck traffic amounts were derived from the observations in the traffic counts. The truck percentages ranged from 1% to 1.5%. These percentages were split equally between medium and heavy trucks.

The day / night traffic volume was split 90% / 10% as per the STAMSON Technical Document recommendation for regional roads.

The current posted speed limit is 60 km/h on St. Paul Avenue and 50 km/hr on Mountain Road. It was assumed to remain the same within the next 20 years.

3.2 Rail Noise Sources

The rail traffic noise source assessed for the potential impact on the new St Paul Development Condominium Development is CN’s Grimsby Subdivision Rail Line.

Rail traffic volumes are presented in Table 3. The rail traffic data provided by Rail Company for this report is included in Appendix A.

CN's rail line is not located within 300 m of the Site, being at closest located roughly 350 m.

3.3 Aircraft Noise Sources

Although the subject development is in proximity to Niagara Falls International Airport, the proposed development is located outside of the NEF/NEP 25 noise contour. This analysis is based on the distance of the NEP 30 contour from the end of the runways at Toronto Pearson International Airport (Pearson Airport). Burnside has observed this distance to be 8.5 km for Pearson Airport. Considering Niagara Falls International Airport's closest runway is 11.2 km, we estimate that the NEF 25 noise contour will fall well away from the subject's site. Therefore, aircraft noise is not considered a significant noise source for this proposed development.

The NEF contour lines of Pearson Airport are shown in Figure 4.

3.4 Transportation Noise Receptors

The proposed St Paul Development Condominium Development was assigned two representative plane of an open window points of reception per tower. The development therefore has four calculation points. The predictable worst-case location of façade or corner of racing the roads and railway was selected. Sound levels at all other plane of window receptors will be at or below the sound levels at these representative receptors. The point of reception was assumed to be at the 15th or 19th floor, which is the top level of each tower.

The proposed St Paul Development Condominium Development also contains two Common OLA points of reception. There are two elevated terraces.

ACK Architects Studio Inc. has advised Burnside that there will be no private terraces or balconies greater than 4.0 m in depth. Therefore, none of the proposed private balconies of the development require a noise assessment under NPC-300.

4.0 Transportation Noise Impact Assessment

4.1 Methodology

Sound levels associated with road traffic predicted with MECP traffic noise prediction methodology ORNAMENT, implemented through the STAMSON (version 5.04) computer program. The model calculates expected sound levels based on road traffic, distance to receptor, receptor height, and topographical features. In order to predict sound levels from road traffic, STAMSON requires:

- Source to receiver distance – between 15 m and 500 m.
- Minimum traffic volume – 40 vehicles per hour.
- Minimum vehicle speed – 50 km/h.

The assumptions below were used in the noise model:

- The road gradient was assumed to be 2%.
- Road pavement was assumed as a standard asphalt surface.
- Flat / gentle slope topography was selected.
- Intermediate surface was assumed to be absorptive.

Outdoor Living Area points of reception were taken 3 m away from the edge of the terrace and 1.5 m above the floor level. Plane of Windows points of reception were taken at the building façade at the top floor of the respective tower.

Sound levels associated with rail traffic predicted with MECP rail traffic noise prediction model STEAM, implemented through the STAMSON (version 5.04) computer program. The model calculates expected sound levels based on rail traffic, distance to receptor, receptor height, and topographical features. To predict sound levels from rail traffic STAMSON requires:

- Source to receiver distance – between 15 m and 500 m.
- Type of Train – Electric or Diesel.
- Cars per Train.
- Locomotives per Train.
- Maximum traffic volume.
- Train speed.
- Welded rail? – Yes / No.
- Whistle? – Yes / No.
- Angle to whistle crossing.

The assumptions below were used in the noise model:

- Flat / gentle slope topography was selected.
- Intermediate surface was assumed to be absorptive.
- A 2.5% growth rate was assumed for the 20-year future traffic prediction.

4.2 Predicted Sound Levels – Plane of Window (POW)

Following the methodology presented above, Burnside has predicted sound levels at four representative receptors which provide sufficient information to determine the requirements for the entire development site. Each point was taken at the height of the top residential floor. These results are summarized in Table 4. A sample modeling printout is included in Appendix C (Description: Tower A Road Plane of Window Calculation). The worst case predicted level was 63 dBA during the daytime, and 57 dBA during the nighttime.

Based on the calculations, all units require provision for air conditioning and a warning clause Type C, as the predicted sound levels are in the range of 56 dBA to 65 dBA during the daytime and / or 51 dBA to 60 dBA during the nighttime.

4.3 Predicted Sound Levels – Outdoor Living Area (OLA)

Following the methodology presented in Section 4.1, Burnside has predicted OLA sound levels at two representative receptors that provide sufficient information to determine the requirements for the whole development site. The points were taken at a height of 1.5 m above the terrace level. These results are summarized in Table 4. A sample modeling printout is included in Appendix C (Description: Tower A OLA Road Calculation). The worst case predicted level was 55 dBA during the daytime. Based on the calculations, the following Tower A is not recommended or required to have an acoustic barrier, as the predicted unmitigated sound levels are at or under the MECP objective sound level of 55 dBA during the daytime.

Based on the calculations, the following OLAs are recommended to have an acoustic barrier, as the predicted unmitigated sound levels are above 55 dBA during the daytime.

Tower B – Roof Top Terrace

However, a barrier is not mandatory, and if it is not provided, prospective purchasers or tenants should be informed of potential noise problems by a warning clause Type A. Given this barrier would be on a terrace, Burnside recommends a warning clause Type A. If a barrier were constructed, 1.2 m would be the sufficient height. If a barrier is provided, a warning clause Type A is not required.

Table 5 demonstrates the alternative barrier heights between the objective 55 dBA and allowable maximum of 60 dBA.

Acoustical barriers must be constructed in a structurally sound manner, designed to withstand wind and snow loading. The barrier must have a minimum surface density of 20 kg/m^2. The barrier must be constructed without cracks or surface gaps. Any gaps that are under the barriers that are necessary for drainage purposes should be localized and minimized, so that the acoustical performance of the barrier is maintained.

4.4 Predicted Sound Levels – Indoor Living Areas

A preliminary building component assessment is required when rail noise is a source if the daytime sound levels at the plane of window exceed 60 dBA or the nighttime sound levels at the plane of window exceed 55 dBA. For road noise, the criterion is 5 dB higher but can only be considered at locations where there is no rail noise impact. As the sound levels at any point of reception did not exceed these criteria, the assessment was not required and Standard Sound Transmission Class (STC) window and wall designs will be acceptable for the entire development.

4.5 Noise Levels – Aircraft

The proposed development is located outside the theoretical NEF/NEP contours of Niagara Falls International Airport as estimated by Burnside. Therefore, no aircraft noise mitigation measures are required.

5.0 Stationary Noise Sources and Receptors

5.1 Internal Stationary Noise

Internal stationary noise is defined as the on-site stationary noise of the proposed development. The potential impact of internal stationary noise is assessed at neighbouring noise sensitive land uses and at noise sensitive locations within the proposed development itself, if appropriate.

5.1.1 Internal Stationary Noise Sources

The proposed development contains the following sources of stationary noise:

- Chiller / Cooling Tower.
  - Burnside has assumed each building will be cooled with a cooling tower. It is generally assumed that 1 ton of cooling is required per 400 ft^2. Tower A has a total of 12,630 ft^2 for each of the 15 floors. Therefore, a total of 474 tons of cooling is required for Tower A. Tower B has a total of 10,170 ft^2 for each of the 19 floors. Therefore, a total of 483 tons of colling is required for Tower B. Burnside has therefore assumed a 500-ton air cooled chiller for both buildings. Burnside has assumed a sound power of 105.9 dBA based on a proxy manufacturer data. A reference is provided in Appendix E.
- Building: Emergency Generator
  - The details are not known at this time, therefore conservative preliminary estimates were used.
  - A sound power level of 100 dBA has been assumed.
  - The unit is assumed to operate for a full hour during the day when testing operations would take place. Emergency operations of the generator are exempt.

- Garage Exhaust Fans:

  The proposed parking garage is 1,792.8 m^2. OBC-12 requires a ventilation rate of 3.9 L/s/m^2 (8.264 CFM/m^2) for the ventilation of an enclosed garage. Therefore, a total of 14,816 CFM is required to ventilate the proposed garage. Burnside estimates that there will be two exhaust shafts which means 7,408 CFM is required at each exhaust shaft with constant operation during day, evening, and night.

  Burnside has therefore assumed a sound power emission level of 86.6 dBA for each exhaust shaft. A reference is provided in Appendix E. This emission level is based on the manufacture's reported sound emission level of an approximately 7,880 CFM garage exhaust fan with a 5/8 inches of water gauge static pressure.

5.1.2 Internal Stationary Noise Points of Reception

The proposed St Paul Development Condominium Development is in proximity to the following noise sensitive land uses:

- POR01
  - Located on the southwest corner of Tower A.
  - Located near a theoretical garage exhaust fan.
- POR02
  - Located on the southeast corner of Tower A.
  - Located near a theoretical garage rooftop mechanical room.
- POR03
  - Located on the northwest corner of Tower B.
  - Located near a theoretical garage rooftop mechanical room.
- POR04
  - Located on the southwest corner of Tower B.
  - Located near a theoretical garage exhaust fan.

All of the above PORs are located within the proposed development as they are the closest PORs relative to the noise sources. All noise sensitive locations located off site will be at a greater distance setback to the sources compared to these PORs. Therefore, if compliance is established at these PORs all other noise sensitive locations in the vicinity will also be compliant.

6.0 Stationary Noise Impact Assessment

6.1 Methodology

Sound levels associated with stationary noise are predicted with Softnoise GmbH Predictor software, version 2023.1 (64 bit) (Predictor) noise modeling software. Predictor follows the ISO 9613/2 method of sound level calculation as implemented in the ISO 17534-3 Quality Assurance standard.

The following settings are used:

- Calculation height: 4.5 m.
- Default Ground attenuation Factor: 0.
- No Barrier effect for direct sight – Active.
- Dmax According to ISO 9613 – Active.
- Avoid overestimating barrier effect – Active.
- Terrain model: Use full DTM.
- Temperature: 283.15 K.
- Pressure: 101.33 kPa.
- Air humidity: 70%.[5]

6.2 Predicted Ambient Sound Levels & Applicable Criteria

Ambient sound levels were predicted with MECP traffic noise prediction methodology ORNAMENT, implemented through the STAMSON (version 5.04) computer program. The model calculates expected sound levels based on the lowest hour road traffic, distance to receptor, receptor height, and topographical features.

The hourly traffic data provided to Burnside for this report is included in Appendix A.

Sample ambient sound level modeling printout is included in Appendix C. These calculations use typical traffic distributions for the type of road and the 24-hour impact predicted by STAMSON using the AADT for that road.

The ambient sound levels were determined for each point of reception and are shown in

B	**58**	**-**	**-**	**-**	**-**	**-**	**1.2**	**-**

Table 6. In cases where the ambient noise exceeds the Class 1 exclusion limits the ambient noise level replaces the exclusion limit as the noise criteria.

The proposed St Paul Development is located in a Class 1 Area. Therefore, the applicable sound level criteria for stationary noise are presented in Table 7.

6.3 Predicted Internal Stationary Sound Levels

The predicted internal stationary sound levels of the proposed development onto the neighboring noise sensitive land uses and noise sensitive locations within the development itself are presented in Table 8.

[5] ISO 9613 Requirement

The unmitigated daytime noise contours are provided in Figure 7. The unmitigated evening noise contours are provided in Figure 8, and the unmitigated nighttime noise contours in Figure 9. All noise contours are presented at a height of 4.5 m.

Therefore, as the unmitigated internal stationary sound levels are not compliant with the applicable sound level criteria for all PORs mitigation is required.

6.4 Predicted Mitigated Internal Stationary Sound Levels

To sufficiently mitigate the internal stationary noise model the following assumptions were made:

- 23 dB reduction applied to emergency generators. This could be achieved by:
  - Selecting lower sound power emission generators.
  - Locating the source inside a mechanical suite.
  - Adding acoustic insulation to the exhaust.
- 23 dB reduction applied to air cooled chillers. This could be achieved by:
  - Selecting lower sound power chiller.
  - Locating the source inside a mechanical suite.
  - Adding acoustic insulation to the exhaust.
- 22 dB reduction applied to garage exhaust shafts:
  - Selecting lower sound power fans.
  - Adding acoustic insulation to the exhaust shaft.
  - Implement CO monitoring to allow for less frequent operation.

Based on Burnside's experience with other similar projects this level of reduction is achievable with appropriate design.

With these mitigation measures included, the internal stationary sound levels were reassessed. The results of this mitigated assessment are shown in Table 9, which indicates that compliance is now met.

The mitigated daytime noise contours are provided in Figure 7. The mitigated evening noise contours are provided in Figure 8, and the mitigated nighttime noise contours in Figure 9. All noise contours are presented at a height of 4.5 m.

Therefore, with the inclusion of the mitigation measures described above the internal stationary sound levels will be compliant with the applicable sound level criteria for all PORs.

7.0 Noise Mitigation Measures

Based on the predicted sound levels it was determined that noise mitigation measures are required for this Condominium Development. The required measures are summarized in Table 10.

7.1 Ventilation Requirements

All Units are required to have provision for air conditioning and warning clause Type C. If air conditioning is voluntary provided by the developer a warning clause Type D should replace the warning clause Type C.

7.2 Acoustic Barrier Requirements

The following locations are recommended to have an acoustic barrier, otherwise warning clause A must be provided.

- **Tower B – All units**

7.3 Railway Requirements

There are no special requirements from the development's proximity to CN Rail's Grimsby Subdivision Rail Line.

7.4 STC Requirements

All Unit in the proposed development will achieve the minimum MECP indoor sound levels by incorporating standard requirements for the exterior walls and doors as per the Ontario Building Code. The windows required to meet the minimum MECP indoor sound level are of a commonly available STC rating. Minimum ratings for windows are discussed in Section 4.4, which are applicable to all dwellings requiring AC (which are listed in Section 7.1).

7.5 Internal Stationary Noise Mitigation Requirements

The assessment of the proposed St Paul Development's internal stationary sources determined that the following noise mitigation measures were required to meet the applicable MECP noise standards:

- 23 dB reduction applied to emergency generators.
- 23 dB reduction applied to air cooled chillers.
- 22 dB reduction applied to garage exhaust shafts.

8.0 Implementation Procedures

The following implementation procedures are recommended to ensure that each requirement of this study is implemented at the correct stage of the development process:

- Prior to the Issuance of Building Permit an Acoustical Consultant should be retained to review the shop drawings of the required acoustic barriers. Improperly constructed acoustic barriers can result in the developer being required to repair or replace the barrier in order to receive a Certificate of Completion for the development's acoustic requirements.
- Prior to occupancy, the development should be certified by a qualified Acoustics Engineer for compliance with the requirements of the Detailed Environmental Noise Assessment.

9.0 Conclusion

The results of St Paul Development Condominium Development Detailed Environmental Noise Assessment demonstrate that if all noise mitigation measures prescribed in Table 10 are implemented, sound levels at all the proposed development will meet the Ministry of the Environment, Conservation and Parks noise guideline requirements. The Implementation Procedures as outlined in Section 8.0 should be followed carefully to ensure that no requirements of the noise study are overlooked during the development and construction process.

10.0 References

Computer Program STAMSON Version 5.04. Ministry of the Environment, Conservation and Parks.

Controlling Sound Transmission into Buildings by J.D. Quirt. National Research Council Canada, September 1985.

Environmental Noise Guideline. Stationary and Transportation Sources – Approval and Planning. Publication NPC-300. Ministry of the Environment, Conservation and Parks, August 2013 (released October 21, 2013).

Ontario Building Code. Ministry of Municipal Affairs and Housing, 2012.

Regional Road Noise Policy PW5.NO1.0

ORNAMENT – Ontario Road Noise Analysis Method for Environment and Transportation. Technical Document. Ministry of the Environment, Conservation and Parks, October 1989.

STEAM – Sound from Trains Environmental Analysis Method. Ministry of the Environment, Conservation and Parks, July 1990.

Principal Main Line Requirements. Canadian National. June 2008.

Environmental Guide for Noise, October 2006. Ministry of Transportation Ontario.

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Tables

Table 1: Traffic Data

Road	St. Paul Avenue	Mountain Road
Location	North of Mountain Road	East of St. Paul Avenue
Current Peak Hourly	-	-
"Current" Daily Traffic	10,517	10,632
"Current" Year	2021	2021
Assumed Growth Rate	2.50%	2.50%
"Future" Year	2043	2043
20-Year Daily Traffic[1]	18,106	18,304
No. of Lanes	3	2
Posted Speed	60 km/h	50 km/h
% Heavy Trucks	0.50%	0.75%
% Medium Trucks	0. 50%	0.75%
Day/Night Split	90% / 10%	90% / 10%

1. Traffic growth Formula:

$$Future\ traffic = Present\ Traffic * (1 + growth\ \%)^{Years}$$

Table 2: 20-year Predicted Road Traffic Volumes

Road	Maximum AADT Traffic			
	Total	**# of Light Vehicles**	**# of Medium Trucks**	**# of Heavy Trucks**
St. Paul Avenue	18,106	17,925	91	91
Mountain Road	18,304	18,029	137	137

Table 3: 20-year Predicted Rail Traffic Volumes

Rail	Total	Maximum Traffic		
		# of Freight	**# of Way Freight**	**# of Passenger**
CN – Grimsby	6 – Daytime 2 – Nighttime	4 – Daytime	2 - Nighttime	2– Daytime

Table 4: Predicted Daytime and Nighttime Sound Levels for the Forecasted 20-Year Traffic Volumes

Receptor ID	Tower	Area	Predicted Sound Levels (dBA)	
			Daytime	Nighttime
1 Rail	A	OLA	54	-
		PofW	59	43
2 Road	A	OLA	55	-
		PofW	63	57
3 Rail	B	OLA	56	-
		PofW	59	43
4 Road	B	OLA	58	-
		PofW	62	55

Notes:

- Outdoor Living Area (OLA) points of assessment were taken:
  - 1.5 m above grade; and
  - aligned with the midpoint of the subject façade.
- Plane of Window (PofW) points of assessment were taken:
  - at the building façade; and
  - 4.5 m above grade.

Table 5: Acoustic Barrier Height Alternatives

Receptor	Unmitigated Sound Level (dBA)	Required Barrier Height (m) to Achieve[6]:						Burnside Barrier Height Recommendation (m)
Tower		60 dBA	59 dBA	58 dBA	57 dBA	56 dBA	55 dBA	
A	55	-	-	-	-	-	-	-
B	58	-	-	-	-	-	1.2	-

[6] Barrier heights reviewed in 0.2 m increments starting at 1.0 m for parapets and 2.0 m for ground level acoustic barriers.

Table 6: Predicted Ambient Sound Levels

POR #	Time of Day	Ambient Sound Level
POR 01	Daytime	60 dBA
	Evening	57 dBA
	Nighttime	47 dBA
POR 02	Daytime	57 dBA
	Evening	54 dBA
	Nighttime	44 dBA
POR 03	Daytime	57 dBA
	Evening	54 dBA
	Nighttime	45 dBA
POR 04	Daytime	59 dBA
	Evening	56 dBA
	Nighttime	45 dBA

Table 7: Applicable Stationary Sound Level Criteria

POR #	Time of Day	Ambient Sound Level	NPC-300 Exclusion Limit	Applicable Sound Level Criteria
POR 01	Daytime	60 dBA	50 dBA	60 dBA
	Evening	57 dBA	50 dBA	57 dBA
	Nighttime	47 dBA	45 dBA	47 dBA
POR 02	Daytime	57 dBA	50 dBA	57 dBA
	Evening	54 dBA	50 dBA	54 dBA
	Nighttime	44 dBA	45 dBA	45 dBA
POR 03	Daytime	57 dBA	50 dBA	57 dBA
	Evening	54 dBA	50 dBA	54 dBA
	Nighttime	44 dBA	45 dBA	45 dBA
POR 04	Daytime	59 dBA	50 dBA	59 dBA
	Evening	56 dBA	50 dBA	56 dBA
	Nighttime	45 dBA	45 dBA	45 dBA

Table 8: Predicted Internal Stationary Sound Levels (Unmitigated)

POR #	Time of Day	Impact	Criteria	Compliance?
POR 01	Daytime	65 dBA	60 dBA	No
	Evening	65 dBA	57 dBA	No
	Nighttime	65 dBA	47 dBA	No
POR 02	Daytime	65 dBA	57 dBA	No
	Evening	63 dBA	54 dBA	No
	Nighttime	61 dBA	45 dBA	No
POR 03	Daytime	72 dBA	57 dBA	No
	Evening	70 dBA	54 dBA	No
	Nighttime	68 dBA	45 dBA	No
POR 04	Daytime	66 dBA	59 dBA	No
	Evening	66 dBA	56 dBA	No
	Nighttime	66 dBA	45 dBA	No

Table 9: Predicted Internal Stationary Sound Levels (Mitigated)

POR #	Time of Day	Impact	Criteria	Compliance?
POR 01	Daytime	43 dBA	60 dBA	Yes
	Evening	43 dBA	57 dBA	Yes
	Nighttime	43 dBA	47 dBA	Yes
POR 02	Daytime	42 dBA	57 dBA	Yes
	Evening	40 dBA	54 dBA	Yes
	Nighttime	38 dBA	45 dBA	Yes
POR 03	Daytime	49 dBA	57 dBA	Yes
	Evening	47 dBA	54 dBA	Yes
	Nighttime	45 dBA	45 dBA	Yes
POR 04	Daytime	44 dBA	59 dBA	Yes
	Evening	44 dBA	56 dBA	Yes
	Nighttime	44 dBA	45 dBA	Yes

Table 10: Minimum Noise Mitigation Measures

Receptor ID	Location	Air Conditioning[1]	Exterior Wall STC Rating [2]	Window STC Rating[2]	Door STC Rating[2]	Acoustic Barrier Height (m)[3]	Warning Clause[4]
1	Tower A	Provision for adding	Standard	Standard	Standard	-	C
2	Tower B	Provision for adding	Standard	Standard	Standard	-	A, C

Notes:

1. “Provision for adding” means that building must be built so that the occupant can install conditioning in the future, at their discretion. Required means that the building must be built with central air conditioning installed.
2. STC – Sound Transmission Class rating. STC values are based upon the assumption that all wall and window areas are 80% and 30%, respectively, of the corresponding room floor area.
3. Height of an acoustic barrier with no gaps underneath or in the wall.
4. Notification to potential purchaser of a potential annoyance due to an existing source of environmental noise. Warning clauses should be included in agreements of Offers of Purchase and Sale.
5. An acoustic barrier is optional and if not installed, prospective purchasers or tenants should be informed of potential noise problems by a warning clause Type A.

Warning Clauses - Transportation Sources

Type A

"Purchasers/tenants are advised that sound levels due to increasing road traffic (rail traffic) (air 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."

Type B

"Purchasers/tenants are advised that despite the inclusion of noise mitigation features in the development and within the building units, sound levels due to increasing road traffic (rail traffic) (air traffic) may on occasions 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."

Type C

"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments 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."

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."

Warning Clauses - Stationary Sources

Type E

"Purchasers/tenants are advised that due to the proximity of the adjacent industry (facility) (utility), noise from the industry (facility) (utility) may at times be audible."

Warning Clauses – Class 4 Area Notification

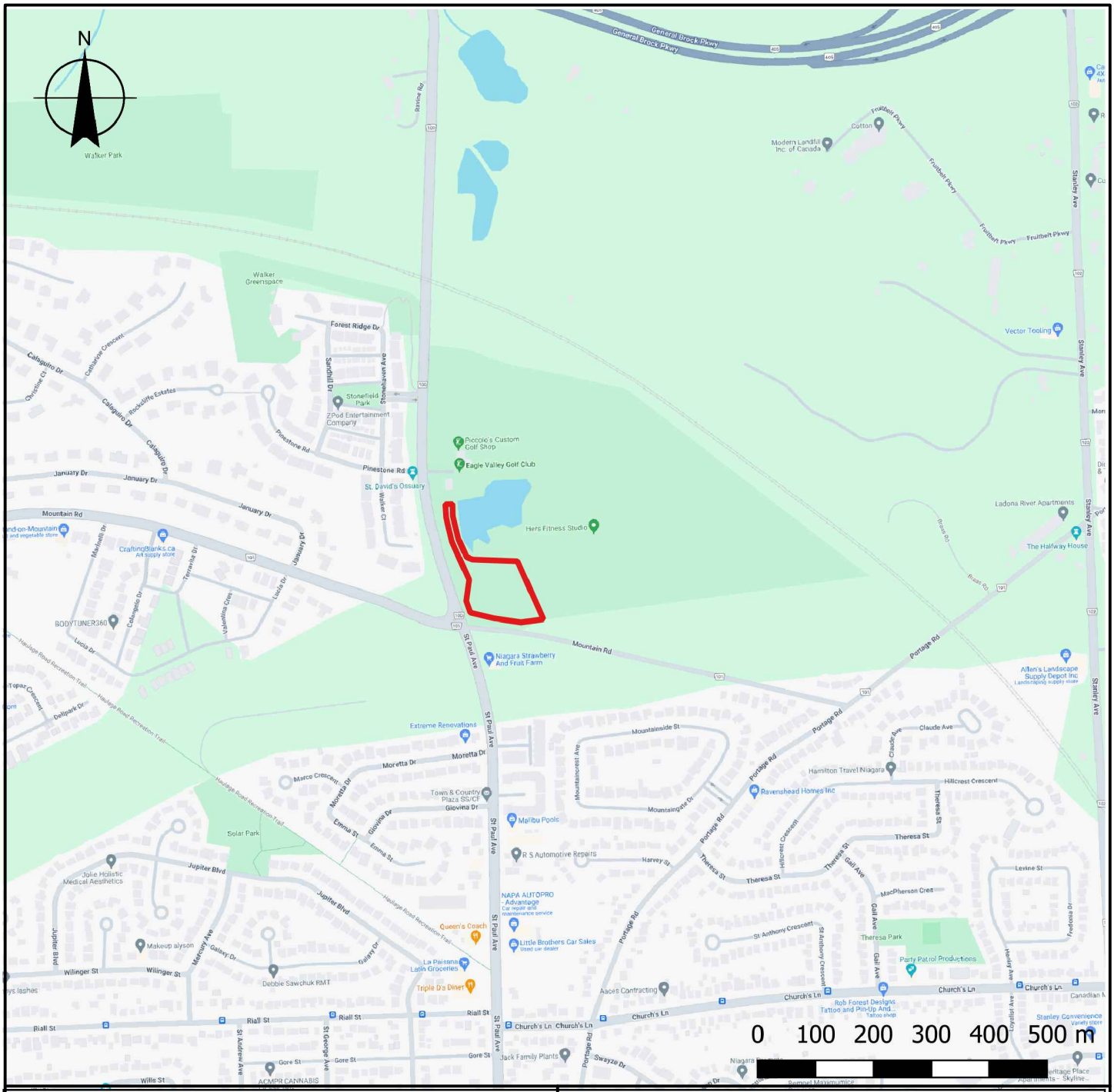
Type F

"Purchasers/tenants are 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."

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Figures



KEY MAP OF ONTARIO

BURNSIDE

Client

ACK Architects Studio Inc.

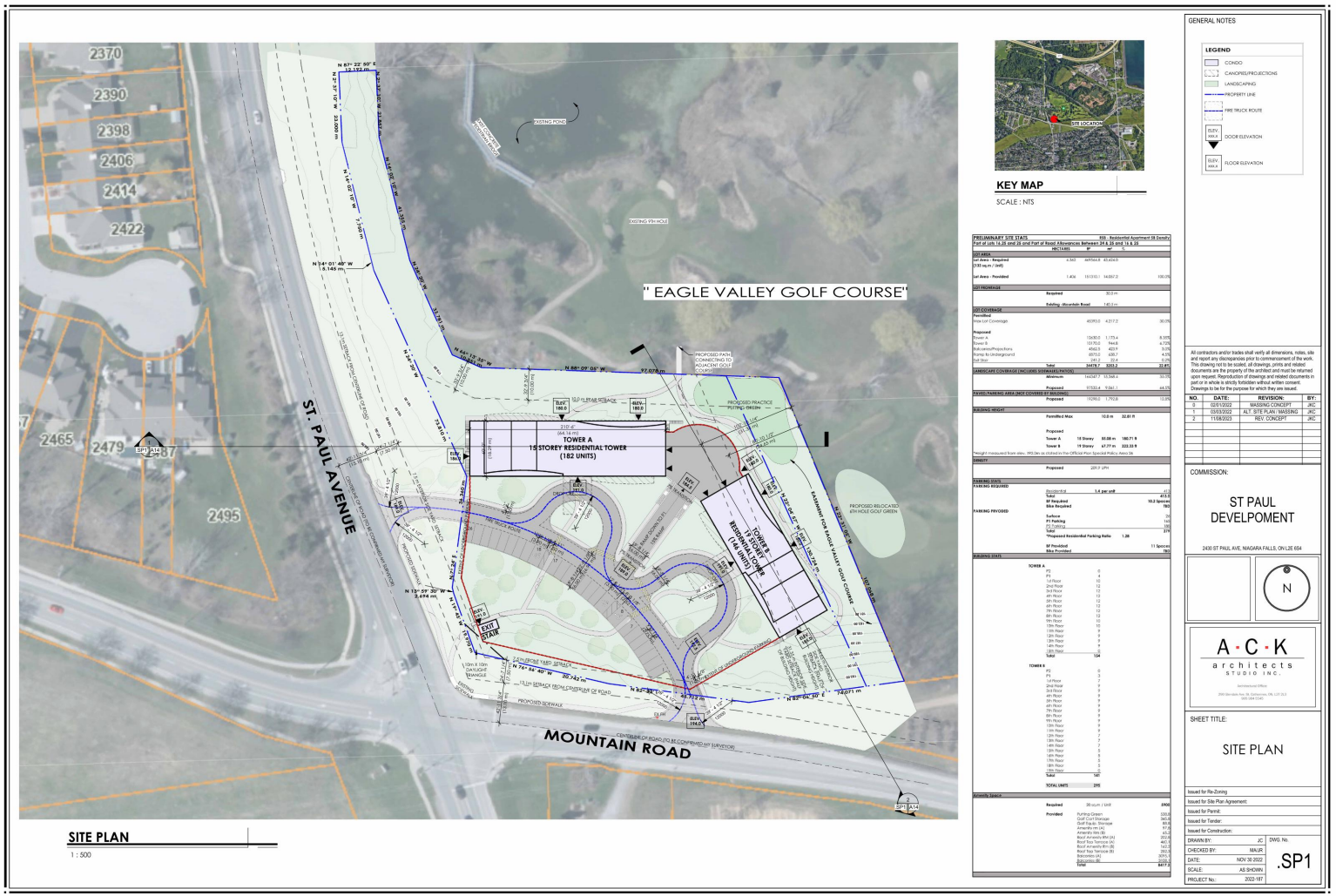
Figure Title

Site Location Map

2430 St. Paul Avenue Noise Report

Drawn	Checked	Date	Figure No.
BM	HW	December 2023	1
Scale		Project No.	
1:10,000		300057018.0000	

File: C:\Users\BMiller\RJB\057018 - 2430 St. Paul Avenue, Niagara Falls - Documents\02_Tech Proj Doc\Dwg Fig Map\2430 St Paul CAD.dwg Date Plotted: December 5, 2023 - 11:15 AM



BURNSIDE

Figure Title

Site Plan

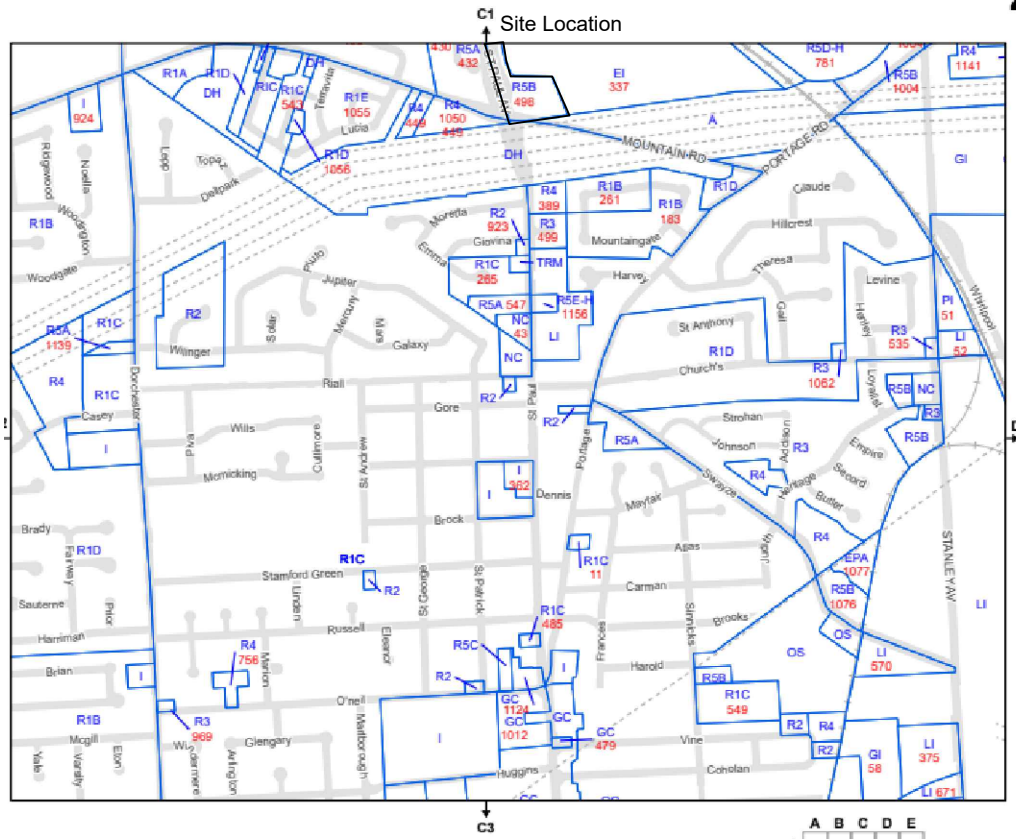
2430 St. Paul Avenue Noise Report

Client

ACK Architects Studio Inc.

Drawn	Checked	Date	Figure No.
BM	HW	December 2023	**2**
Scale		Project No.	
N/A		300057018.0000	

ZONING BY-LAW 79-200



CITY OF NIAGARA FALLS
Planning & Development Department

0 500 m

Scale 1:13,000

Print Date: FEBRUARY, 2023

NiagaraFalls

ZONE LINES

EXCEPTIONS & SPECIAL PROVISION NO.
SEE SECTION 19

99-143	18-024
99-149	18-067
01-088	18-119
01-137	19-073
01-135	20-091
02-018	20-092
04-067	20-123
04-191	20-126
06-146	21-120
07-209	
07-248	
07-144	
10-164	
10-163	
11-115	
11-148	
11-143	
12-102	
13-059	
14-075	
15-067	
17-102	
18-010	

N W E S

CONSOLIDATION
DECEMBER 2022

A B C D E
1 2 3 4 5 6 7 8 F

SHEET C2

BURNSIDE

Figure Title

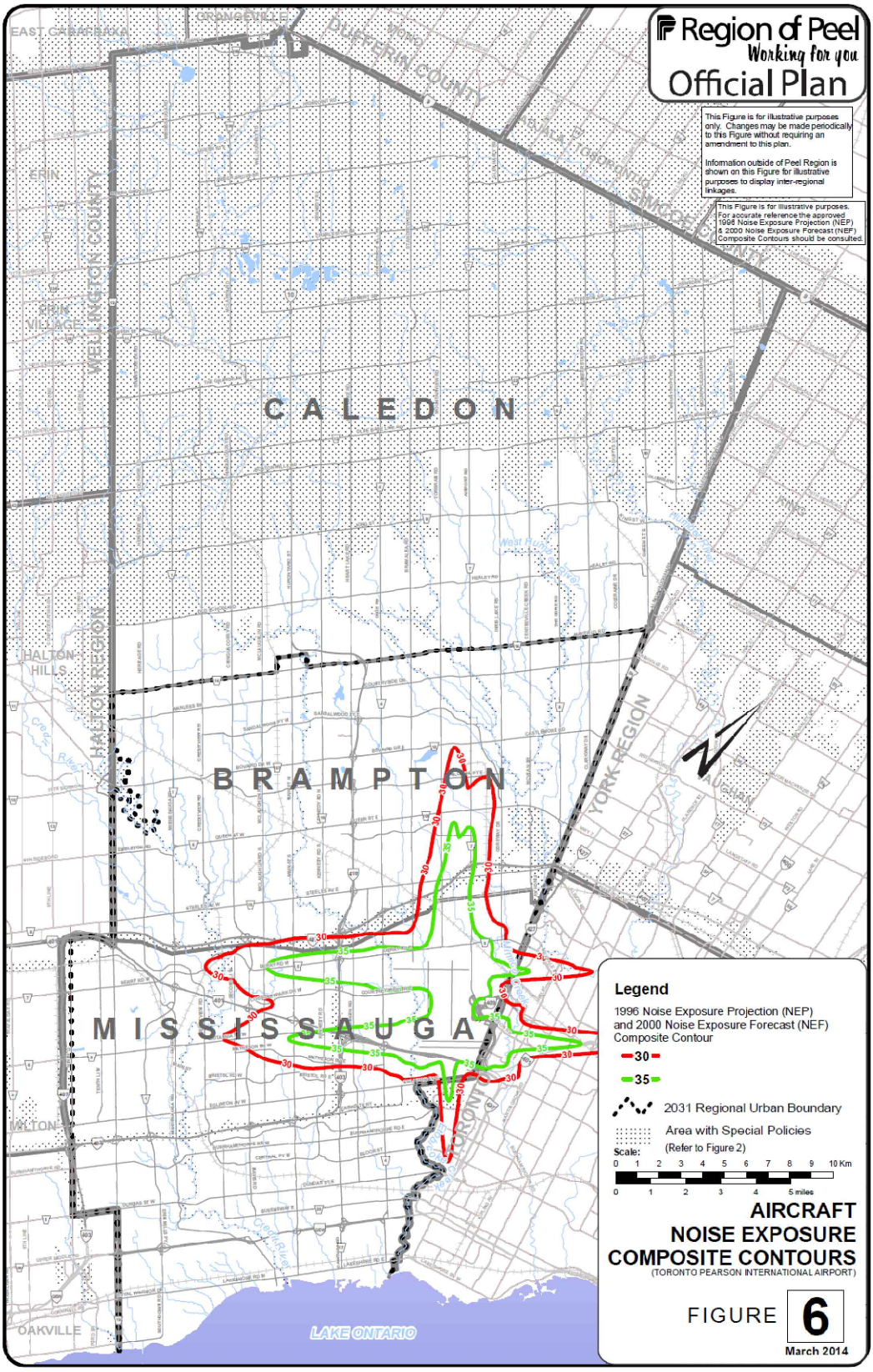
Zoning Map

2430 St. Paul Avenue Noise Report

Client

ACK Architects Studio Inc.

Drawn	Checked	Date	Figure No.
BM	HW	December 2023	3
Scale		Project No.	
N/A		300057018.0000	



BURNSIDE

Figure Title

NEF / NEP Contours

2430 St. Paul Avenue Noise Report

Client	Drawn	Checked	Date	Figure No.
ACK Architects Studio Inc.	BM	KZ	December 2023	**4**
	Scale		Project No.	
	N/A		300057018.0000	

File: C:\Users\BMiller\RJB\057018 - 2430 St. Paul Avenue, Niagara Falls - Documents\02_Tech Proj Doc\Dwg Fig Map\2430 St Paul CAD.dwg Date Plotted: December 14, 2023 - 2:18 PM

BURNSIDE

Figure Title

Stationary Noise - Points of Reception

2430 St. Paul Avenue Noise Report

Client	Drawn	Checked	Date	Figure No.
ACK Architects Studio Inc.	BM	KZ	December 2023	**5**
	Scale		Project No.	
	1:1000		300057018.0000	

BURNSIDE

Figure Title

Figure 6: Internal Stationary Noise Sources

2430 St. Paul Avenue Noise Report

Client	Drawn	Checked	Date	Figure No.
ACK Architects Studio Inc.	BM	KZ	December 2023	**6**
	Scale		Project No.	
	1:1000		300057018.0000	

Figure 7: Unmitigated Daytime Internal Stationary Noise

RJ Burnside

Internal Stationary Model

14 Dec 2023, 14:07

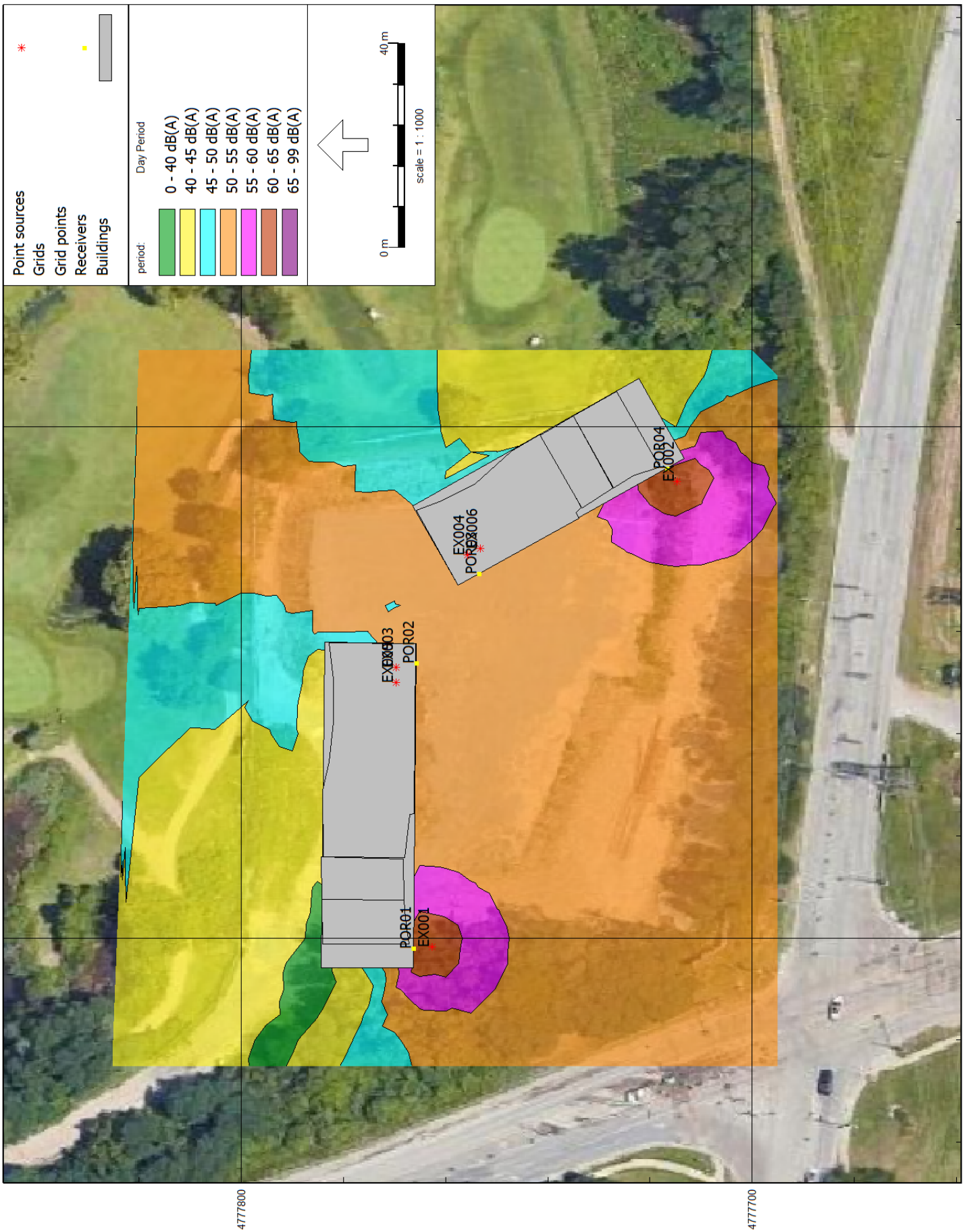


Figure 8: Unmitigated Evening Internal Stationary Noise

RJ Burnside

Internal Stationary Model

14 Dec 2023, 14:06

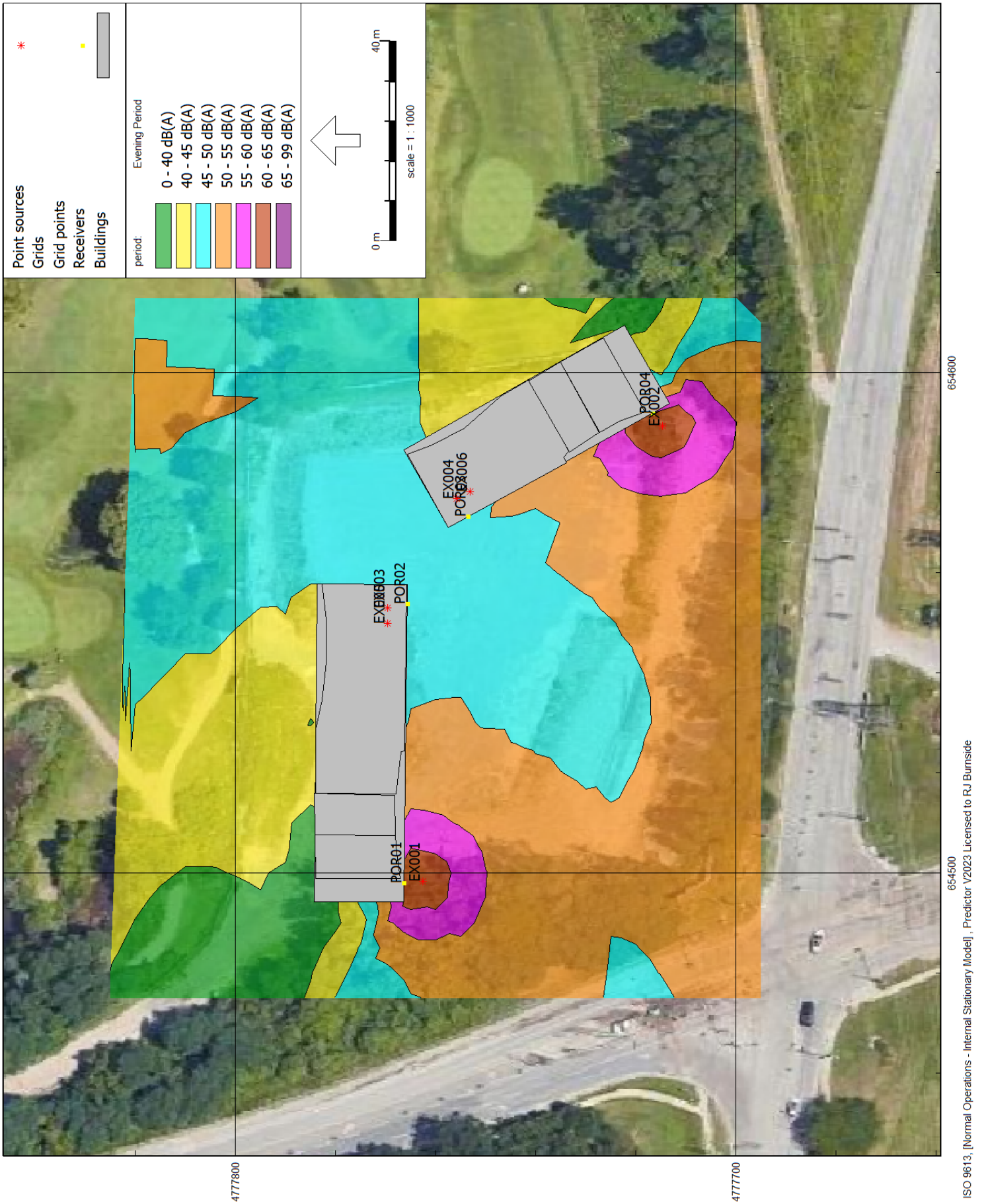


Figure 9: Unmitigated Nighttime Internal Stationary Noise

RJ Burnside

Internal Stationary Model

14 Dec 2023, 14:05

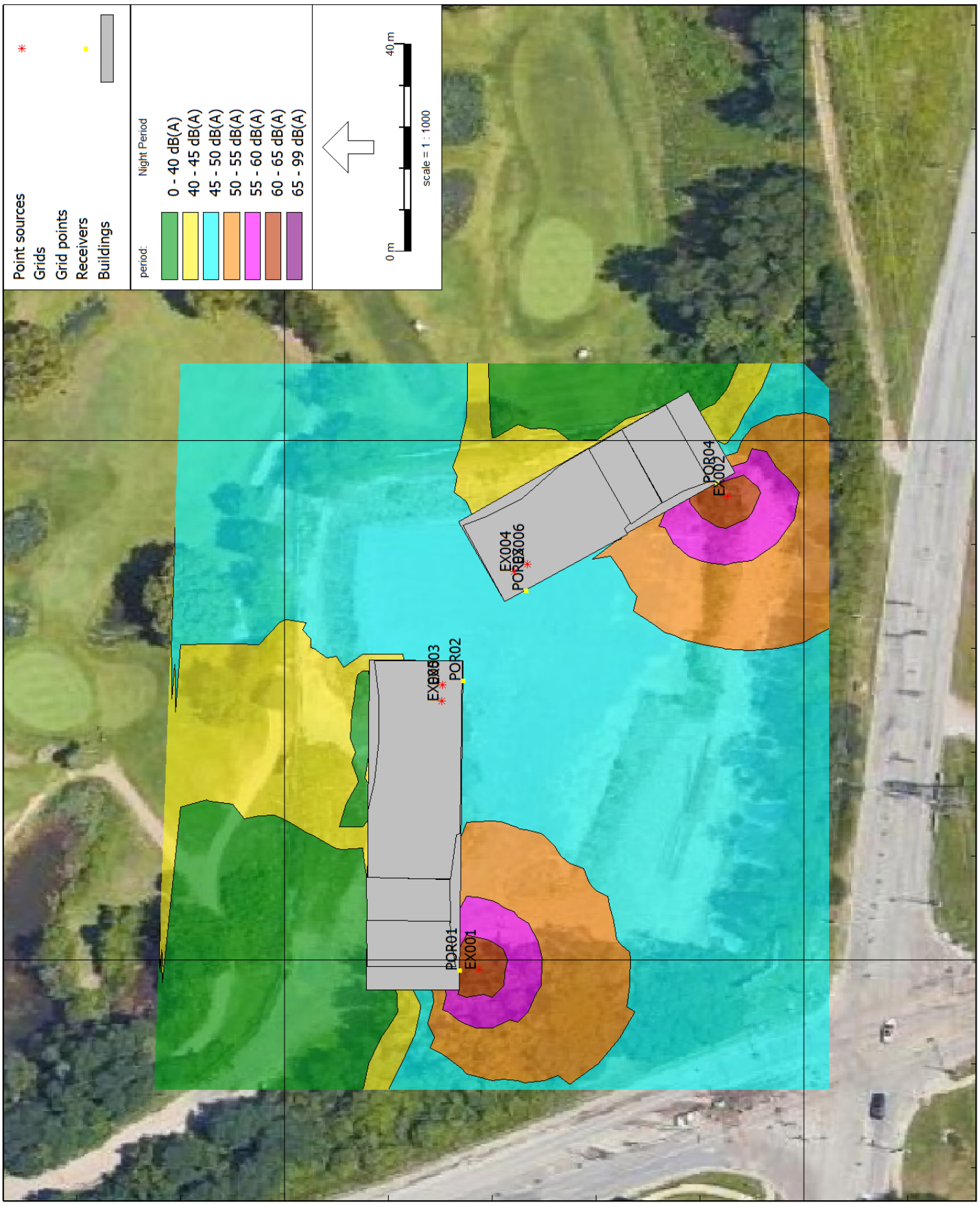


Figure 10: Mitigated Daytime Internal Stationary Noise

RJ Burnside

Internal Stationary Model - Mitigated

14 Dec 2023, 14:08

ISO 9613, [Normal Operations - Internal Stationary Model - Mitigated] , Predictor V2023 Licensed to RJ Burnside

Figure 11: Mitigated Evening Internal Stationary Noise

RJ Burnside

Internal Stationary Model - Mitigated

14 Dec 2023, 14:08

Figure 12: Mitigated Nighttime Internal Stationary Noise

RJ Burnside

Internal Stationary Model - Mitigated

14 Dec 2023, 14:09

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

Traffic Data

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Niagara Region
Street: 610274 - EB
Location: 610274

A study of vehicle traffic was conducted with the device having serial number 403585. The study was done in the EB lane at 610274 - EB in Niagara Region, ON in county. The study began on 2021-09-01 at 12:00 AM and concluded on 2021-09-02 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 5,525 vehicles passed through the location with a peak volume of 138 on 2021-09-01 at [04:45 PM-05:00 PM] and a minimum volume of 1 on 2021-09-01 at [12:45 AM-01:00 AM]. The AADT count for this study was 5,525.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 50 - 55 KM/H range or lower. The average speed for all classifed vehicles was 56 KM/H with 81.15% vehicles exceeding the posted speed of 50 KM/H. 0.33% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 50KM/H and the 85th percentile was 64.35 KM/H.

< to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to >
150	258	621	1668	1248	798	447	161	56	33	18	0	0	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.
Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 5042 which represents 92 percent of the total classified vehicles. The number of Small Trucks in the study was 109 which represents 2 percent of the total classified vehicles. The number of Trucks/Buses in the study was 215 which represents 4 percent of the total classified vehicles. The number of Tractor Trailers in the study was 92 which represents 2 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 21.9	22.0 to >							
1963	3079	109	215	50	11	21	10							

CHART 2

HEADWAY

During the peak traffic period, on 2021-09-01 at [04:45 PM-05:00 PM] the average headway between vehicles was 6.475 seconds. During the slowest traffic period, on 2021-09-01 at [12:45 AM-01:00 AM] the average headway between vehicles was 450 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 22.00 and 38.00 degrees C.

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Niagara Region
Street: 610274 - WB
Location: 610274

A study of vehicle traffic was conducted with the device having serial number 135571. The study was done in the WB lane at 610274 - WB in Niagara Region, ON in county. The study began on 2021-09-01 at 12:00 AM and concluded on 2021-09-02 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 5,197 vehicles passed through the location with a peak volume of 159 on 2021-09-01 at [05:15 PM-05:30 PM] and a minimum volume of 1 on 2021-09-01 at [02:00 AM-02:15 AM]. The AADT count for this study was 5,197.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 50 - 55 KM/H range or lower. The average speed for all classifed vehicles was 50 KM/H with 61.17% vehicles exceeding the posted speed of 50 KM/H. 0.21% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 50KM/H and the 85th percentile was 56.80 KM/H.

< to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to >
249	491	1269	2150	661	215	79	26	18	5	11	0	0	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.
Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 4951 which represents 96 percent of the total classified vehicles. The number of Small Trucks in the study was 132 which represents 3 percent of the total classified vehicles. The number of Trucks/Buses in the study was 51 which represents 1 percent of the total classified vehicles. The number of Tractor Trailers in the study was 40 which represents 1 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 21.9	22.0 to >							
3740	1211	132	51	10	12	17	1							

CHART 2

HEADWAY

During the peak traffic period, on 2021-09-01 at [05:15 PM-05:30 PM] the average headway between vehicles was 5.625 seconds. During the slowest traffic period, on 2021-09-01 at [02:00 AM-02:15 AM] the average headway between vehicles was 450 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 24.00 and 42.00 degrees C.

Time/Class Report

Device ID: 403585	**Location:** 7894			**Raw Count:** 5,525	
Operator: MD	**Lane:** EB			**AADT Count:** 5,525	
Begin: 09-01-2021 12:00 AM	**Street:** 610274 - EB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 50	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[00:00-00:15]	3	3	0	0	0	0	0	0	6
[00:15-00:30]	4	1	0	0	0	0	0	0	5
[00:30-00:45]	4	5	0	0	0	0	0	0	9
[00:45-01:00]	1	0	0	0	0	0	0	0	1
	12	9	0	0	0	0	0	0	21
[01:00-01:15]	7	0	0	0	0	0	0	0	7
[01:15-01:30]	0	1	0	0	0	0	0	0	1
[01:30-01:45]	0	1	0	0	0	0	0	0	1
[01:45-02:00]	1	1	0	0	0	0	0	0	2
	8	3	0	0	0	0	0	0	11
[02:00-02:15]	0	2	0	0	0	0	0	0	2
[02:15-02:30]	0	2	0	0	0	0	0	0	2
[02:30-02:45]	2	1	0	0	0	0	0	0	3
[02:45-03:00]	1	1	0	0	0	0	0	0	2
	3	6	0	0	0	0	0	0	9
[03:00-03:15]	0	2	0	0	0	0	0	0	2
[03:15-03:30]	1	1	0	0	0	0	0	0	2
[03:30-03:45]	1	0	0	0	0	0	0	0	1
[03:45-04:00]	0	2	0	0	0	0	0	0	2
	2	5	0	0	0	0	0	0	7
[04:00-04:15]	0	2	0	0	0	0	0	0	2
[04:15-04:30]	1	1	0	0	0	0	0	0	2
[04:30-04:45]	0	2	1	0	0	0	0	0	3
[04:45-05:00]	0	1	0	0	0	0	0	0	1
	1	6	1	0	0	0	0	0	8
[05:00-05:15]	1	5	0	0	0	1	0	0	7
[05:15-05:30]	7	14	1	0	0	0	0	0	22
[05:30-05:45]	5	5	0	0	0	0	0	0	10
[05:45-06:00]	13	13	2	1	0	0	0	0	29
	26	37	3	1	0	1	0	0	68
[06:00-06:15]	13	24	0	0	0	0	0	0	37
[06:15-06:30]	18	28	0	0	0	0	0	0	46
[06:30-06:45]	19	30	2	0	1	0	0	0	52
[06:45-07:00]	17	24	2	0	1	0	0	0	44
	67	106	4	0	2	0	0	0	179
[07:00-07:15]	10	20	0	1	1	0	0	0	32
[07:15-07:30]	16	30	3	3	0	0	1	0	53
[07:30-07:45]	24	32	1	5	0	0	1	1	64

Time/Class Report

Device ID: 403585	**Location:** 7894			**Raw Count:** 5,525	
Operator: MD	**Lane:** EB			**AADT Count:** 5,525	
Begin: 09-01-2021 12:00 AM	**Street:** 610274 - EB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 50	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[07:45-08:00]	27	40	1	5	0	0	0	0	73
	77	122	5	14	1	0	2	1	222
[08:00-08:15]	19	49	1	3	1	0	1	0	74
[08:15-08:30]	29	54	3	5	0	0	0	1	92
[08:30-08:45]	32	53	2	3	3	0	1	0	94
[08:45-09:00]	31	63	0	3	1	0	1	0	99
	111	219	6	14	5	0	3	1	359
[09:00-09:15]	10	47	0	2	0	0	1	0	60
[09:15-09:30]	28	50	2	5	0	0	0	1	86
[09:30-09:45]	21	41	4	7	2	0	0	0	75
[09:45-10:00]	27	61	2	3	2	1	1	0	97
	86	199	8	17	4	1	2	1	318
[10:00-10:15]	22	48	1	9	0	0	1	0	81
[10:15-10:30]	27	36	0	4	1	1	0	0	69
[10:30-10:45]	44	30	3	4	1	0	0	0	82
[10:45-11:00]	27	47	2	4	1	0	0	0	81
	120	161	6	21	3	1	1	0	313
[11:00-11:15]	36	48	2	7	2	0	0	0	95
[11:15-11:30]	35	53	3	5	1	0	1	1	99
[11:30-11:45]	37	48	1	7	0	1	2	1	97
[11:45-12:00]	23	55	0	7	2	1	2	0	90
	131	204	6	26	5	2	5	2	381
[12:00-12:15]	37	61	0	2	1	1	0	1	103
[12:15-12:30]	27	55	0	4	1	0	0	0	87
[12:30-12:45]	32	66	1	7	1	1	0	1	109
[12:45-13:00]	28	59	4	3	0	0	1	1	96
	124	241	5	16	3	2	1	3	395
[13:00-13:15]	29	48	2	8	0	0	0	1	88
[13:15-13:30]	37	50	1	1	2	0	1	0	92
[13:30-13:45]	38	46	4	3	1	0	0	0	92
[13:45-14:00]	41	40	5	6	2	0	0	0	94
	145	184	12	18	5	0	1	1	366
[14:00-14:15]	34	55	0	3	1	1	0	0	94
[14:15-14:30]	31	58	1	5	2	0	1	0	98
[14:30-14:45]	42	54	3	4	3	0	0	0	106
[14:45-15:00]	39	61	5	7	0	0	1	0	113
	146	228	9	19	6	1	2	0	411

Time/Class Report

Device ID: 403585	**Location:** 7894			**Raw Count:** 5,525	
Operator: MD	**Lane:** EB			**AADT Count:** 5,525	
Begin: 09-01-2021 12:00 AM	**Street:** 610274 - EB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 50	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[15:00-15:15]	31	71	5	6	2	0	0	0	115
[15:15-15:30]	34	58	2	8	3	0	0	0	105
[15:30-15:45]	43	61	6	5	2	0	1	0	118
[15:45-16:00]	37	68	5	4	0	0	0	0	114
	145	258	18	23	7	0	1	0	452
[16:00-16:15]	38	66	2	5	0	2	1	0	114
[16:15-16:30]	48	62	4	5	2	0	1	1	123
[16:30-16:45]	42	68	3	7	0	0	0	0	120
[16:45-17:00]	54	75	3	3	0	0	0	0	135
	182	271	12	20	2	2	2	1	492
[17:00-17:15]	40	64	4	5	2	0	0	0	115
[17:15-17:30]	40	56	2	5	3	0	0	0	106
[17:30-17:45]	43	56	3	5	0	0	1	0	108
[17:45-18:00]	44	55	0	1	0	0	0	0	100
	167	231	9	16	5	0	1	0	429
[18:00-18:15]	45	50	1	3	0	0	0	0	99
[18:15-18:30]	33	51	1	0	0	0	0	0	85
[18:30-18:45]	19	42	0	2	0	0	0	0	63
[18:45-19:00]	23	46	0	0	0	0	0	0	69
	120	189	2	5	0	0	0	0	316
[19:00-19:15]	23	51	0	0	0	0	0	0	74
[19:15-19:30]	24	31	0	1	2	0	0	0	58
[19:30-19:45]	17	34	0	0	0	1	0	0	52
[19:45-20:00]	23	43	0	1	0	0	0	0	67
	87	159	0	2	2	1	0	0	251
[20:00-20:15]	34	31	1	2	0	0	0	0	68
[20:15-20:30]	24	29	2	0	0	0	0	0	55
[20:30-20:45]	22	20	0	0	0	0	0	0	42
[20:45-21:00]	17	23	0	1	0	0	0	0	41
	97	103	3	3	0	0	0	0	206
[21:00-21:15]	17	21	0	0	0	0	0	0	38
[21:15-21:30]	14	15	0	0	0	0	0	0	29
[21:30-21:45]	10	14	0	0	0	0	0	0	24
[21:45-22:00]	13	9	0	0	0	0	0	0	22
	54	59	0	0	0	0	0	0	113
[22:00-22:15]	8	10	0	0	0	0	0	0	18
[22:15-22:30]	8	11	0	0	0	0	0	0	19
[22:30-22:45]	11	17	0	0	0	0	0	0	28

Time/Class Report

Device ID: 403585	**Location:** 7894			**Raw Count:** 5,525	
Operator: MD	**Lane:** EB			**AADT Count:** 5,525	
Begin: 09-01-2021 12:00 AM	**Street:** 610274 - EB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 50	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[22:45-23:00]	8	9	0	0	0	0	0	0	17
	35	47	0	0	0	0	0	0	82
[23:00-23:15]	8	10	0	0	0	0	0	0	18
[23:15-23:30]	3	6	0	0	0	0	0	0	9
[23:30-23:45]	1	11	0	0	0	0	0	0	12
[23:45-00:00]	5	5	0	0	0	0	0	0	10
	17	32	0	0	0	0	0	0	49
09-01-2021 12:00 AM									
09-02-2021 12:00 AM	1963	3079	109	215	50	11	21	10	5458

Time/Class Report

Device ID: 135571	**Location:** 7894			**Raw Count:** 5,197	
Operator: MD	**Lane:** WB			**AADT Count:** 5,197	
Begin: 09-01-2021 12:00 AM	**Street:** 610274 - WB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 50	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[00:00-00:15]	6	0	0	0	0	0	0	0	6
[00:15-00:30]	7	0	0	0	0	0	0	0	7
[00:30-00:45]	5	1	0	0	0	0	0	0	6
[00:45-01:00]	2	1	0	0	0	0	0	0	3
	20	2	0	0	0	0	0	0	22
[01:00-01:15]	3	0	0	0	0	0	0	0	3
[01:15-01:30]	1	1	0	0	0	0	0	0	2
[01:30-01:45]	2	0	0	0	0	0	0	0	2
[01:45-02:00]	3	0	0	0	0	0	0	0	3
	9	1	0	0	0	0	0	0	10
[02:00-02:15]	1	0	0	0	0	0	0	0	1
[02:15-02:30]	2	0	0	0	0	0	0	0	2
[02:30-02:45]	1	1	0	0	0	0	0	0	2
[02:45-03:00]	1	0	0	0	0	0	0	0	1
	5	1	0	0	0	0	0	0	6
[03:00-03:15]	1	0	0	0	0	0	0	0	1
[03:15-03:30]	1	0	0	0	0	0	0	0	1
[03:30-03:45]	0	0	0	0	0	0	1	0	1
[03:45-04:00]	2	0	0	0	0	0	0	0	2
	4	0	0	0	0	0	1	0	5
[04:00-04:15]	1	1	0	0	0	0	0	0	2
[04:15-04:30]	1	1	0	0	0	0	0	0	2
[04:30-04:45]	4	1	0	0	0	0	0	0	5
[04:45-05:00]	7	2	1	0	0	1	0	0	11
	13	5	1	0	0	1	0	0	20
[05:00-05:15]	4	1	0	0	0	0	0	0	5
[05:15-05:30]	8	2	0	0	0	0	0	0	10
[05:30-05:45]	17	5	0	0	0	0	0	0	22
[05:45-06:00]	13	6	0	0	0	0	0	0	19
	42	14	0	0	0	0	0	0	56
[06:00-06:15]	10	5	0	0	0	0	0	0	15
[06:15-06:30]	16	6	1	0	0	0	0	1	24
[06:30-06:45]	30	11	1	0	0	0	0	0	42
[06:45-07:00]	17	12	0	1	0	0	1	0	31
	73	34	2	1	0	0	1	1	112
[07:00-07:15]	24	19	2	2	0	1	0	0	48
[07:15-07:30]	36	12	7	0	0	0	1	0	56
[07:30-07:45]	41	17	3	0	1	0	0	0	62

Time/Class Report

Device ID: 135571	**Location:** 7894			**Raw Count:** 5,197	
Operator: MD	**Lane:** WB			**AADT Count:** 5,197	
Begin: 09-01-2021 12:00 AM	**Street:** 610274 - WB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 50	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[07:45-08:00]	52	12	3	0	0	0	0	0	67
	153	60	15	2	1	1	1	0	233
[08:00-08:15]	44	15	3	1	1	0	0	0	64
[08:15-08:30]	42	9	4	3	0	0	0	0	58
[08:30-08:45]	62	23	1	1	1	0	1	0	89
[08:45-09:00]	50	14	3	1	0	1	0	0	69
	198	61	11	6	2	1	1	0	280
[09:00-09:15]	60	12	2	1	0	0	1	0	76
[09:15-09:30]	58	25	1	1	1	0	0	0	86
[09:30-09:45]	60	19	0	3	0	1	0	0	83
[09:45-10:00]	45	15	2	1	0	1	1	0	65
	223	71	5	6	1	2	2	0	310
[10:00-10:15]	43	12	3	3	0	0	0	0	61
[10:15-10:30]	49	14	4	0	0	0	1	0	68
[10:30-10:45]	69	19	4	1	0	2	0	0	95
[10:45-11:00]	48	19	1	0	0	1	0	0	69
	209	64	12	4	0	3	1	0	293
[11:00-11:15]	64	23	3	1	0	0	0	0	91
[11:15-11:30]	70	22	5	4	1	0	0	0	102
[11:30-11:45]	51	20	1	0	0	0	1	0	73
[11:45-12:00]	52	16	5	1	1	0	1	0	76
	237	81	14	6	2	0	2	0	342
[12:00-12:15]	53	26	2	2	0	0	1	0	84
[12:15-12:30]	56	12	2	1	0	0	0	0	71
[12:30-12:45]	61	34	5	1	1	1	0	0	103
[12:45-13:00]	75	21	2	1	0	0	0	0	99
	245	93	11	5	1	1	1	0	357
[13:00-13:15]	64	19	3	0	1	0	0	0	87
[13:15-13:30]	74	25	4	1	1	0	1	0	106
[13:30-13:45]	67	11	6	0	1	0	0	0	85
[13:45-14:00]	80	20	1	1	0	0	1	0	103
	285	75	14	2	3	0	2	0	381
[14:00-14:15]	73	18	3	2	0	0	1	0	97
[14:15-14:30]	65	25	4	4	0	0	0	0	98
[14:30-14:45]	83	22	5	0	0	0	0	0	110
[14:45-15:00]	66	32	1	1	0	1	0	0	101
	287	97	13	7	0	1	1	0	406

Time/Class Report

Device ID: 135571	**Location:** 7894			**Raw Count:** 5,197	
Operator: MD	**Lane:** WB			**AADT Count:** 5,197	
Begin: 09-01-2021 12:00 AM	**Street:** 610274 - WB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 50	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[15:00-15:15]	67	28	1	0	0	0	0	0	96
[15:15-15:30]	69	15	3	1	0	0	2	0	90
[15:30-15:45]	63	27	3	0	0	0	1	0	94
[15:45-16:00]	68	26	3	1	0	0	0	0	98
	267	96	10	2	0	0	3	0	378
[16:00-16:15]	74	41	1	2	0	0	0	0	118
[16:15-16:30]	88	26	5	0	0	1	0	0	120
[16:30-16:45]	95	27	1	3	0	0	0	0	126
[16:45-17:00]	85	44	3	0	0	0	0	0	132
	342	138	10	5	0	1	0	0	496
[17:00-17:15]	85	36	3	1	0	0	0	0	125
[17:15-17:30]	124	30	3	1	0	0	0	0	158
[17:30-17:45]	59	20	0	1	0	0	0	0	80
[17:45-18:00]	67	25	1	1	0	0	1	0	95
	335	111	7	4	0	0	1	0	458
[18:00-18:15]	64	14	1	0	0	0	0	0	79
[18:15-18:30]	67	10	0	0	0	0	0	0	77
[18:30-18:45]	53	15	1	1	0	0	0	0	70
[18:45-19:00]	46	21	1	0	0	0	0	0	68
	230	60	3	1	0	0	0	0	294
[19:00-19:15]	54	18	0	0	0	0	0	0	72
[19:15-19:30]	55	17	0	0	0	0	0	0	72
[19:30-19:45]	43	9	0	0	0	1	0	0	53
[19:45-20:00]	44	13	1	0	0	0	0	0	58
	196	57	1	0	0	1	0	0	255
[20:00-20:15]	44	13	2	0	0	0	0	0	59
[20:15-20:30]	41	10	0	0	0	0	0	0	51
[20:30-20:45]	38	9	0	0	0	0	0	0	47
[20:45-21:00]	37	10	0	0	0	0	0	0	47
	160	42	2	0	0	0	0	0	204
[21:00-21:15]	19	4	1	0	0	0	0	0	24
[21:15-21:30]	25	2	0	0	0	0	0	0	27
[21:30-21:45]	20	5	0	0	0	0	0	0	25
[21:45-22:00]	26	10	0	0	0	0	0	0	36
	90	21	1	0	0	0	0	0	112
[22:00-22:15]	20	10	0	0	0	0	0	0	30
[22:15-22:30]	15	6	0	0	0	0	0	0	21
[22:30-22:45]	20	0	0	0	0	0	0	0	20

Time/Class Report

Device ID: 135571	**Location:** 7894			**Raw Count:** 5,197	
Operator: MD	**Lane:** WB			**AADT Count:** 5,197	
Begin: 09-01-2021 12:00 AM	**Street:** 610274 - WB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 50	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[22:45-23:00]	19	1	0	0	0	0	0	0	20
	74	17	0	0	0	0	0	0	91
[23:00-23:15]	22	7	0	0	0	0	0	0	29
[23:15-23:30]	8	2	0	0	0	0	0	0	10
[23:30-23:45]	6	0	0	0	0	0	0	0	6
[23:45-00:00]	7	1	0	0	0	0	0	0	8
	43	10	0	0	0	0	0	0	53
09-01-2021 12:00 AM									
09-02-2021 12:00 AM	3740	1211	132	51	10	12	17	1	5174

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Niagara Region
Street: 610275 - NB
Location: 610275

A study of vehicle traffic was conducted with the device having serial number 135173. The study was done in the NB lane at 610275 - NB in Niagara Region, ON in county. The study began on 2021-09-01 at 12:00 AM and concluded on 2021-09-02 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 5,120 vehicles passed through the location with a peak volume of 112 on 2021-09-01 at [02:30 PM-02:45 PM] and a minimum volume of 0 on 2021-09-01 at [01:15 AM-01:30 AM]. The AADT count for this study was 5,120.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 60 - 65 KM/H range or lower. The average speed for all classifed vehicles was 60 KM/H with 53.64% vehicles exceeding the posted speed of 60 KM/H. 1.16% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 60KM/H and the 85th percentile was 69.34 KM/H.

< to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to >
139	55	181	785	1193	1246	824	375	151	68	36	23	0	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.
Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 4967 which represents 98 percent of the total classified vehicles. The number of Small Trucks in the study was 42 which represents 1 percent of the total classified vehicles. The number of Trucks/Buses in the study was 55 which represents 1 percent of the total classified vehicles. The number of Tractor Trailers in the study was 12 which represents 0 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 21.9	22.0 to >							
2990	1977	42	55	2	3	5	2							

CHART 2

HEADWAY

During the peak traffic period, on 2021-09-01 at [02:30 PM-02:45 PM] the average headway between vehicles was 7.965 seconds. During the slowest traffic period, on 2021-09-01 at [01:15 AM-01:30 AM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 24.00 and 35.00 degrees C.

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Niagara Region
Street: 610275 - SB
Location: 610275

A study of vehicle traffic was conducted with the device having serial number 132657. The study was done in the SB lane at 610275 - SB in Niagara Region, ON in county. The study began on 2021-09-01 at 12:00 AM and concluded on 2021-09-02 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 5,467 vehicles passed through the location with a peak volume of 180 on 2021-09-01 at [05:15 PM-05:30 PM] and a minimum volume of 0 on 2021-09-01 at [02:00 AM-02:15 AM]. The AADT count for this study was 5,467.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 55 - 60 KM/H range or lower. The average speed for all classifed vehicles was 56 KM/H with 25.47% vehicles exceeding the posted speed of 60 KM/H. 0.20% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 55KM/H and the 85th percentile was 63.19 KM/H.

< to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to >
104	190	796	1404	1561	892	292	120	47	24	7	4	0	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.
Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 5295 which represents 97 percent of the total classified vehicles. The number of Small Trucks in the study was 76 which represents 1 percent of the total classified vehicles. The number of Trucks/Buses in the study was 55 which represents 1 percent of the total classified vehicles. The number of Tractor Trailers in the study was 15 which represents 0 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 21.9	22.0 to >							
3977	1318	76	55	4	6	4	1							

CHART 2

HEADWAY

During the peak traffic period, on 2021-09-01 at [05:15 PM-05:30 PM] the average headway between vehicles was 4.972 seconds. During the slowest traffic period, on 2021-09-01 at [02:00 AM-02:15 AM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 25.00 and 41.00 degrees C.

Time/Class Report

Device ID: 135173	**Location:** 7895			**Raw Count:** 5,120	
Operator: MD	**Lane:** NB			**AADT Count:** 5,120	
Begin: 09-01-2021 12:00 AM	**Street:** 610275 - NB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 60	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[00:00-00:15]	1	1	0	0	0	0	0	0	2
[00:15-00:30]	4	2	0	0	0	0	0	0	6
[00:30-00:45]	2	1	0	0	0	0	0	0	3
[00:45-01:00]	2	2	0	0	0	0	0	0	4
	9	6	0	0	0	0	0	0	15
[01:00-01:15]	5	0	0	0	0	0	0	0	5
[01:15-01:30]	0	0	0	0	0	0	0	0	0
[01:30-01:45]	1	1	0	0	0	0	0	0	2
[01:45-02:00]	1	2	0	0	0	0	0	0	3
	7	3	0	0	0	0	0	0	10
[02:00-02:15]	1	1	0	0	0	0	0	0	2
[02:15-02:30]	0	2	0	0	0	0	0	0	2
[02:30-02:45]	0	1	0	0	0	0	0	0	1
[02:45-03:00]	0	1	0	0	0	0	0	0	1
	1	5	0	0	0	0	0	0	6
[03:00-03:15]	0	0	0	0	0	0	0	0	0
[03:15-03:30]	3	0	0	0	0	0	0	0	3
[03:30-03:45]	0	2	0	0	0	0	0	0	2
[03:45-04:00]	2	0	0	0	0	0	0	0	2
	5	2	0	0	0	0	0	0	7
[04:00-04:15]	2	3	0	0	0	0	0	0	5
[04:15-04:30]	2	1	0	0	0	0	0	0	3
[04:30-04:45]	2	1	0	0	0	0	0	0	3
[04:45-05:00]	1	3	0	0	0	0	0	0	4
	7	8	0	0	0	0	0	0	15
[05:00-05:15]	4	1	0	0	0	0	0	0	5
[05:15-05:30]	7	6	0	0	0	0	0	0	13
[05:30-05:45]	7	8	0	0	0	0	0	0	15
[05:45-06:00]	13	10	0	0	0	0	0	0	23
	31	25	0	0	0	0	0	0	56
[06:00-06:15]	17	8	0	0	0	0	0	0	25
[06:15-06:30]	22	19	0	0	0	0	0	0	41
[06:30-06:45]	29	23	0	1	0	0	0	0	53
[06:45-07:00]	24	23	0	0	0	0	0	0	47
	92	73	0	1	0	0	0	0	166
[07:00-07:15]	19	15	0	1	0	0	0	0	35
[07:15-07:30]	19	22	0	2	0	0	0	0	43
[07:30-07:45]	36	15	0	2	0	0	0	0	53

Time/Class Report

Device ID: 135173	**Location:** 7895			**Raw Count:** 5,120	
Operator: MD	**Lane:** NB			**AADT Count:** 5,120	
Begin: 09-01-2021 12:00 AM	**Street:** 610275 - NB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 60	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[07:45-08:00]	35	26	2	1	0	0	0	0	64
	109	78	2	6	0	0	0	0	195
[08:00-08:15]	33	22	0	2	0	0	0	0	57
[08:15-08:30]	33	39	0	3	0	0	0	1	76
[08:30-08:45]	53	26	2	0	1	0	0	0	82
[08:45-09:00]	41	43	1	2	0	0	1	0	88
	160	130	3	7	1	0	1	1	303
[09:00-09:15]	33	30	0	0	0	0	0	0	63
[09:15-09:30]	53	25	0	2	0	0	0	0	80
[09:30-09:45]	47	27	0	2	0	0	0	0	76
[09:45-10:00]	54	29	1	3	0	0	0	0	87
	187	111	1	7	0	0	0	0	306
[10:00-10:15]	38	38	2	1	0	0	0	0	79
[10:15-10:30]	35	36	1	2	0	0	0	0	74
[10:30-10:45]	46	39	0	1	0	0	0	0	86
[10:45-11:00]	42	34	1	0	0	0	0	0	77
	161	147	4	4	0	0	0	0	316
[11:00-11:15]	49	31	0	2	0	0	0	1	83
[11:15-11:30]	60	33	1	0	0	0	0	0	94
[11:30-11:45]	66	36	2	2	0	0	0	0	106
[11:45-12:00]	56	43	2	1	0	0	1	0	103
	231	143	5	5	0	0	1	1	386
[12:00-12:15]	54	44	3	3	0	1	0	0	105
[12:15-12:30]	49	36	0	1	0	0	0	0	86
[12:30-12:45]	50	44	0	1	0	0	0	0	95
[12:45-13:00]	64	37	2	2	0	0	0	0	105
	217	161	5	7	0	1	0	0	391
[13:00-13:15]	44	38	0	1	0	0	0	0	83
[13:15-13:30]	60	34	1	2	0	0	0	0	97
[13:30-13:45]	57	27	0	0	0	0	0	0	84
[13:45-14:00]	62	26	0	3	0	0	0	0	91
	223	125	1	6	0	0	0	0	355
[14:00-14:15]	50	23	1	0	0	0	0	0	74
[14:15-14:30]	58	41	3	1	0	0	0	0	103
[14:30-14:45]	69	41	1	0	0	0	0	0	111
[14:45-15:00]	60	42	1	1	0	0	0	0	104
	237	147	6	2	0	0	0	0	392

Time/Class Report

Device ID: 135173	**Location:** 7895			**Raw Count:** 5,120	
Operator: MD	**Lane:** NB			**AADT Count:** 5,120	
Begin: 09-01-2021 12:00 AM	**Street:** 610275 - NB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 60	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[15:00-15:15]	63	39	0	1	0	0	0	0	103
[15:15-15:30]	63	39	0	3	0	1	0	0	106
[15:30-15:45]	69	29	0	0	0	0	1	0	99
[15:45-16:00]	62	38	1	0	0	0	0	0	101
	257	145	1	4	0	1	1	0	409
[16:00-16:15]	64	34	0	0	0	0	0	0	98
[16:15-16:30]	55	33	1	1	0	0	1	0	91
[16:30-16:45]	71	35	2	0	0	0	0	0	108
[16:45-17:00]	74	32	1	1	0	1	0	0	109
	264	134	4	2	0	1	1	0	406
[17:00-17:15]	51	33	2	2	0	0	0	0	88
[17:15-17:30]	42	28	1	1	0	0	0	0	72
[17:30-17:45]	58	31	1	0	0	0	1	0	91
[17:45-18:00]	65	34	1	0	0	0	0	0	100
	216	126	5	3	0	0	1	0	351
[18:00-18:15]	52	37	0	1	0	0	0	0	90
[18:15-18:30]	42	43	2	0	0	0	0	0	87
[18:30-18:45]	31	38	1	0	1	0	0	0	71
[18:45-19:00]	41	28	0	0	0	0	0	0	69
	166	146	3	1	1	0	0	0	317
[19:00-19:15]	37	24	0	0	0	0	0	0	61
[19:15-19:30]	41	26	1	0	0	0	0	0	68
[19:30-19:45]	31	24	0	0	0	0	0	0	55
[19:45-20:00]	38	20	0	0	0	0	0	0	58
	147	94	1	0	0	0	0	0	242
[20:00-20:15]	37	17	0	0	0	0	0	0	54
[20:15-20:30]	38	20	0	0	0	0	0	0	58
[20:30-20:45]	32	15	0	0	0	0	0	0	47
[20:45-21:00]	23	15	0	0	0	0	0	0	38
	130	67	0	0	0	0	0	0	197
[21:00-21:15]	22	21	0	0	0	0	0	0	43
[21:15-21:30]	21	11	0	0	0	0	0	0	32
[21:30-21:45]	20	11	0	0	0	0	0	0	31
[21:45-22:00]	12	11	0	0	0	0	0	0	23
	75	54	0	0	0	0	0	0	129
[22:00-22:15]	10	7	1	0	0	0	0	0	18
[22:15-22:30]	7	10	0	0	0	0	0	0	17
[22:30-22:45]	16	9	0	0	0	0	0	0	25

Time/Class Report

Device ID: 135173	**Location:** 7895			**Raw Count:** 5,120	
Operator: MD	**Lane:** NB			**AADT Count:** 5,120	
Begin: 09-01-2021 12:00 AM	**Street:** 610275 - NB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 60	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[22:45-23:00]	8	8	0	0	0	0	0	0	16
	41	34	1	0	0	0	0	0	76
[23:00-23:15]	8	5	0	0	0	0	0	0	13
[23:15-23:30]	2	4	0	0	0	0	0	0	6
[23:30-23:45]	4	1	0	0	0	0	0	0	5
[23:45-00:00]	3	3	0	0	0	0	0	0	6
	17	13	0	0	0	0	0	0	30
09-01-2021 12:00 AM									
09-02-2021 12:00 AM	2990	1977	42	55	2	3	5	2	5076

Time/Class Report

Device ID: 132657	**Location:** 7895			**Raw Count:** 5,467	
Operator: MD	**Lane:** SB			**AADT Count:** 5,467	
Begin: 09-01-2021 12:00 AM	**Street:** 610275 - SB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 60	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[00:00-00:15]	6	2	0	0	0	0	0	0	8
[00:15-00:30]	5	0	0	0	0	0	0	0	5
[00:30-00:45]	4	2	0	0	0	0	0	0	6
[00:45-01:00]	2	1	0	0	0	0	0	0	3
	17	5	0	0	0	0	0	0	22
[01:00-01:15]	3	1	0	0	0	0	0	0	4
[01:15-01:30]	1	0	0	0	0	0	0	0	1
[01:30-01:45]	2	1	0	0	0	0	0	0	3
[01:45-02:00]	2	1	0	0	0	0	0	0	3
	8	3	0	0	0	0	0	0	11
[02:00-02:15]	0	0	0	0	0	0	0	0	0
[02:15-02:30]	0	0	0	0	0	0	0	0	0
[02:30-02:45]	1	0	0	0	0	0	0	0	1
[02:45-03:00]	1	2	0	0	0	0	0	0	3
	2	2	0	0	0	0	0	0	4
[03:00-03:15]	2	0	0	0	0	0	0	0	2
[03:15-03:30]	1	1	0	0	0	0	0	0	2
[03:30-03:45]	1	0	0	0	0	1	0	0	2
[03:45-04:00]	0	1	0	0	0	0	0	0	1
	4	2	0	0	0	1	0	0	7
[04:00-04:15]	1	0	0	0	0	0	0	0	1
[04:15-04:30]	1	0	0	0	0	0	0	0	1
[04:30-04:45]	2	0	0	0	0	0	0	0	2
[04:45-05:00]	2	2	0	0	0	0	0	0	4
	6	2	0	0	0	0	0	0	8
[05:00-05:15]	4	2	0	0	0	0	0	0	6
[05:15-05:30]	3	1	0	0	0	0	0	0	4
[05:30-05:45]	11	2	0	0	0	0	0	0	13
[05:45-06:00]	5	3	2	0	0	0	0	0	10
	23	8	2	0	0	0	0	0	33
[06:00-06:15]	6	2	0	0	0	0	0	0	8
[06:15-06:30]	12	5	0	0	0	0	0	0	17
[06:30-06:45]	16	6	0	0	0	0	0	0	22
[06:45-07:00]	17	3	0	0	0	0	0	0	20
	51	16	0	0	0	0	0	0	67
[07:00-07:15]	18	12	0	1	0	0	0	0	31
[07:15-07:30]	30	5	1	0	0	0	0	0	36
[07:30-07:45]	23	11	1	0	0	0	0	0	35

Time/Class Report

Device ID: 132657	**Location:** 7895			**Raw Count:** 5,467	
Operator: MD	**Lane:** SB			**AADT Count:** 5,467	
Begin: 09-01-2021 12:00 AM	**Street:** 610275 - SB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 60	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[07:45-08:00]	33	13	0	0	0	0	0	0	46
	104	41	2	1	0	0	0	0	148
[08:00-08:15]	38	16	0	2	0	0	0	0	56
[08:15-08:30]	49	14	3	1	0	0	0	0	67
[08:30-08:45]	55	19	0	2	0	0	0	0	76
[08:45-09:00]	49	17	1	0	0	0	0	0	67
	191	66	4	5	0	0	0	0	266
[09:00-09:15]	55	13	1	2	0	0	0	0	71
[09:15-09:30]	51	17	3	0	0	0	0	0	71
[09:30-09:45]	61	16	3	2	0	0	0	0	82
[09:45-10:00]	55	23	2	0	0	0	0	0	80
	222	69	9	4	0	0	0	0	304
[10:00-10:15]	62	16	1	2	0	0	0	0	81
[10:15-10:30]	53	19	2	1	0	0	0	0	75
[10:30-10:45]	69	26	0	0	0	1	0	0	96
[10:45-11:00]	58	23	1	0	0	0	0	0	82
	242	84	4	3	0	1	0	0	334
[11:00-11:15]	55	20	2	1	0	0	0	0	78
[11:15-11:30]	62	30	0	2	1	0	2	0	97
[11:30-11:45]	70	16	2	3	0	0	0	0	91
[11:45-12:00]	61	26	3	3	0	0	0	0	93
	248	92	7	9	1	0	2	0	359
[12:00-12:15]	67	20	1	3	0	0	0	0	91
[12:15-12:30]	60	21	0	2	0	0	0	0	83
[12:30-12:45]	81	31	2	1	0	1	0	0	116
[12:45-13:00]	80	27	3	0	0	0	0	0	110
	288	99	6	6	0	1	0	0	400
[13:00-13:15]	80	22	2	0	1	0	1	0	106
[13:15-13:30]	75	25	1	0	1	0	0	0	102
[13:30-13:45]	75	24	3	2	0	0	0	0	104
[13:45-14:00]	81	29	1	1	0	0	0	0	112
	311	100	7	3	2	0	1	0	424
[14:00-14:15]	87	29	1	3	0	0	0	1	121
[14:15-14:30]	87	30	3	3	0	0	0	0	123
[14:30-14:45]	82	22	1	2	0	0	0	0	107
[14:45-15:00]	88	20	2	0	0	0	0	0	110
	344	101	7	8	0	0	0	1	461

Time/Class Report

Device ID: 132657	**Location:** 7895			**Raw Count:** 5,467	
Operator: MD	**Lane:** SB			**AADT Count:** 5,467	
Begin: 09-01-2021 12:00 AM	**Street:** 610275 - SB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 60	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[15:00-15:15]	77	27	0	0	0	0	0	0	104
[15:15-15:30]	74	26	6	3	0	0	1	0	110
[15:30-15:45]	76	27	2	0	0	1	0	0	106
[15:45-16:00]	95	23	3	0	0	1	0	0	122
	322	103	11	3	0	2	1	0	442
[16:00-16:15]	84	34	0	0	0	0	0	0	118
[16:15-16:30]	90	40	2	0	0	0	0	0	132
[16:30-16:45]	90	30	0	2	0	0	0	0	122
[16:45-17:00]	102	46	4	2	0	0	0	0	154
	366	150	6	4	0	0	0	0	526
[17:00-17:15]	85	33	2	3	0	0	0	0	123
[17:15-17:30]	145	30	3	1	1	0	0	0	180
[17:30-17:45]	90	25	0	1	0	0	0	0	116
[17:45-18:00]	78	31	1	1	0	0	0	0	111
	398	119	6	6	1	0	0	0	530
[18:00-18:15]	57	16	1	2	0	1	0	0	77
[18:15-18:30]	61	14	0	0	0	0	0	0	75
[18:30-18:45]	51	18	1	1	0	0	0	0	71
[18:45-19:00]	53	25	0	0	0	0	0	0	78
	222	73	2	3	0	1	0	0	301
[19:00-19:15]	42	18	0	0	0	0	0	0	60
[19:15-19:30]	63	19	0	0	0	0	0	0	82
[19:30-19:45]	55	15	0	0	0	0	0	0	70
[19:45-20:00]	48	13	1	0	0	0	0	0	62
	208	65	1	0	0	0	0	0	274
[20:00-20:15]	42	14	1	0	0	0	0	0	57
[20:15-20:30]	38	18	0	0	0	0	0	0	56
[20:30-20:45]	47	9	1	0	0	0	0	0	57
[20:45-21:00]	40	17	0	0	0	0	0	0	57
	167	58	2	0	0	0	0	0	227
[21:00-21:15]	19	7	0	0	0	0	0	0	26
[21:15-21:30]	35	6	0	0	0	0	0	0	41
[21:30-21:45]	21	3	0	0	0	0	0	0	24
[21:45-22:00]	32	7	0	0	0	0	0	0	39
	107	23	0	0	0	0	0	0	130
[22:00-22:15]	29	11	0	0	0	0	0	0	40
[22:15-22:30]	24	5	0	0	0	0	0	0	29
[22:30-22:45]	22	3	0	0	0	0	0	0	25

Time/Class Report

Device ID: 132657	**Location:** 7895			**Raw Count:** 5,467	
Operator: MD	**Lane:** SB			**AADT Count:** 5,467	
Begin: 09-01-2021 12:00 AM	**Street:** 610275 - SB			**AADT Factor:** 1	
End: 09-02-2021 12:00 AM	**City:** Niagara Region			**Speed Limit:** 60	
Hours: 24.00	**County:**				
Period (min): 15	**State:** ON				

Date And Time Range	< to 15	16 to 25	26 to 32	33 to 42	43 to 51	52 to 61	62 to 71	72 to >	Total
Wed,09-01-2021									
[22:45-23:00]	14	3	0	0	0	0	0	0	17
	89	22	0	0	0	0	0	0	111
[23:00-23:15]	22	7	0	0	0	0	0	0	29
[23:15-23:30]	7	3	0	0	0	0	0	0	10
[23:30-23:45]	6	0	0	0	0	0	0	0	6
[23:45-00:00]	2	5	0	0	0	0	0	0	7
	37	15	0	0	0	0	0	0	52
09-01-2021 12:00 AM									
09-02-2021 12:00 AM	3977	1318	76	55	4	6	4	1	5441

System Engineering
Engineering Services

1 Administration Road
Concord, ON, L4K 1B9
T: 905.669.3264
F: 905.760.3406

Train Count Data

TRANSMITTAL

To: *Destinataire :*	RJ Burnside 1465 Pickering Parkway, Suite 200, Pickering ON L1V 7G7	*Project :*	GRM-3.78 –St- Paul Avenue, Niagara Falls ON
Attn.:	Brent Miller	*Routing:*	Brent.Miller@rjburnside.com
From: *Expéditeur :*	Umair Naveed	*Date:*	2023/11/23
Cc:	Adjacent Development CN via e-mail		

☐ Urgent ☐ For Your Use ☐ For Review ■ For Your Information ☐ Confidential

Re: Train Traffic Data – CN Grimsby Subdivision near St Paul Avenue in Niagara Falls, ON

Please find attached the requested Train Traffic Data; this data does not reflect GO Metrolinx Traffic. The application fee in the amount of **$500.00** +HST will be invoiced.

Should you have any questions, please do not hesitate to contact the undersigned at permits.gld@cn.ca.

Sincerely,

Umair Naveed

Umair Naveed
Officer Public Works- Great Lakes Division
permits.gld@cn.ca

Date: 2023/11/23 Project Number: GRM-3.78- St Paul Avenue , Niagara Falls ON

Dear Brent:

Re: Train Traffic Data – CN Grimsby Subdivision near St Paul Avenue in Niagara Falls, ON

The following is provided in response to Brent's 2023/09/20 request for information regarding rail traffic in the vicinity of St Paul Avenue in Niagara Falls at approximately Mile 3.78 on CN's Grimsby Subdivision.

Typical daily traffic volumes are recorded below. However, traffic volumes may fluctuate due to overall economic conditions, varying traffic demands, weather conditions, track maintenance programs, statutory holidays and traffic detours that when required may be heavy although temporary. For the purpose of noise and vibration reports, train volumes must be escalated by 2.5% per annum for a 10-year period.

Typical daily traffic volumes at this site location are as follows:

***Maximum train speed is given in Miles per Hour**

	0700-2300			
Type of Train	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	4	140	60	4
Way Freight	0	25	60	2
Passenger	2	10	80	2

	2300-0700			
Type of Train	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	0	140	60	4
Way Freight	2	25	60	2
Passenger	0	10	80	2

The volumes recorded reflect westbound and eastbound freight and passenger operations on CN's Grimsby Subdivision.

Except where anti-whistling bylaws are in effect, engine-warning whistles and bells are normally sounded at all at-grade crossings. There are three (3) at-grade crossings in the immediate vicinity of the study area at Mile 2.63 Church's Lane Xing, Mile 2.84 Stanley Ave Xing and Mile 4.39 Dorchester Road Xing. Anti-whistling bylaws are in effect at these crossings. Please note that engine warning whistles may be sounded in cases of emergency, as a safety and or warning precaution at station locations and pedestrian crossings and occasionally for operating requirements.

With respect to equipment restrictions, the gross weight of the heaviest permissible car is 286,000 lbs.

The double mainline track is considered to be continuously welded rail throughout the study area. The presence of two (2) switches located at Mile 2.75 and Mile 2.4 may exacerbate the noise and vibration caused by train movements.

The Canadian National Railway continues to be strongly opposed to locating developments near railway facilities and rights-of-way due to potential safety and environmental conflicts. Development adjacent to the Railway Right-of-Way is not appropriate without sound impact mitigation measures to reduce the incompatibility. For confirmation of the applicable rail noise, vibration and safety standards, Adjacent Development, Canadian National Railway Properties at Proximity@cn.ca should be contacted directly.

I trust the above information will satisfy your current request.

Sincerely,

Umair Naveed

Umair Naveed
Officer Public Works- Great Lakes Division
permits.gld@cn.ca

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix B

MECP Sound Level Limits

APPENDIX B

Table B-1: Sound Level Limit for Outdoor Living Areas – Road and Rail

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

Table B-2: Indoor Sound Level Limits – Road and Rail

Type of Space	Time Period	L_{eq} (dBA)	
		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
Sleeping quarters	23:00 – 07:00	40	35

Table B-3: Road Noise Control Measures – Outdoor Living Areas

Sound Levels	Measures
≤ 55 dBA	Noise control measures may not be required.
> 55 dBA and ≤ 60 dBA	Noise control measures may be applied, otherwise warning clause Type A.
> 60 dBA	Noise control measures should be implemented to reduce the levels to 55 dBA, otherwise warning clause Type B.

Table B-4: Plane of a Window – Ventilation Requirements

Daytime Period, 07:00 – 23:00 Hours

Sound Levels	Measures
≤ 55 dBA	Noise control measures may not be required.
> 55 dBA and ≤ 65 dBA	The dwelling should be designed with a provision of for the installation of central air conditioning in the future, at the occupant's discretion. Warning clause Type C is also recommended.
> 65 dBA	Installation of central air conditioning should be implemented with a warning clause Type D. In addition, building components including windows, walls and doors, where applicable, should be designed so that the indoor sound levels comply with the sound level limits in Table B-2.

Table B-5: Plane of a Window – Ventilation Requirements

Nighttime Period, 23:00 – 07.00 Hours

Sound Levels	Measures
≤ 50 dBA	Noise control measures may not be required.
> 50 dBA and ≤ 60 dBA	The dwelling should be designed with a provision of for the installation of central air conditioning in the future, at the occupant's discretion. Warning clause Type C is also recommended.
> 60 dBA	Installation of central air conditioning should be implemented with a warning clause Type D. In addition, building components including windows, walls and doors, where applicable, should be designed so that the indoor sound levels comply with the sound level limits in Table B-2.

Table B-6: Indoor Living Areas – Building Components

Sound Levels	Measures
> 60 dBA nighttime > 65 dBA daytime	Building components including windows, walls and doors, where applicable, should be designed so that the indoor sound levels comply with the sound level limits in Table B-2. The acoustical performance of the building components (windows, doors and walls) should be specified.

Table B-7: MECP Table C-5 of NPC-300: Exclusion Limit Values of One-Hour Equivalent Sound Level (Leq, dBA) Outdoor Points of Reception

Time of Day	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 19:00	50 dBA	50 dBA	45 dBA	55 dBA
19:00 – 23:00	50 dBA	45 dBA	40 dBA	55 dBA

Table B-8: MECP Table C-6 of NPC-300: Exclusion Limit Values of One-Hour Equivalent Sound Level (Leq, dBA) Plane of Window of Noise Sensitive Spaces

Time of Day	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 19:00	50 dBA	50 dBA	45 dBA	60 dBA
19:00 – 23:00	50 dBA	50 dBA	40 dBA	60 dBA
23:00 – 07:00	45 dBA	45 dBA	40 dBA	55 dBA

Table B-9: MECP Table C-7 of NPC-300: Exclusion Limit Values of Impulsive Sound Level (LLM, dBAI) Outdoor Points of Reception

Time of Day	Actual number of impulses in Period of one hour	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 23:00	9 or more	50	50	45	55
07:00 – 23:00	7 to 8	55	55	50	60
07:00 – 23:00	5 to 6	60	60	55	65
07:00 – 23:00	4	65	65	60	70
07:00 – 23:00	3	70	70	65	75
07:00 – 23:00	2	75	75	70	80
07:00 – 23:00	1	80	80	75	85

Table B-10: MECP Table C-8 of NPC-300: Exclusion Limit Values of Impulsive Sound Level (LLM, dBAI) Plane of Window – Noise Sensitive Spaces (Day/Night)

Actual number of impulses in Period of one hour	Class 1 Area (7:00-23:00) / (23:00-7:00)	Class 2 Area (7:00-23:00) / (23:00-7:00)	Class 3 Area (7:00-19:00) / (19:00-7:00)	Class 4 Area (7:00-23:00) / (23:00-7:00)
9 or more	50/45	50/45	45/40	60/55
7 to 8	55/50	55/50	50/45	65/60
5 to 6	60/55	60/55	55/50	70/65
4	65/60	65/60	60/55	75/70
3	70/65	70/65	65/60	80/75
2	75/70	75/70	70/65	85/80
1	80/75	80/75	75/70	90/85

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix C

Sample Transportation Noise Modeling Printouts

STAMSON 5.0 NORMAL REPORT Date: 14-12-2023 15:05:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: olaarail.te Time Period: Day/Night 16/8 hours
Description: Tower A OLA Railway Calculation

Rail data, segment # 1: GrimsbyCN (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. Freight	6.6/0.0	97.0	4.0	140.0	Diesel	Yes
* 2. Way Freight	0.0/3.3	80.0	2.0	25.0	Diesel	Yes
* 3. Passenger	3.3/0.0	129.0	2.0	10.0	Diesel	Yes

* The identified number of trains have been adjusted for
future growth using the following parameters:

Train type: No Name	Unadj. Trains	Annual % Increase	Years of Growth
1. Freight	4.0/0.0	2.50	20.00
2. Way Freight	0.0/2.0	2.50	20.00
3. Passenger	2.0/0.0	2.50	20.00

Data for Segment # 1: GrimsbyCN (day/night)

Angle1 Angle2	-5.00 deg	45.00 deg
Wood depth	0	(No woods.)
No of house rows	0 / 0	
Surface	1	(Absorptive ground surface)
Receiver source distance	395.00 / 395.00 m	
Receiver height	45.00 / 4.50 m	
Topography	1	(Flat/gentle slope; no barrier)

No Whistle
Reference angle : 0.00

Results segment # 1: GrimsbyCN (day)

LOCOMOTIVE (0.00 + 53.01 + 0.00) = 53.01 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-5	45	0.00	72.78	-14.21	-5.56	0.00	0.00	0.00	53.01

WHEEL (0.00 + 46.34 + 0.00) = 46.34 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq

```
-------------------------------------------------------------------------
    -5     45   0.00  66.11 -14.21  -5.56   0.00   0.00   0.00  46.34
-------------------------------------------------------------------------

Segment Leq : 53.86 dBA

Total Leq All Segments: 53.86 dBA

↟
Results segment # 1: GrimsbyCN (night)
-------------------------------------

LOCOMOTIVE (0.00 + 37.73 + 0.00) = 37.73 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    -5     45   0.50  64.73 -21.24  -5.77   0.00   0.00   0.00  37.73
-------------------------------------------------------------------------

WHEEL (0.00 + 28.71 + 0.00) = 28.71 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    -5     45   0.60  57.25 -22.73  -5.81   0.00   0.00   0.00  28.71
-------------------------------------------------------------------------

Segment Leq : 38.24 dBA

Total Leq All Segments: 38.24 dBA

↟



TOTAL Leq FROM ALL SOURCES (DAY): 53.86
                           (NIGHT): 38.24
↟
↟
```

STAMSON 5.0 NORMAL REPORT Date: 14-12-2023 15:06:29
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: olaardbr.te Time Period: Day/Night 16/8 hours
Description: Tower A OLA Road Barrier Calculation

Road data, segment # 1: St. Paul (day/night)

Car traffic volume : 16132/1792 veh/TimePeriod *
Medium truck volume : 81/9 veh/TimePeriod *
Heavy truck volume : 81/9 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 10517
Percentage of Annual Growth : 2.50
Number of Years of Growth : 22.00
Medium Truck % of Total Volume : 0.50
Heavy Truck % of Total Volume : 0.50
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: St. Paul (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 37.70 / 37.70 m
Receiver height : 46.50 / 46.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 45.00 m
Barrier receiver distance : 3.00 / 10.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Road data, segment # 2: Mountain (day/night)

Car traffic volume : 16226/1803 veh/TimePeriod *
Medium truck volume : 124/14 veh/TimePeriod *
Heavy truck volume : 124/14 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 2 %

```
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  10632
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  22.00
    Medium Truck % of Total Volume     :   0.75
    Heavy Truck  % of Total Volume     :   0.75
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: Mountain (day/night)
------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  82.50 / 82.50  m
Receiver height           :  46.50 / 46.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  45.00 m
Barrier receiver distance :   3.00 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

🡅
Results segment # 1: St. Paul (day)
-----------------------------------

Source height = 0.84 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.84 !       46.50 !       42.87 !        42.87

ROAD (0.00 + 51.79 + 0.00) = 51.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  65.75   0.00  -4.00   0.00   0.00   0.00  -9.96  51.79
-------------------------------------------------------------------------------

Segment Leq : 51.79 dBA

🡅
```

Results segment # 2: Mountain (day)

Source height = 0.93 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.93	46.50	44.84	44.84

ROAD (0.00 + 51.99 + 0.00) = 51.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	64.49	0.00	-7.40	0.00	0.00	0.00	-5.10	51.99

Segment Leq : 51.99 dBA

Total Leq All Segments: 54.90 dBA

↟

Results segment # 1: St. Paul (night)

Source height = 0.84 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.84	46.50	34.39	34.39

ROAD (0.00 + 38.33 + 0.00) = 38.33 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	59.21	0.00	-4.00	0.00	0.00	0.00	-16.88	38.33

Segment Leq : 38.33 dBA

↟

Results segment # 2: Mountain (night)

Source height = 0.94 m

Barrier height for grazing incidence

```
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.94 !       46.50 !       40.98 !        40.98

ROAD (0.00 + 38.13 + 0.00) = 38.13 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  57.99   0.00  -7.40   0.00   0.00   0.00 -12.45  38.13
-------------------------------------------------------------------------------

Segment Leq : 38.13 dBA

Total Leq All Segments: 41.24 dBA

♠



TOTAL Leq FROM ALL SOURCES (DAY): 54.90
                           (NIGHT): 41.24
♠
♠
```

STAMSON 5.0 NORMAL REPORT Date: 14-12-2023 15:06:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: olaaroad.te Time Period: Day/Night 16/8 hours
Description: Tower A OLA Road Calculation

Road data, segment # 1: St. Paul (day/night)

Car traffic volume : 16132/1792 veh/TimePeriod *
Medium truck volume : 81/9 veh/TimePeriod *
Heavy truck volume : 81/9 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 10517
Percentage of Annual Growth : 2.50
Number of Years of Growth : 22.00
Medium Truck % of Total Volume : 0.50
Heavy Truck % of Total Volume : 0.50
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: St. Paul (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 37.70 / 37.70 m
Receiver height : 46.50 / 46.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 45.00 m
Barrier receiver distance : 3.00 / 10.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Road data, segment # 2: Mountain (day/night)

Car traffic volume : 16226/1803 veh/TimePeriod *
Medium truck volume : 124/14 veh/TimePeriod *
Heavy truck volume : 124/14 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 2 %

```
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):  10632
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  22.00
    Medium Truck % of Total Volume     :   0.75
    Heavy Truck  % of Total Volume     :   0.75
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: Mountain (day/night)
------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  82.50 / 82.50  m
Receiver height           :  46.50 / 46.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  45.00 m
Barrier receiver distance :   3.00 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

🡅
Results segment # 1: St. Paul (day)
-----------------------------------

Source height = 0.84 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.84 !       46.50 !       42.87 !        42.87

ROAD (0.00 + 51.79 + 0.00) = 51.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  65.75   0.00  -4.00   0.00   0.00   0.00  -9.96  51.79
-------------------------------------------------------------------------------

Segment Leq : 51.79 dBA

🡅
```

Results segment # 2: Mountain (day)

Source height = 0.93 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.93	46.50	44.84	44.84

ROAD (0.00 + 51.99 + 0.00) = 51.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	64.49	0.00	-7.40	0.00	0.00	0.00	-5.10	51.99

Segment Leq : 51.99 dBA

Total Leq All Segments: 54.90 dBA

↟

Results segment # 1: St. Paul (night)

Source height = 0.84 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.84	46.50	34.39	34.39

ROAD (0.00 + 38.33 + 0.00) = 38.33 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	59.21	0.00	-4.00	0.00	0.00	0.00	-16.88	38.33

Segment Leq : 38.33 dBA

↟

Results segment # 2: Mountain (night)

Source height = 0.94 m

Barrier height for grazing incidence

```
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.94 !       46.50 !       40.98 !        40.98

ROAD (0.00 + 38.13 + 0.00) = 38.13 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  57.99   0.00  -7.40   0.00   0.00   0.00 -12.45  38.13
-------------------------------------------------------------------------------

Segment Leq : 38.13 dBA

Total Leq All Segments: 41.24 dBA

♠



TOTAL Leq FROM ALL SOURCES (DAY): 54.90
                           (NIGHT): 41.24
♠
♠
```

STAMSON 5.0 NORMAL REPORT Date: 14-12-2023 15:04:59
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por01amb.te Time Period: 24 hours
Description: Point of Reception 1 - Ambient Calculation

Road data, segment # 1: St. Paul

Car traffic volume : 10412 veh/TimePeriod
Medium truck volume : 52 veh/TimePeriod
Heavy truck volume : 52 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: St. Paul

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 37.70 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Mountain

Car traffic volume : 10472 veh/TimePeriod
Medium truck volume : 80 veh/TimePeriod
Heavy truck volume : 80 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: Mountain

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 82.50 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: St. Paul

Source height = 0.84 m

ROAD (0.00 + 58.08 + 0.00) = 58.08 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	62.08	0.00	-4.00	0.00	0.00	0.00	0.00	58.08

Segment Leq : 58.08 dBA

Results segment # 2: Mountain

Source height = 0.93 m

ROAD (0.00 + 53.43 + 0.00) = 53.43 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	60.83	0.00	-7.40	0.00	0.00	0.00	0.00	53.43

Segment Leq : 53.43 dBA

Total Leq All Segments: 59.36 dBA

TOTAL Leq FROM ALL SOURCES: 59.36

STAMSON 5.0 NORMAL REPORT Date: 14-12-2023 15:07:09
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: poraroad.te Time Period: Day/Night 16/8 hours
Description: Tower A Road Plane of Window Calculation

Road data, segment # 1: St. Paul (day/night)

Car traffic volume : 16132/1792 veh/TimePeriod *
Medium truck volume : 81/9 veh/TimePeriod *
Heavy truck volume : 81/9 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 10517
Percentage of Annual Growth : 2.50
Number of Years of Growth : 22.00
Medium Truck % of Total Volume : 0.50
Heavy Truck % of Total Volume : 0.50
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: St. Paul (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 37.70 / 37.70 m
Receiver height : 46.50 / 46.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Mountain (day/night)

Car traffic volume : 16226/1803 veh/TimePeriod *
Medium truck volume : 124/14 veh/TimePeriod *
Heavy truck volume : 124/14 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 10632
Percentage of Annual Growth : 2.50

```
    Number of Years of Growth          :  22.00
    Medium Truck % of Total Volume     :   0.75
    Heavy Truck  % of Total Volume     :   0.75
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: Mountain (day/night)
------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  82.50 / 82.50  m
Receiver height           :  46.50 / 46.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

🠝
Results segment # 1: St. Paul (day)
-----------------------------------

Source height = 0.84 m

ROAD (0.00 + 61.74 + 0.00) = 61.74 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  65.75   0.00  -4.00   0.00   0.00   0.00   0.00  61.74
-------------------------------------------------------------------------------

Segment Leq : 61.74 dBA

🠝
Results segment # 2: Mountain (day)
-----------------------------------

Source height = 0.93 m

ROAD (0.00 + 57.09 + 0.00) = 57.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  64.49   0.00  -7.40   0.00   0.00   0.00   0.00  57.09
-------------------------------------------------------------------------------

Segment Leq : 57.09 dBA

Total Leq All Segments: 63.02 dBA

🠝
Results segment # 1: St. Paul (night)
-----------------------------------
```

Source height = 0.84 m

ROAD (0.00 + 55.21 + 0.00) = 55.21 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	59.21	0.00	-4.00	0.00	0.00	0.00	0.00	55.21

Segment Leq : 55.21 dBA

Results segment # 2: Mountain (night)

Source height = 0.94 m

ROAD (0.00 + 50.59 + 0.00) = 50.59 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	57.99	0.00	-7.40	0.00	0.00	0.00	0.00	50.59

Segment Leq : 50.59 dBA

Total Leq All Segments: 56.50 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.02
(NIGHT): 56.50

STAMSON 5.0 NORMAL REPORT Date: 14-12-2023 15:07:36
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: powarail.te Time Period: Day/Night 16/8 hours
Description: Tower A Rail Plane of Window Calculation

Rail data, segment # 1: GrimsbyCN (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. Freight	6.6/0.0	97.0	4.0	140.0	Diesel	Yes
* 2. Way Freight	0.0/3.3	80.0	2.0	25.0	Diesel	Yes
* 3. Passenger	3.3/0.0	129.0	2.0	10.0	Diesel	Yes

* The identified number of trains have been adjusted for
future growth using the following parameters:

Train type: No Name	Unadj. Trains	Annual % Increase	Years of Growth
1. Freight	4.0/0.0	2.50	20.00
2. Way Freight	0.0/2.0	2.50	20.00
3. Passenger	2.0/0.0	2.50	20.00

Data for Segment # 1: GrimsbyCN (day/night)

Angle1 Angle2	-90.00 deg	90.00 deg
Wood depth	0	(No woods.)
No of house rows	0 / 0	
Surface	1	(Absorptive ground surface)
Receiver source distance	395.00 / 395.00 m	
Receiver height	45.00 / 4.50 m	
Topography	1	(Flat/gentle slope; no barrier)

No Whistle

Reference angle	0.00

Results segment # 1: GrimsbyCN (day)

LOCOMOTIVE (0.00 + 58.58 + 0.00) = 58.58 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	72.78	-14.21	0.00	0.00	0.00	0.00	58.58

WHEEL (0.00 + 51.90 + 0.00) = 51.90 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq

```
-------------------------------------------------------------------------
   -90     90   0.00  66.11 -14.21   0.00   0.00   0.00   0.00  51.90
-------------------------------------------------------------------------

Segment Leq : 59.42 dBA

Total Leq All Segments: 59.42 dBA

↟
Results segment # 1: GrimsbyCN (night)
---------------------------------

LOCOMOTIVE (0.00 + 42.33 + 0.00) = 42.33 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.50  64.73 -21.24  -1.17   0.00   0.00   0.00  42.33
-------------------------------------------------------------------------

WHEEL (0.00 + 33.17 + 0.00) = 33.17 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.60  57.25 -22.73  -1.35   0.00   0.00   0.00  33.17
-------------------------------------------------------------------------

Segment Leq : 42.83 dBA

Total Leq All Segments: 42.83 dBA

↟



TOTAL Leq FROM ALL SOURCES (DAY): 59.42
                           (NIGHT): 42.83
↟
↟
```

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix D

Sample Internal Stationary Noise Modeling Printouts

Day	Limit 100 Sources, 88 PORs								
Group / source	Reduct	POR01	POR01_A	POR02	POR02_A	POR03	POR03_A	POR04_A	POR04_A
	[dB]	result	corr.	result	corr.	result	corr.	result	corr.
EX001 - EX001	0	42.6	42.6	13.3	13.3	12.7	12.7	9.5	9.5
EX002 - EX002	0	9.5	9.5	12.4	12.4	14.1	14.1	43.7	43.7
EX003 - Air Cooled Chi...	0	14.1	14.1	39.9	39.9	45.2	45.2	24.2	24.2
EX004 - Air Cooled Chi...	0	21.8	21.8	33.9	33.9	44.4	44.4	13.6	13.6
EX005 - Emergency G...	0	8.1	8.1	33.7	33.7	38.7	38.7	18.4	18.4
EX006 - Emergency G...	0	16	16	26.5	26.5	38.9	38.9	7.8	7.8
Total		42.7	42.7	41.8	41.8	48.8	48.8	43.8	43.8
Evening	Limit 100 Sources								
Group / source	Reduct	POR01	POR01_A	POR02	POR02_A	POR03	POR03_A	POR04_A	POR04_A
	[dB]	result	corr.	result	corr.	result	corr.	result	corr.
EX001 - EX001	0	42.6	42.6	13.3	13.3	12.7	12.7	9.5	9.5
EX002 - EX002	0	9.5	9.5	12.4	12.4	14.1	14.1	43.7	43.7
EX003 - Air Cooled Chi...	0	12.9	12.9	38.7	38.7	43.9	43.9	22.9	22.9
EX004 - Air Cooled Chi...	0	20.5	20.5	32.6	32.6	43.2	43.2	12.4	12.4
EX005 - Emergency G...	0	--	--	--	--	--	--	--	--
EX006 - Emergency G...	0	--	--	--	--	--	--	--	--
Total		42.7	42.7	39.6	39.6	46.6	46.6	43.8	43.8
Night	Limit 100 Sources								
Group / source	Reduct	POR01	POR01_A	POR02	POR02_A	POR03	POR03_A	POR04_A	POR04_A
	[dB]	result	corr.	result	corr.	result	corr.	result	corr.
EX001 - EX001	0	42.6	42.6	13.3	13.3	12.7	12.7	9.5	9.5
EX002 - EX002	0	9.5	9.5	12.4	12.4	14.1	14.1	43.7	43.7
EX003 - Air Cooled Chi...	0	11.1	11.1	36.9	36.9	42.1	42.1	21.1	21.1
EX004 - Air Cooled Chi...	0	18.8	18.8	30.9	30.9	41.4	41.4	10.6	10.6
EX005 - Emergency G...	0	--	--	--	--	--	--	--	--
EX006 - Emergency G...	0	--	--	--	--	--	--	--	--
Total		42.7	42.7	37.9	37.9	44.8	44.8	43.8	43.8

Limit of 88								
Description	Group	X	Y	Height	Day	Evenin	Night	Li
POR01	--	7E+05	5E+06	1.5	42.7	42.7	42.7	42.7
POR02	--	7E+05	5E+06	43.5	41.8	39.6	37.9	41.8
POR03	--	7E+05	5E+06	55.5	48.8	46.6	44.8	48.8
POR04	--	7E+05	5E+06	1.5	43.8	43.8	43.8	43.8

Appendix D: Predictor Inputs

Point Source Limit of 100

	Group	Item ID	Grp ID	Date	Name	Desc.	Shape	X	Y	Height	Rel.H	Abs.H	Terrain L
1	--	209	0	######	EX001	EX001	Point	654498.2	4777763	0	0	0	0
2	--	210	0	######	EX002	EX002	Point	654589.3	4777715	0	0	0	0
3	--	211	0	######	EX003	Air Coc	Point	654552.9	4777770	49.5	49.5	49.5	0
4	--	212	0	######	EX004	Air Coc	Point	654574.8	4777756	58.5	58.5	58.5	0
5	--	213	0	######	EX005	Emerg	Point	654549.9	4777770	49.5	49.5	49.5	0
6	--	214	0	######	EX006	Emerg	Point	654576.2	4777753	58.5	58.5	58.5	0

Grid Limit of 20

	Group	Item ID	Grp ID	Date	1st Kid	Kid Cnt	Name	Desc.	Shape	X1	Y1	Height	Rel.H
1	--	215	0	######	-25	755	Grid		Polygon	654473.5	4777691	4.5	4.5

Receiver Limit of 88

	Group	Item ID	Grp ID	Date	1st Kid	Kid Cnt	Name	Desc.	Shape	X	Y	Terrain L	HDef.
1	--	205	0	######	-1	1	POR01	POR01	Point	654498	4777766	0	Relative
2	--	206	0	######	-7	1	POR02	POR02	Point	654553.8	4777766	0	Relative
3	--	207	0	######	-13	1	POR03	POR03	Point	654571.2	4777753	0	Relative
4	--	208	0	######	-19	1	POR04	POR04	Point	654591.8	4777717	0	Relative

Building Limit of 100

	Group	Item ID	Grp ID	Date	Name	Desc.	Shape	X1	Y1	Height	Rel.H	Abs.H	Terrain L
1	--	197	0	######	0	0	Polygo	654494.2	4777784	30	30	30	0
2	--	198	0	######	0	0	Polygo	654569	4777758	6	6	6	0
3	--	199	0	######	0	0	Polygo	654582	4777734	57	57	57	0
4	--	200	0	######	0	0	Polygo	654584	4777733	36	36	36	0
5	--	201	0	######	0	0	Polygo	654588.1	4777727	30	30	30	0
6	--	202	0	######	0	0	Polygo	654528.8	4777784	48	48	48	0
7	--	203	0	######	0	0	Polygo	654515.5	4777768	45	45	45	0
8	--	204	0	######	0	0	Polygo	654507.6	4777784	36	36	36	0

Appendix D: Predictor Inputs

Point Source Limit of 100

	Group	Item ID	Grp ID	Date	Name	Desc.	Shape	X	Y	Height	Rel.H	Abs.H
1	--	209	0	12/14/2023 10:02	EX001	EX001	Point	654498.2	4777763	0	0	0
2	--	210	0	12/14/2023 10:03	EX002	EX002	Point	654589.3	4777715	0	0	0
3	--	211	0	12/14/2023 11:02	EX003	Air Coc	Point	654552.9	4777770	49.5	49.5	49.5
4	--	212	0	12/14/2023 10:05	EX004	Air Coc	Point	654574.8	4777756	58.5	58.5	58.5
5	--	213	0	12/13/2023 16:52	EX005	Emerg	Point	654549.9	4777770	49.5	49.5	49.5
6	--	214	0	12/14/2023 10:05	EX006	Emerg	Point	654576.2	4777753	58.5	58.5	58.5

Grid Limit of 20

	Group	Item ID	Grp ID	Date	1st Kid	Kid Cnt	Name	Desc.	Shape	X1	Y1	Height
1	--	215	0	12/14/2023 10:31	-25	755	Grid		Polygon	654473.5	4777691	4.5

Receiver Limit of 88

	Group	Item ID	Grp ID	Date	1st Kid	Kid Cnt	Name	Desc.	Shape	X	Y	Terrain L
1	--	205	0	12/12/2023 15:10	-1	1	POR01	POR01	Point	654498	4777766	0
2	--	206	0	12/12/2023 15:10	-7	1	POR02	POR02	Point	654553.8	4777766	0
3	--	207	0	12/12/2023 15:11	-13	1	POR03	POR03	Point	654571.2	4777753	0
4	--	208	0	12/12/2023 15:10	-19	1	POR04	POR04	Point	654591.8	4777717	0

Building Limit of 100

	Group	Item ID	Grp ID	Date	Name	Desc.	Shape	X1	Y1	Height	Rel.H	Abs.H
1	--	197	0	12/12/2023 15:11	0	0	Polygo	654494.2	4777784	30	30	30
2	--	198	0	12/12/2023 15:13	0	0	Polygo	654569	4777758	6	6	6
3	--	199	0	12/12/2023 15:14	0	0	Polygo	654582	4777734	57	57	57
4	--	200	0	12/12/2023 15:15	0	0	Polygo	654584	4777733	36	36	36
5	--	201	0	12/12/2023 15:15	0	0	Polygo	654588.1	4777727	30	30	30
6	--	202	0	12/12/2023 15:12	0	0	Polygo	654528.8	4777784	48	48	48
7	--	203	0	12/12/2023 15:12	0	0	Polygo	654515.5	4777768	45	45	45
8	--	204	0	12/12/2023 15:12	0	0	Polygo	654507.6	4777784	36	36	36

Terrain L
0
0
0
0
0
0

Rel.H
4.5

HDef.
Relative
Relative
Relative
Relative

Terrain L
0
0
0
0
0
0
0
0

Day — Limit 100 Sources, 88 PORs

Group / source	Reduct [dB]	POR01 result	POR01_A corr.	POR02 result	POR02_A corr.	POR03 result	POR03_A corr.	POR04_A result	POR04_A corr.
EX001 - EX001	0	64.6	64.6	35.3	35.3	34.7	34.7	31.5	31.5
EX002 - EX002	0	31.5	31.5	34.4	34.4	36.1	36.1	65.7	65.7
EX003 - Air Cooled Chi...	0	37.1	37.1	62.9	62.9	68.2	68.2	47.2	47.2
EX004 - Air Cooled Chi...	0	44.8	44.8	56.9	56.9	67.4	67.4	36.6	36.6
EX005 - Emergency G...	0	31.1	31.1	56.7	56.7	61.7	61.7	41.4	41.4
EX006 - Emergency G...	0	39	39	49.5	49.5	61.9	61.9	30.8	30.8
Total		64.7	64.7	64.8	64.8	71.8	71.8	65.8	65.8

Evening — Limit 100 Sources

Group / source	Reduct [dB]	POR01 result	POR01_A corr.	POR02 result	POR02_A corr.	POR03 result	POR03_A corr.	POR04_A result	POR04_A corr.
EX001 - EX001	0	64.6	64.6	35.3	35.3	34.7	34.7	31.5	31.5
EX002 - EX002	0	31.5	31.5	34.4	34.4	36.1	36.1	65.7	65.7
EX003 - Air Cooled Chi...	0	35.9	35.9	61.7	61.7	66.9	66.9	45.9	45.9
EX004 - Air Cooled Chi...	0	43.5	43.5	55.6	55.6	66.2	66.2	35.4	35.4
EX005 - Emergency G...	0	--	--	--	--	--	--	--	--
EX006 - Emergency G...	0	--	--	--	--	--	--	--	--
Total		64.7	64.7	62.6	62.6	69.6	69.6	65.8	65.8

Night — Limit 100 Sources

Group / source	Reduct [dB]	POR01 result	POR01_A corr.	POR02 result	POR02_A corr.	POR03 result	POR03_A corr.	POR04_A result	POR04_A corr.
EX001 - EX001	0	64.6	64.6	35.3	35.3	34.7	34.7	31.5	31.5
EX002 - EX002	0	31.5	31.5	34.4	34.4	36.1	36.1	65.7	65.7
EX003 - Air Cooled Chi...	0	34.1	34.1	59.9	59.9	65.1	65.1	44.1	44.1
EX004 - Air Cooled Chi...	0	41.8	41.8	53.9	53.9	64.4	64.4	33.6	33.6
EX005 - Emergency G...	0	--	--	--	--	--	--	--	--
EX006 - Emergency G...	0	--	--	--	--	--	--	--	--
Total		64.7	64.7	60.9	60.9	67.8	67.8	65.8	65.8

Limit of 88

Description	Group	X	Y	Height	Day	Evenin	Night	Li
POR01	--	7E+05	5E+06	1.5	64.7	64.7	64.7	64.7
POR02	--	7E+05	5E+06	43.5	64.8	62.6	60.9	64.8
POR03	--	7E+05	5E+06	55.5	71.8	69.6	67.8	71.8
POR04	--	7E+05	5E+06	1.5	65.8	65.8	65.8	65.8

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix E

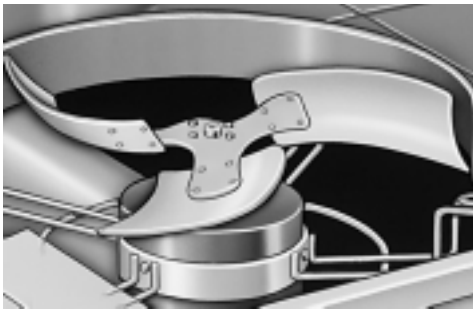
Noise Data References

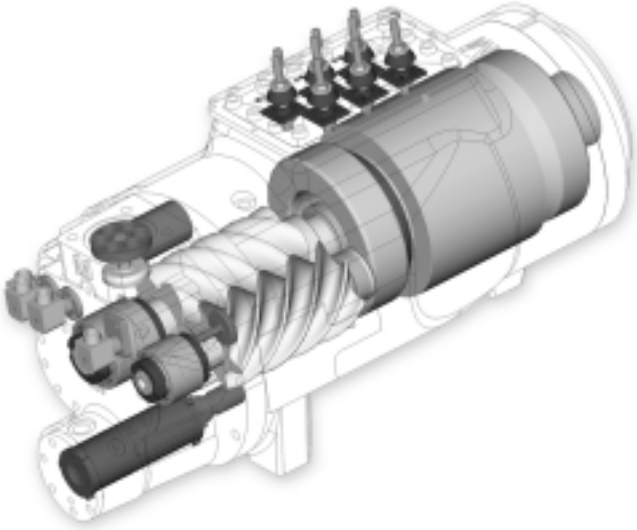
TRANE®

Engineering Bulletin

Sound Data and Application Guide For the New and Quieter Air-Cooled Series R™ Chiller

Model RTAC
140-500 Tons (60 Hz)
140-400 Tons (50 Hz)





RLC-PRB009-EN

Appendix A

Appendix A

Sound Power Octave Band Data

Sound power octave band data can be used for purposes of describing the basic acoustical properties of the air-cooled Series R™ chiller. However, there are two cautionary notes. First, if the engineer is using the data as a criteria in a bid evaluation, make sure that the data from all competitors is on an equal basis. Insist that all competitors present data terms of **SOUND POWER (*not* sound pressure),** in a consistent format, according to **ARI Standard 370**.

>>>Sound **power** data CANNOT be compared directly to sound **pressure** data. <<<

Second, the sound power data does not provide sufficient information to correctly position the chiller or attenuate its sound to take full advantage of the characteristics of the air-cooled Series R chiller. Unlike most reciprocating chillers that exhibit a low frequency, pounding sound, the air-cooled Series R chiller sound is directional in nature and has a higher frequency characteristic that is more easily attenuated. The specific application information given in the preceding parts of this bulletin can be used to create a significant competitive advantage over competitive air-cooled reciprocating chillers.

NOTE: Sound Power Rating data given in Tables A-1 through A-2 may vary ± 2 dB in any specific octave band due to normal variations in chiller construction.

Table A-1 (60 Hz) – Octave Band Sound Power Levels, dB ref, 1 pw

	Octave Band & Center Frequency, Hz								Overall
Model RTAC	63	125	250	500	1000	2000	4000	8000	A' Wtd
140 STD	101	102	98	97	96	91	86	83	100
155 STD	102	102	98	98	97	93	86	83	101
170 STD	102	103	99	99	98	94	87	84	102
185 STD	102	103	99	100	98	93	87	84	102
200 STD	103	104	100	101	98	93	88	85	103
225 STD	103	104	100	101	98	93	88	85	103
250 STD	104	104	101	101	98	94	88	85	103
275 STD	104	105	101	101	100	95	89	86	104
300 STD	105	105	101	102	100	95	90	87	104
350 STD	105	106	102	103	100	95	90	87	105
400 STD	106	107	103	104	101	96	91	88	106
450 STD	106	107	103	104	101	96	91	88	106
500 STD	107	107	104	104	101	97	91	88	106
140 HIGH	102	103	99	98	97	92	87	84	101
155 HIGH	102	103	99	99	97	93	87	84	102
170 HIGH	103	104	99	100	98	94	87	85	102
185 HIGH	103	104	100	100	98	94	88	85	103
200 HIGH	104	104	100	101	98	93	88	86	103
225 HIGH	104	104	100	101	98	94	88	85	103
250 HIGH	104	105	101	102	99	94	88	86	103
275 HIGH	105	105	101	102	100	96	89	86	104
300 HIGH	105	106	102	103	100	95	90	87	105
350 HIGH	106	107	102	103	101	97	90	88	105
400 HIGH	107	107	103	104	102	96	91	89	106

Sound Power is a calculated quantity and cannot be measured directly like SOUND PRESSURE. Sound power is the amount of acoustical power produced at the source, and thus is an absolute quantity and not dependent on the surrounding environment or distance, as is sound pressure. 32 measurements are taken over a prescribed area around the unit. Data is then mathematically reduced to give the sound power level, dB.

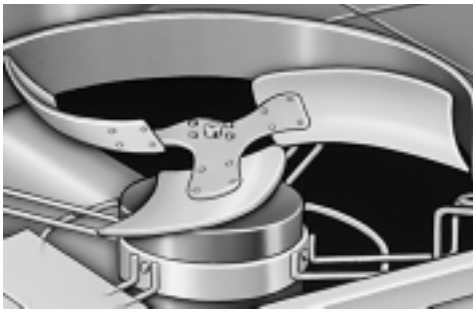
Sound Power is reported in dB but converted to dBA before use in noise model.

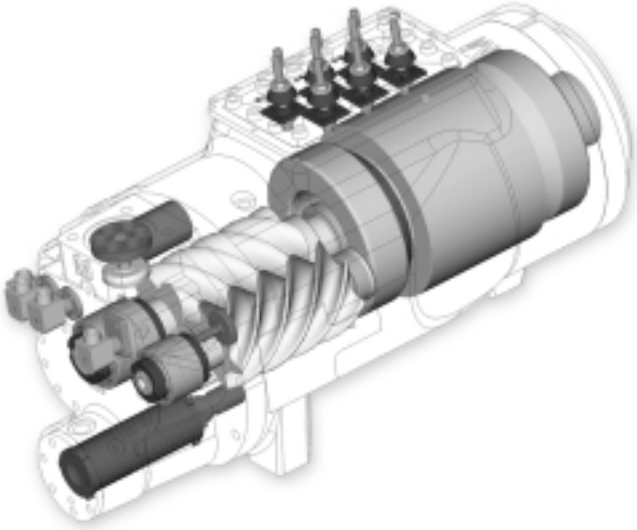
TRANE®

Engineering Bulletin

Sound Data and Application Guide For the New and Quieter Air-Cooled Series R™ Chiller

Model RTAC
140-500 Tons (60 Hz)
140-400 Tons (50 Hz)





RLC-PRB009-EN

Appendix A

Appendix A

Sound Power Octave Band Data

Sound power octave band data can be used for purposes of describing the basic acoustical properties of the air-cooled Series R™ chiller. However, there are two cautionary notes. First, if the engineer is using the data as a criteria in a bid evaluation, make sure that the data from all competitors is on an equal basis. Insist that all competitors present data terms of **SOUND POWER (*not* sound pressure),** in a consistent format, according to **ARI Standard 370**.

>>>Sound **power** data CANNOT be compared directly to sound **pressure** data. <<<

Second, the sound power data does not provide sufficient information to correctly position the chiller or attenuate its sound to take full advantage of the characteristics of the air-cooled Series R chiller. Unlike most reciprocating chillers that exhibit a low frequency, pounding sound, the air-cooled Series R chiller sound is directional in nature and has a higher frequency characteristic that is more easily attenuated. The specific application information given in the preceding parts of this bulletin can be used to create a significant competitive advantage over competitive air-cooled reciprocating chillers.

NOTE: Sound Power Rating data given in Tables A-1 through A-2 may vary ± 2 dB in any specific octave band due to normal variations in chiller construction.

Table A-1 (60 Hz) – Octave Band Sound Power Levels, dB ref, 1 pw

	Octave Band & Center Frequency, Hz								Overall
Model RTAC	63	125	250	500	1000	2000	4000	8000	A' Wtd
140 STD	101	102	98	97	96	91	86	83	100
155 STD	102	102	98	98	97	93	86	83	101
170 STD	102	103	99	99	98	94	87	84	102
185 STD	102	103	99	100	98	93	87	84	102
200 STD	103	104	100	101	98	93	88	85	103
225 STD	103	104	100	101	98	93	88	85	103
250 STD	104	104	101	101	98	94	88	85	103
275 STD	104	105	101	101	100	95	89	86	104
300 STD	105	105	101	102	100	95	90	87	104
350 STD	105	106	102	103	100	95	90	87	105
400 STD	106	107	103	104	101	96	91	88	106
450 STD	106	107	103	104	101	96	91	88	106
500 STD	107	107	104	104	101	97	91	88	106
140 HIGH	102	103	99	98	97	92	87	84	101
155 HIGH	102	103	99	99	97	93	87	84	102
170 HIGH	103	104	99	100	98	94	87	85	102
185 HIGH	103	104	100	100	98	94	88	85	103
200 HIGH	104	104	100	101	98	93	88	86	103
225 HIGH	104	104	100	101	98	94	88	85	103
250 HIGH	104	105	101	102	99	94	88	86	103
275 HIGH	105	105	101	102	100	96	89	86	104
300 HIGH	105	106	102	103	100	95	90	87	105
350 HIGH	106	107	102	103	101	97	90	88	105
400 HIGH	107	107	103	104	102	96	91	89	106

Sound Power is a calculated quantity and cannot be measured directly like SOUND PRESSURE. Sound power is the amount of acoustical power produced at the source, and thus is an absolute quantity and not dependent on the surrounding environment or distance, as is sound pressure. 32 measurements are taken over a prescribed area around the unit. Data is then mathematically reduced to give the sound power level, dB.

Sound Power is reported in dB but converted to dBA before use in noise model.

CANARM®

LFI AXIAL FANS

BELT & DIRECT DRIVE AXIAL FANS

ROOF EXHAUSTERS

MANCOOLERS

SUPPLY FANS

JET FANS

DAMPERS

DUCT FANS

CONTROLS

FANTRAXX

CIRCULATING FANS

CANARM.... PROVIDING CUSTOMERS WITH VALUE, KNOWLEDGE AND QUALITY PRODUCTS

XB - BELT DRIVE WALL FANS

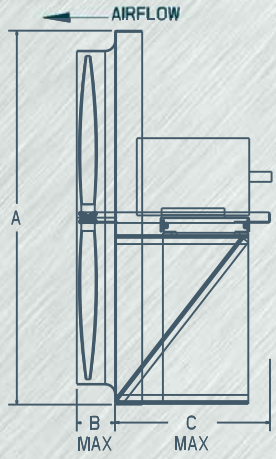
Designed for commercial and light duty industrial applications - Factories, Warehouses, Gymnasiums, Underground parking garages, etc.

These fans are typically used for low pressure applications with little or no duct work. The XB series is designed and constructed for efficient and economical operation at low speeds and low noise levels. These fans are used for exhaust applications.
For supply applications, please see next page.

FEATURES

- Heavy gauge steel fan panel with deep spun and flared venturi for maximum efficiency.
- Heavy gauge welded steel motor and bearing supports.
- Heavy duty cast iron pillow block bearings.
- TEFC motors are standard.

DIMENSIONS



MODEL	BLADE DIAMETER	A X A SQUARE	B	C (BELT DRIVE MOTOR FRAME)	
				56 - 184	213 - 286
XB24	24"	29.625"	4.0"	18"	--
XB30	30"	35.625"	4.5"	18"	--
XB36	36"	41.625"	5.0"	18"	28"
XB42	42"	47.625"	5.0"	18"	28"
XB48	48"	53.625"	5.0"	18"	28"
XB54	54"	59.657"	5.5"	18"	28"
XB60	60"	67.657"	6.0"	18"	28"

BLADE DIAMETER	MODEL # SINGLE PHASE	MODEL # THREE PHASE	WEIGHT (LBS.)	RPM	H.P.	dBA @ 5 ft.	CFM @ STATIC PRESSURE 0"	1/8"	1/4"	3/8"	1/2"	5/8"
24"	XB24T10033	XB24T30033*	115	670	1/3	61	4643	4038	2488	-	-	-
	XB24T10050	XB24T30050*	115	805	1/2	65	5578	5112	4405	2934	-	-
	XB24T10075	XB24T30075*	115	925	3/4	70	6410	6030	5526	4731	3354	-
	XB24T10100	XB24T30100*	133	1040	1.0	73	7207	6883	6457	5930	5143	3793
30"	XB30T10033	XB30T30033*	128	470	1/3	59	6658	4717	1948	-	-	-
	XB30T10050	XB30T30050*	129	565	1/2	63	8004	6689	4298	2119	-	-
	XB30T10075	XB30T30075*	129	640	3/4	66	9067	8014	6073	4220	2203	-
	XB30T10100	XB30T30100*	148	715	1.0	69	10129	9223	7790	5688	4248	2452
	XB30T10150	XB30T30150*	129	830	1.5	73	11758	11032	10045	8530	6647	5543
36"	XB36T10050	XB36T30050*	161	410	1/2	59	9854	7547	3560	-	-	-
	XB36T10075	XB36T30075*	160	460	3/4	63	11056	9197	5120	2876	-	-
	XB36T10100	XB36T30100*	180	515	1.0	67	12378	10847	7976	4784	2740	-
	XB36T10150	XB36T30150*	160	605	1.5	71	14541	13394	11542	8258	5859	4122
	XB36T10200	XB36T30200*	203	675	2.0	73	16223	15195	13750	11831	8029	6506
42"	XB42T10075	XB42T30075*	211	330	3/4	58	11755	8579	3357	-	-	-
	XB42T10100	XB42T30100*	230	390	1.0	63	13892	11596	5764	3462	-	-
	XB42T10150	XB42T30150*	207	465	1.5	68	16564	14700	12037	6386	4670	-
	XB42T10200	XB42T30200*	248	510	2.0	71	18167	16479	14514	9114	6418	4770
	XB42T10300	XB42T30300*	264	590	3.0	75	21016	19579	18030	15887	10630	7882
48"	XB48T10100	XB48T30100*	257	330	1.0	63	18658	14895	7243	3301	-	-
	XB48T10150	XB48T30150*	236	380	1.5	67	21485	18589	12083	7263	3754	-
	XB48T10200	XB48T30200*	281	425	2.0	70	24030	21457	17737	10447	7459	4205
	XB48T10300	XB48T30300*	290	485	3.0	74	27422	25190	22472	18073	11634	9008
	XB48T10500	XB48T30500*	312	585	5.0	80	33076	31236	29331	26834	23759	17330
54"	XB54T10150	XB54T30150*	316	310	1.5	65	24281	20657	10405	5754	2747	-
	XB54T10200	XB54T30200*	359	345	2.0	68	26593	23275	15740	8821	5199	2455
	XB54T10300	XB54T30300*	370	400	3.0	72	30832	28008	24336	14731	10317	6921
	XB54T10500	XB54T30500*	380	475	5.0	76	36613	34384	31798	28018	19368	13736
	XB54T10750	XB54T30750*	492	545	7.5	81	42009	40171	37818	35727	31930	24931
60"	XB60T10150	XB60T30150*	363	275	1.5	64	28093	23231	12618	6346	3157	-
	XB60T10200	XB60T30200*	405	300	2.0	66	30647	26162	17561	9965	5469	2822
	XB60T10300	XB60T30300*	416	345	3.0	70	35244	31470	27438	16612	11289	7142
	XB60T10500	XB60T30500*	430	420	5.0	76	42906	40193	36504	33232	23610	17734
	XB60T10750	XB60T30750*	539	485	7.5	81	49546	47400	44167	41266	38377	30896

For three phase motors, substitute "*" with "M" for 208-230/460 volt or "P" for 575 volt
Fan blades tested in accordance with AMCA standard 210, figure 12
dBA ratings shown are measured at 0" static pressure and should be used as a guideline only

OPTIONS

For fan complete with cabinet/guard and shutter, substitute "T" with CBS
For fan complete with front sleeve and shutter, substitute "T" with SLS
For fan with rear sleeve and back guard, substitute "T" with SLB

For a complete listing of all available options, see page 9.


CBS


SLS


SLB

CANARM®

LFI AXIAL FANS

BELT & DIRECT DRIVE AXIAL FANS

ROOF EXHAUSTERS

MANCOOLERS

SUPPLY FANS

JET FANS

DAMPERS

DUCT FANS

CONTROLS

FANTRAXX

CIRCULATING FANS

CANARM.... PROVIDING CUSTOMERS WITH VALUE, KNOWLEDGE AND QUALITY PRODUCTS

XB - BELT DRIVE WALL FANS

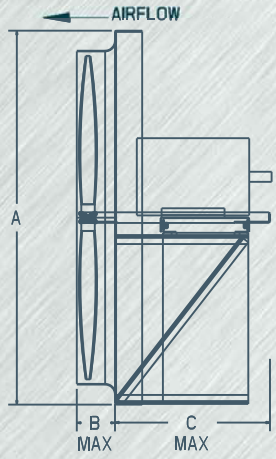
Designed for commercial and light duty industrial applications - Factories, Warehouses, Gymnasiums, Underground parking garages, etc.

These fans are typically used for low pressure applications with little or no duct work. The XB series is designed and constructed for efficient and economical operation at low speeds and low noise levels. These fans are used for exhaust applications.
For supply applications, please see next page.

FEATURES

- Heavy gauge steel fan panel with deep spun and flared venturi for maximum efficiency.
- Heavy gauge welded steel motor and bearing supports.
- Heavy duty cast iron pillow block bearings.
- TEFC motors are standard.

DIMENSIONS



MODEL	BLADE DIAMETER	A X A SQUARE	B	C (BELT DRIVE MOTOR FRAME)	
				56 - 184	213 - 286
XB24	24"	29.625"	4.0"	18"	--
XB30	30"	35.625"	4.5"	18"	--
XB36	36"	41.625"	5.0"	18"	28"
XB42	42"	47.625"	5.0"	18"	28"
XB48	48"	53.625"	5.0"	18"	28"
XB54	54"	59.657"	5.5"	18"	28"
XB60	60"	67.657"	6.0"	18"	28"

BLADE DIAMETER	MODEL # SINGLE PHASE	MODEL # THREE PHASE	WEIGHT (LBS.)	RPM	H.P.	dBA @ 5 ft.	CFM @ STATIC PRESSURE 0"	1/8"	1/4"	3/8"	1/2"	5/8"
24"	XB24T10033	XB24T30033*	115	670	1/3	61	4643	4038	2488	-	-	-
	XB24T10050	XB24T30050*	115	805	1/2	65	5578	5112	4405	2934	-	-
	XB24T10075	XB24T30075*	115	925	3/4	70	6410	6030	5526	4731	3354	-
	XB24T10100	XB24T30100*	133	1040	1.0	73	7207	6883	6457	5930	5143	3793
30"	XB30T10033	XB30T30033*	128	470	1/3	59	6658	4717	1948	-	-	-
	XB30T10050	XB30T30050*	129	565	1/2	63	8004	6689	4298	2119	-	-
	XB30T10075	XB30T30075*	129	640	3/4	66	9067	8014	6073	4220	2203	-
	XB30T10100	XB30T30100*	148	715	1.0	69	10129	9223	7790	5688	4248	2452
	XB30T10150	XB30T30150*	129	830	1.5	73	11758	11032	10045	8530	6647	5543
36"	XB36T10050	XB36T30050*	161	410	1/2	59	9854	7547	3560	-	-	-
	XB36T10075	XB36T30075*	160	460	3/4	63	11056	9197	5120	2876	-	-
	XB36T10100	XB36T30100*	180	515	1.0	67	12378	10847	7976	4784	2740	-
	XB36T10150	XB36T30150*	160	605	1.5	71	14541	13394	11542	8258	5859	4122
	XB36T10200	XB36T30200*	203	675	2.0	73	16223	15195	13750	11831	8029	6506
42"	XB42T10075	XB42T30075*	211	330	3/4	58	11755	8579	3357	-	-	-
	XB42T10100	XB42T30100*	230	390	1.0	63	13892	11596	5764	3462	-	-
	XB42T10150	XB42T30150*	207	465	1.5	68	16564	14700	12037	6386	4670	-
	XB42T10200	XB42T30200*	248	510	2.0	71	18167	16479	14514	9114	6418	4770
	XB42T10300	XB42T30300*	264	590	3.0	75	21016	19579	18030	15887	10630	7882
48"	XB48T10100	XB48T30100*	257	330	1.0	63	18658	14895	7243	3301	-	-
	XB48T10150	XB48T30150*	236	380	1.5	67	21485	18589	12083	7263	3754	-
	XB48T10200	XB48T30200*	281	425	2.0	70	24030	21457	17737	10447	7459	4205
	XB48T10300	XB48T30300*	290	485	3.0	74	27422	25190	22472	18073	11634	9008
	XB48T10500	XB48T30500*	312	585	5.0	80	33076	31236	29331	26834	23759	17330
54"	XB54T10150	XB54T30150*	316	310	1.5	65	24281	20657	10405	5754	2747	-
	XB54T10200	XB54T30200*	359	345	2.0	68	26593	23275	15740	8821	5199	2455
	XB54T10300	XB54T30300*	370	400	3.0	72	30832	28008	24336	14731	10317	6921
	XB54T10500	XB54T30500*	380	475	5.0	76	36613	34384	31798	28018	19368	13736
	XB54T10750	XB54T30750*	492	545	7.5	81	42009	40171	37818	35727	31930	24931
60"	XB60T10150	XB60T30150*	363	275	1.5	64	28093	23231	12618	6346	3157	-
	XB60T10200	XB60T30200*	405	300	2.0	66	30647	26162	17561	9965	5469	2822
	XB60T10300	XB60T30300*	416	345	3.0	70	35244	31470	27438	16612	11289	7142
	XB60T10500	XB60T30500*	430	420	5.0	76	42906	40193	36504	33232	23610	17734
	XB60T10750	XB60T30750*	539	485	7.5	81	49546	47400	44167	41266	38377	30896

For three phase motors, substitute "*" with "M" for 208-230/460 volt or "P" for 575 volt
Fan blades tested in accordance with AMCA standard 210, figure 12
dBA ratings shown are measured at 0" static pressure and should be used as a guideline only

OPTIONS

For fan complete with cabinet/guard and shutter, substitute "T" with CBS
For fan complete with front sleeve and shutter, substitute "T" with SLS
For fan with rear sleeve and back guard, substitute "T" with SLB

For a complete listing of all available options, see page 9.


CBS


SLS


SLB

R.J. Burnside & Associates Limited