Riverside South Development Corporation

Noise Control Feasibility Study

980 Earl Armstrong & 4700 Limebank Road, Riverside South

September 2023

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980 Earl Armstrong Road & 4700 Limebank Road, Riverside South

September 2023

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1 Introduction

Arcadis was retained by Riverside South Development Corporation (RSDC) to undertake a Noise Control Feasibility Study in support of a Draft Plan of Subdivision (DPS) application for a proposed development to be located at 980 Earl Armstrong Road & 4700 Limebank Road in Ottawa. The subject property is presently zoned for General Mixed-Use (GM) and envisioned as the future Riverside South Town Centre, per the Riverside South Community Design Plan and Secondary Plan.

The objective of this study is to conduct a preliminary review of the internal and external transportation noise impacts on the subject property through the use of noise contour lines. This evaluation will consider road, rail and aircraft noise impacts, as applicable, to help inform preliminary recommendations regarding the potential need for noise control measures or warning clauses in the Agreement of Purchase and Sale or Tenancy Agreement for any 'noise-sensitive' land uses either proposed within or impacted by the subject development. It is expected that any preliminary recommendations from the study will be investigated further as part of individual Environmental Noise Impact Assessments (ENIAs) during the detailed design stage, if required.

The subject site is located in the southwest quadrant of the Earl Armstrong & Limebank intersection and is bound by Earl Armstrong Road to the north, Limebank Road to the east, greenfield lands south and west, as well as a small-scale, low-density residential enclaved accessible via Portico Way near the northwest corner of the site. It should be noted as well that the proposed development is bisected by a future transit corridor, including LRT Stage 2 (currently under construction) within close proximity to Limebank Road and a ROW protection to support a long-term plan for a Bus Rapid Transit (BRT) corridor further west.

The site location plan and its surround context are illustrated in **Figure 1-1**, while the Draft Plan is presented in **Figure 1-2** below.

J: \144320_Riverside\7.0_Production\7.03_Design\04_Civil_Land\APSR\Sheet Set\FIGURE1.1_LOCATION PLAN.dwg Last Saved By: Chris.Cormier Last Saved At: Sep. 5, 23

Project Title	Drawing Title	Sheet No.
980 EARL ARMSTRONG & 4700 LIMEBANK ROAD RIVERSIDE SOUTH PHASE 7	LOCATION PLAN	FIG 1.1

ARCADIS

OPTION 2
DRAFT PLAN OF SUBDIVISION OF
PART OF LOTS 21 and 22
CONCESSION 1 (RIDEAU FRONT)
Geographic Township of Gloucester
CITY OF OTTAWA
Prepared by Annis , O'Sullivan , Vollebekk Ltd.

Scale 1 : 1500

Metric
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

KEY MAP
NOT TO SCALE

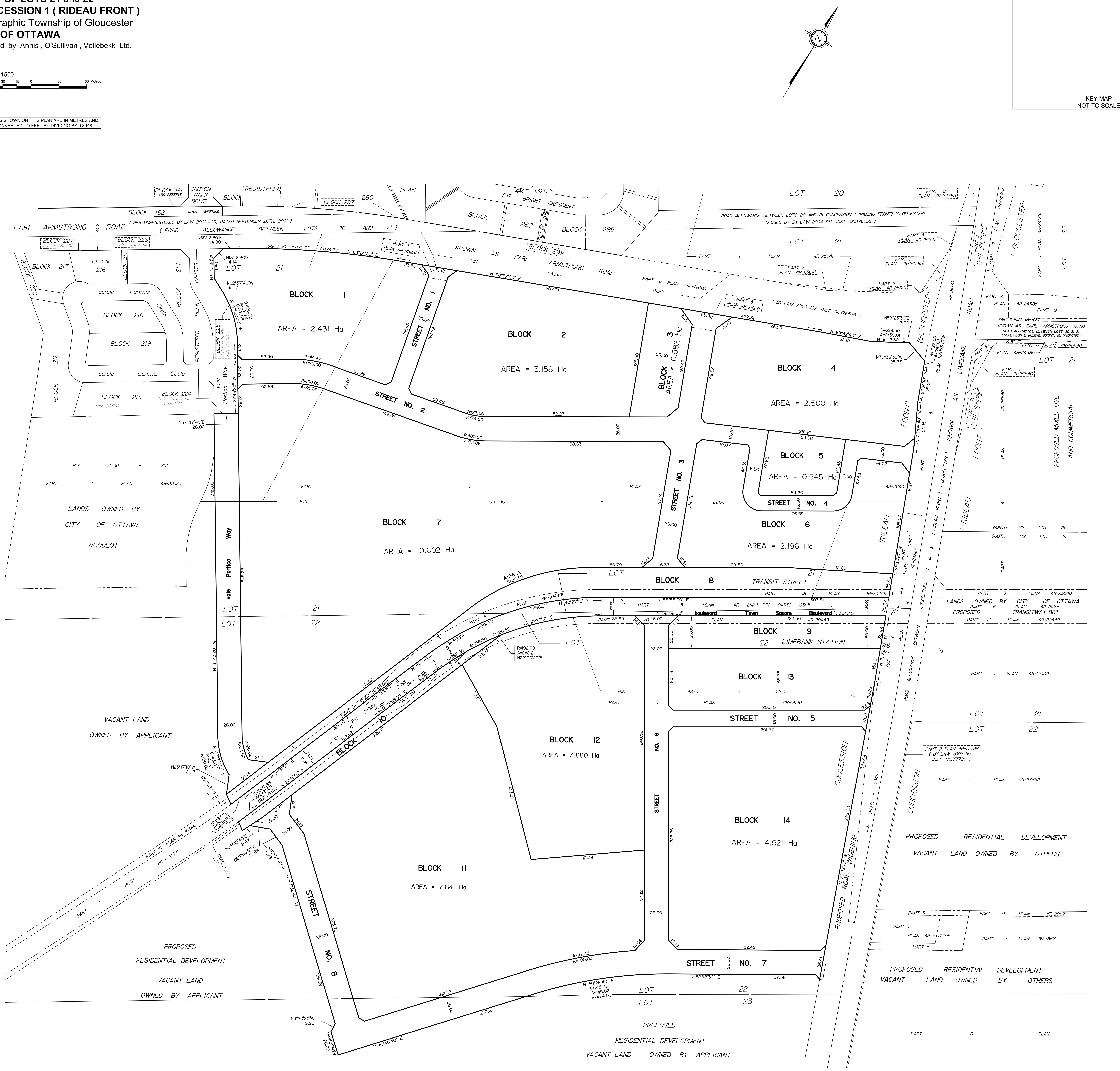

FIGURE 1.2 - DRAFT PLAN

REVISION SCHEDULE			
NO.	REVISION	DATE	BY
11	REVISED LOC. OF SCHOOL BLOCK	SEPT. 20, 2023	N
10	REVISIONS	MAY 4, 2023	N
9	REVISIONS	APR. 27, 2023	N
8	REVISIONS	APR. 26, 2023	N
7	REVISIONS	JUNE 7, 2022	N
6	REVISIONS	APR. 21, 2022	N
5	REVISIONS	APR. 14, 2022	N
4	DISCUSSION	MAR. 19, 2021	N
3	DISCUSSION	JAN. 4, 2021	N
2	DISCUSSION	DEC. 18, 2020	N
1	DISCUSSION	DEC. 10, 2020	N

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2 Background

2.1 Noise Sources

The proposed development will be subject to traffic noise externally from its boundary streets: Earl Armstrong Road and Limebank Road. As part of the Draft Plan of Subdivision application process, six new collector road segments with 26-metre ROW widths are planned through the subject lands. Given that these facilities will be classified as collector streets as per Schedule C-4 of the 2022 Official Plan, the traffic noise impacts associated on these facilities will also be evaluated. The remaining street segments have ROW widths of 18 to 20 metres and are classified as local roads which are not considered as a significant noise source and, as such, do not require evaluation as part of this study.

The site is located entirely within the Airport Vicinity Development Zone (AVDZ), as shown on Schedule C-14 of the 2022 Official Plan, therefore aircraft noise will be considered in this study.

As discussed previously, the subject lands are bisected by the future transit corridor which will provide both LRT and BRT service to the Riverside South Community. In terms of rail lines, the future Limebank Station serves as the terminus of the O-Train Trillium Line Extension just west of Limebank Road and is well within the 100-metre separation distance required for its consideration as a transportation noise source of significance in this study. It is anticipated that the O-Train Trillium Line Extension will be open for full revenue service by 2024. A Bus Rapid Transit (BRT) corridor with a 43-metre ROW is being protected further west of Limebank Station to provision for a longer-term rapid transit connection from Riverside South to Barrhaven and its noise impacts will be considered in this study as well.

2.2 Sound Level limits for Road Traffic

Sound level criteria for road traffic is referenced from the City of Ottawa Environmental Noise Control Guidelines (ENC) Guidelines published in January 2016 and the *Ministry of the Environment Publication NPC-300 (August 2013)*, hereafter referred to as NPC-300. Noise levels are expressed in the form Leq (T) which refers to a weighted level of a steady sound carrying the same total energy in the time period T (in hours) as the observed fluctuation sound.

2.2.1 Indoor Sound Level Criterion

For ‘noise-sensitive’ land uses, the sound level limits for Indoor Living Areas from Table 2.2b (NPC-300, Table C-2) of the ENC Guidelines are as follows:

- Nighttime – sleeping quarters – 23:00 to 07:00 – 40 dBA Leq (8)
- Daytime – living areas, den areas, hospitals, nursing homes (excludes schools or daycares) – 07:00 to 23:00 – 45 dBA Leq (16)

The sound levels are based on the windows and doors to an indoor space being closed.

Based on preliminary density information for the proposed subdivision, it is assumed that buildings heights in high-density blocks (i.e. south of the transit corridor and Block 2) will not exceed 25 storeys and therefore the daytime and nighttime noise is assessed at 76.5 metres above the ground. The remaining property parcels created through

this Draft Plan are expected to conform to the City's standard definition of 'medium density' and be a maximum of 9 storeys. As such, the daytime and nighttime receptor locations for these blocks will be evaluated at 28.5 metres above the ground.

As per NPC-300 C7.1.2.1 and C7.1.2.2, when the outdoor noise levels at the plane of the window are greater than 55 dBA and less than or equal to 65 dBA (daytime) and/or greater than 50 dBA and less than or equal to 60 dBA (nighttime), then a warning clause is required along with forced air heating and a provision for central air conditioning.

Should the outdoor noise levels exceed 65 dBA at the living room and/or exceed 60 dBA at the bedroom, then central air conditioning is mandatory and a warning clause is required.

2.2.2 Outdoor Sound Level Criterion

As per Table 2.2a of NPC-300, the sound level criteria for the outdoor living area (OLA) during the daytime period between 07:00 and 23:00 hours is 55 dBA Leq (16). Sound levels for the OLA are typically calculated 3 metres from the building face at the centre of the façade or within the centre of the OLA at a height of 1.5 metres above the ground.

If the Leq sound level is less than or equal to the above criteria, then no further action is required by the proponent. If the sound level exceeds the criteria by less than 5 dBA then the proponent may, with City approval, either provide a warning clause to prospective purchasers/tenants or install physical attenuation. For sound levels greater than 5 dBA above the criteria control measures are required to reduce the noise levels as close to 55 dBA as technically, economically and administratively possible. Should the sound levels with the barrier in place exceed 55 dBA, a warning clause is also required.

2.2.3 Indoor Sound Level Criterion – Building Components

As per NPC-300 C7.1.3, when the outdoor sound levels are less than or equal to 65 dBA at the 'daytime' window and/or less than or equal to 60 dBA at the 'nighttime' window, then the building must be compliant with the Ontario Building Code. Should the outdoor sound levels exceed this criteria, then the building component (walls, windows etc.) must be designed to achieve indoor sound level criteria.

2.1 Sound Level Limits for Aircraft Noise

Aircraft noise impact assessment is based on the Noise Exposure Forecast (NEF) and Noise Exposure Projection (NEP) methods approved by Transport Canada. The noise contours were used to define the Airport Operating Influence Zone (AOIZ) and Airport Vicinity Development Zone (AVDZ), as indicated on Schedule C-14 of the 2022 Official Plan.

No new noise sensitive developments are permitted within the AOIZ. Noise sensitive development is permitted within the AVDZ and outside of the AOIZ subject to a noise study or under the Prescribed Measures for Aircraft Noise in Part 6 of the ENC Guidelines, while indoor and outdoor sound level limits for aircraft noise are included in Table 4.2a.

3 Roadway Noise

3.1 Road & Rail Traffic Data

Road Traffic Data

The major sources of traffic noise are expected to originate from the segments of the adjacent road network, as well as through new roads extended through the subject lands. The existing and proposed roads which are most relevant to the noise evaluation conducted in this study are presented in **Table 3-1** below.

Table 3-1 – Existing & Proposed Roadways for Noise Evaluation

Name	Road Classification	Orients & Extents	Cross-section	ROW (m)	Speed Limit (km/h)
Earl Armstrong Road	Arterial	Existing - East-West, River Road to High Road	4-Lane, Urban, Divided	44.5	80
Limebank Road	Arterial	Existing - North-South, River Road to Mitch Owens Road	4-Lane, Urban, Divided	44.5	80
Portico Way	Collector	Existing - North-South, Earl Armstrong to south of Larimar Circle Proposed - Southern ext. to future Transit Corridor	2-Lane, Urban Undivided	26.0	40 [1]
Street 2	Collector	Proposed - East-West, Portico Way to Street 3	2-Lane, Urban Undivided	26.0	40 [1]
Street 3	Collector	Proposed - North-South, Earl Armstrong to Transit Corridor	2-Lane, Urban Undivided	26.0	40 [1]
Street 6	Collector	Proposed - North-South, Transit Corridor to Street 7	2-Lane, Urban Undivided	26.0	40 [1]
Street 7 (Borbridge Avenue)	Collector	Proposed - East-West, Street 8 to Limebank	2-Lane, Urban Undivided	26.0	40 [1]
Street 8	Collector	Proposed - North-South, Transit Corridor to Street 7	2-Lane, Urban Undivided	26.0	40 [1]

Notes: [1] Based on the City's Designing Neighbourhood Collector Streets (2019), it is assumed that these facilities within the Riverside South Town Centre will be designed as Complete Streets and that posted speeds will not exceed 40km/h.

Bus Rapid Transit (BRT) Corridor

A 43-metre ROW corridor is protected for a future Bus Rapid Transit corridor, which will ultimately form part of Ottawa's Transitway network. This future BRT corridor exists immediately south of the subject site and will provide a rapid transit connection between Barrhaven Market Place and Riverside South Town Centre in the long term.

The Average Annual Daily Traffic (AADT) and posted speed limit value for the BRT corridor were referenced from the Baseline of Acoustic Conditions Report (2012), included as Appendix F of the Barrhaven-Riverside South Rapid Transit Planning & EA Study (2013). Relevant extracts from the Barrhaven-Riverside South BRT EA Study are included in **Appendix A**.

It should be noted that this likely provides a conservative estimate of AADT, given that it predates the planned extension of the Trillium Line further south from Bowesville Station to Limebank Station. A review of current OC Transpo schedules for Riverview Station indicate that the current daytime and nighttime splits are consistent with the proportions used in the Trillium Line Extension EA Study, as discussed below.

Trillium Line Extension & Bus Loop

The Trillium Line Extension is part of Ottawa's Light Rail Transit (LRT) Stage 2 and involves the expansion of the City's primary north-south transit line from its current terminus at Greenboro Station further south to the future Limebank Station. The Trillium Line Extension is slated to open for full revenue service by 2024.

Consistent with the Noise, Vibration & Air Quality Report O-Train Extension Environmental Assessment (January 2016), the noise impacts of the Trillium Line Extension were modelled using a 4-car SRT (Scarborough Rapid Transit) vehicle with an assumed operating speed of 70km/h and 2031 projected volumes. Daytime and nighttime splits were based on a review of train schedules obtained from OC Transpo as part of the EA study. Relevant extracts from the Trillium Line EA Study are included in **Appendix A**.

A bus loop is currently under construction surrounding the Limebank LRT Station and will allow for clock-wise circulation around this transit hub, facilitating seamless integration with the future BRT corridor to the west.

Summary of Noise Parameters

Based on the four-lane, divided arterial road cross-section of both Earl Armstrong and Limebank, the collector road designation of the new internal streets through the subject lands and the future transit corridor protection bisecting the subject site, **Table 3-2** below summarizes the corresponding road and rail traffic parameters prescribed in Appendix B of the ENC Guidelines.

Table 3-2 – Road & Rail Study Parameters

Parameter	Earl Armstrong Road & Limebank Road (4-UAD[1])	Collector Roads (2-UCU[1])	BRT Corridor	Trillium Line Extension (LRT)
Annual Average Daily Traffic (AADT)	35,000	8,000	600	432 trains
Posted Speed Limit (km/h)	80	40	40 (assumed max. speed in bus loop) 80 (remainder of transit corridor)	70
% Medium Trucks	7%	7%	-	-
% Heavy Trucks	5%	5%	-	-
% Daytime Traffic	92%	92%	89%	89%

Notes: [1] Noise parameters defined as per Appendix B of the ENC Guidelines.

3.2 Calculation Methods

The road and rail noise analysis for this study was conducted using STAMSON v5.04, an industry-standard software program developed by the Ontario Ministry of the Environment, Conservation and Parks (MECP). Road noise is modelled using the ORNAMENT methodology, while rail noise is modelled using the STEAM methodology.

Noise contours were developed to establish the limits of both the indoor and outdoor noise criteria and were conservatively based on the capacity of each road or long-term build-out for LRT/BRT systems, as discussed previously in Section 3.1.

Details pertaining to the noise criteria of interest are outlined below:

- The limits of requirements pertaining to a building component review, mandatory air conditioning and a Type 'D' warning clause, the 65 dBA (daytime) and 60 dBA (nighttime) noise contours were analysed at the building face. The indoor noise evaluation was conducted using a height of 25 storeys (76.5m) to present the top-floor units with the heights road noise exposure, however it should be noted as well that the analysis was reviewed with a 28.5m (9-storey) building height and the noise impacts were calculated to be the same using the STAMSON ORNAMENT methodology.

- To determine the limits of forced air heating, provision for central air-conditioning and a Type 'C' warning clause, the 55 dBA (daytime) and 50 dBA (nighttime) noise contours were evaluated at the building face.

- The noise criteria limits for the outdoor living areas (OLAs) at 60 dBA and 55 dBA were evaluated under daytime conditions only at a receiver height of 1.5m.

The off-set distances presented in **Table 3-3** below were measured from the right-of-way centreline or from the centre of the right-of-way protection for each roadway identified for inclusion in the noise analysis, as discussed in the preceding section.

Table 3-3 – Noise Contour Offsets

Noise Criteria		Distance from Centreline (m)			
		Limebank & Earl Armstrong (4-UAD 80km/h)	Portico Way, Streets 6, 7 & 8 (2-UCU 40km/h)	BRT Corridor	BRT Bus Loop & Trillium Line Extension (LRT)
Indoor Daytime	65 dBA	196.0	11.8 [1]	47.1	192.0
	55 dBA	>500	118.0	470.6	>500
Indoor Nighttime	60 dBA	108.0	6.5 [1]	11.6 [1]	150.0
	50 dBA	>500	65.0	367.4	>500
Outdoor Living Area - OLA (Daytime Only)	60 dBA	115.4	21.2	50.1	118.4
	55 dBA	231.0	42.5	101.4	239.5

Note: 1. Outside of the STAMSON Source-Receiver distance range. Determined using divergence calculations (see **Appendix B**).

Based on **Table 3-3** above for the indoor noise evaluation, the daytime contours for all of the above noted corridors are further from centreline than the nighttime levels for each criterion. As such, only the daytime levels will be considered in the noise analysis for this study. Noise contours for both indoor (daytime only) and outdoor noise evaluation are shown in **Figure 3-1** below. These contours have not been adjusted to reflect screening from proposed buildings. For clarity purposes, the noise contours have not been extended beyond the contours of an intersecting road.

OPTION 2

DRAFT PLAN OF SUBDIVISION OF

PART OF LOTS 21 and **22**

CONCESSION 1 (RIDEAU FRONT)

Geographic Township of Gloucester

CITY OF OTTAWA

Prepared by Annis , O'Sullivan , Vollebekk Ltd.

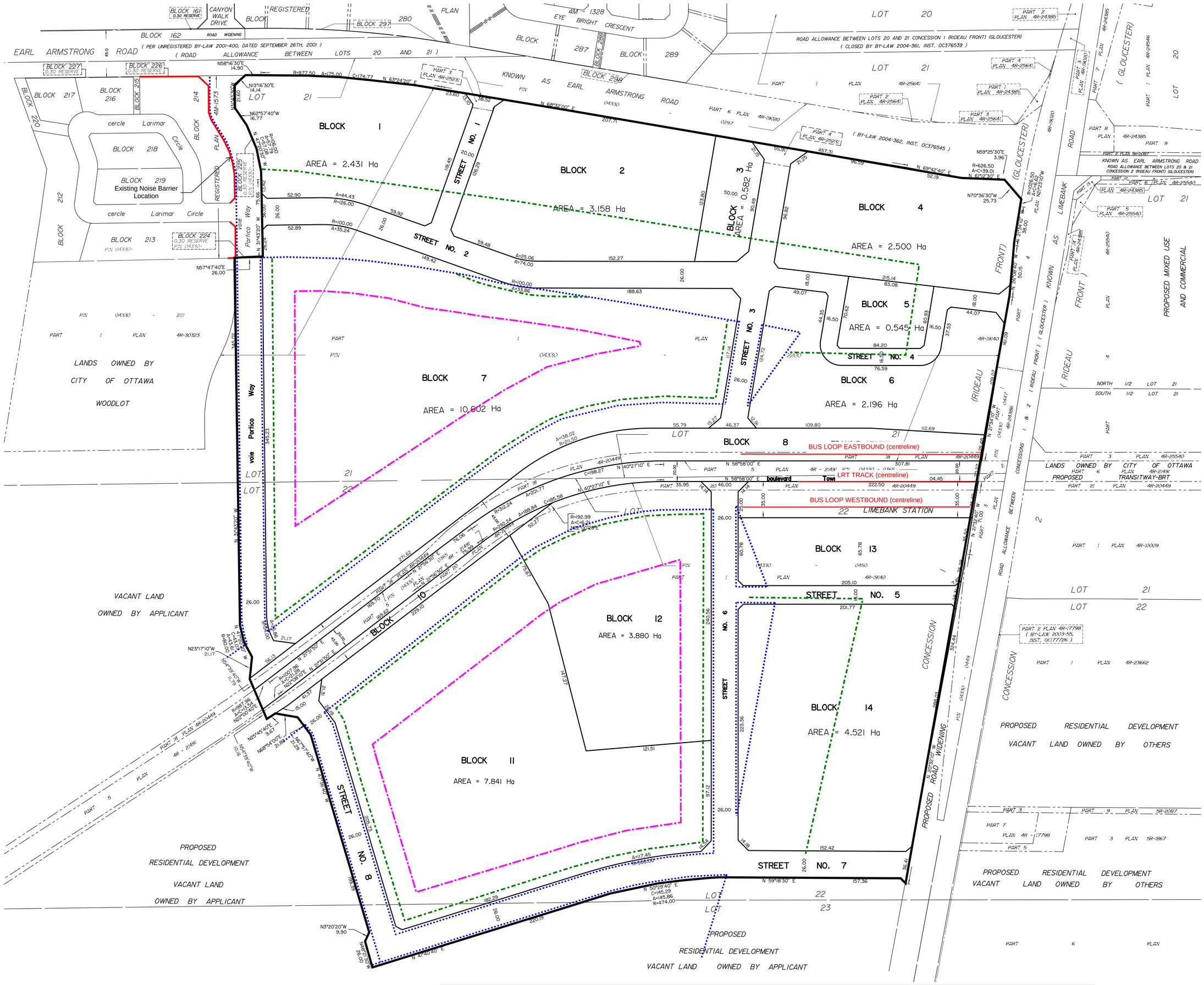
Scale 1 : 1500

60 45 30 15 0 30 60 Metres

Metric

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

KEY MAP
NOT TO SCALE



LEGEND:

- SUBJECT SITE LIMITS
- NOISE BARRIER
- 65 dBA INDOOR NOISE CONTOUR
- 55 dBA INDOOR NOISE CONTOUR
- 60 dBA OLA NOISE CONTOUR
- 55 dBA OLA NOISE CONTOUR

	CENTRELINE OFFSETS			
	EARL ARMSTRONG & LIMEBANK 4-UAD 80km/h	COLLECTOR STREETS 2-UCU 40km/h	BRT CORRIDOR	BRT BUS LOOP & TRILLIUM LINE EXTENSION (LRT)
65 dBA INDOOR (DAY)	196.0m	11.8m	47.1m	192.0m
55 dBA INDOOR (DAY)	>500m*	118.0m*	470.6m*	>500.0m*
60 dBA OLA (DAY)	115.4m	21.2m	50.1m	118.4m
55 dBA OLA (DAY)	231.0m	42.5m	101.4m	239.5m

*Note: Noise contours are not shown on the Noise Plan for clarity purposes.

FIGURE 3.1 - NOISE PLAN

REVISION SCHEDULE

NO.	REVISION	DATE	BY
11	REVISED LOC. OF SCHOOL BLOCK	SEPT. 20, 2023	N
10	REVISIONS	MAY 4, 2023	N
9	REVISIONS	APR. 27, 2023	N
8	REVISIONS	APR. 26, 2023	N
7	REVISIONS	JUNE 7, 2022	N
6	REVISIONS	APR. 21, 2022	N
5	REVISIONS	APR. 14, 2022	N
4	DISCUSSION	MAR. 19, 2021	N
3	DISCUSSION	JAN. 4, 2021	N
2	DISCUSSION	DEC. 18, 2020	N
1	DISCUSSION	DEC. 10, 2020	N

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Ontario Land Surveyors

Job No. 15320-14 Urbandale Pt Lt21 C1 RF GL DPS (11) N

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4 Results

4.1 Indoor Sound Levels

The 55 dBA (daytime) contours shown on **Figure 3-1** represent the limit in which a Type 'C' warning clause and forced air heating with provision for central air conditioning are required for 'noise-sensitive' indoor uses. Similarly, the 65 dBA (daytime) contours represent the limit in which a Type 'D' warning clause, central air conditioning and an acoustical review/design of the building components are required. As noted in Section 3.2, the noise contours have not been adjusted to account for screening by the proposed buildings. The exact number of units that exceed either the 65 dBA or 55 dBA thresholds will be determined during the detailed design phase as part of the Site Plan Control (SPC) application for each block.

A summary of the results of each roadway is as follows:

Earl Armstrong Road & Limebank Road (4-UAD 80km/h) – For either major arterial roadway, the 65 dBA noise contour will extend approximately 196.0 metres from the right-of-way centreline (or approximately 173.8 metres from the edge of the property line). As such, it is expected that 'noise-sensitive' land uses across the majority of property parcels which directly abut either Earl Armstrong or Limebank (i.e. Blocks 1, 2 4, 6, 12 & 13) may require a Type 'D' warning clause or accompanying noise abatement measures.

The 55 dBA noise contour, extending more than 500 metres beyond the right-of-way centreline for both arterial roads encompasses the entirety of the subject property, therefore the remaining Indoor Living Areas on-site may require warning clause Type 'C'. It should be noted, however, that this analysis does not take into consideration any screening from any future buildings on the subject site which can reasonably be expected to reduce the receptor noise levels for the inner-most residential dwelling units to within the acceptable 55 dBA (daytime) threshold limit.

Collector Roads (2-UCU 40km/h) – As shown on **Figure 3-1**, the 65 dBA contour falls within the road ROW and therefore would not impact any dwelling units adjacent to the road. All units directly fronting, backing onto or flanking onto these collector roads will experience noise levels above 55 dBA, requiring alternative means of ventilation and a Type 'C' warning clause. The exact number of units that exceed 55 dBA will be determined during detailed design stage. In the case of Blocks 1 & 2 which directly abut either Earl Armstrong Road or Limebank, the 65 dBA noise contours for these high-speed arterial roads govern and extend beyond the adjacent collector road (i.e. Street 2).

BRT Corridor – The 65 dBA indoor daytime contour is located approximately 47.1 metres from the road centreline which would only impact any dwelling units within closest proximity to this future transit corridor and require these units to be assigned as Type 'D' warning clause on the Agreement of Purchase/Sale or Tenancy Agreement.

The impacts of a Type 'C' warning clause are expected to be farther reaching, extending approximately 470.6 metres from the future BRT ROW centreline. As such, if not screened by other buildings, 'noise sensitive uses throughout the entirety of Blocks 7 and 11 have the potential to require a Type 'C' warning clause.

Trillium Line LRT Corridor & Bus Loop – The 65 dBA indoor daytime contour is located approximately 192.0 metres from the BRT centreline which has the potential to impact any potential 'noise sensitive' land uses within Blocks 6 and 13, located immediately adjacent to the proposed Limebank LRT Station and bus loop, potentially requiring mandatory central air conditioning, a review of building components and a Type 'D' warning clause.

The analysis indicates that the noise impacts associated with the 55 dBA contour extend more than 500 metres from the centreline of the BRT corridor and therefore, depending on the noise screening of future adjacent buildings,

a Type 'C' warning clause has the potential to be required for the remainder of units extending south to Street 7 (Borbridge Avenue). Further north in Block 4, it is expected that noise impacts will be governed by Earl Armstrong Road and Limebank Road. The exact number of dwelling units adjacent to the LRT/BRT transit corridor will be determined during the detailed design stage and through the completion of an ENIA for each development parcel containing 'noise-sensitive uses, as required.

Warning clauses for indoor noise are as follows:

Type 'C'

"This dwelling unit has been fitted with a forced air heating system and the ducting, etc. was sized to accommodate central air conditioning. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of the Environment's noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to comply with noise criteria of MOE Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts both on and in the immediate vicinity of the subject property."

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 City's and the Ministry of the Environment's noise criteria."

4.1.1 Sound Transmission Class (STC) Ratings

All dwelling units requiring a Type 'D' warning clause shall have mandatory central air conditioning and acoustical review of building components. Sound Transmission Class (STC) ratings for windows and glazed doors will be required for any 'noise sensitive' uses with the highest exposure to either Earl Armstrong Road, Limebank Road, the future BRT corridor or the bus loop/LRT corridor.

Dwelling units that are located directly adjacent to collector roads (2-UCU 40km/h) are not anticipated to require trigger a Type 'D' warning clause, unless the noise levels from another nearby corridor identified above encroach on these lands as well.

4.2 Outdoor Sound Levels

The outdoor 60 dBA contour on **Figure 3-1** represents the limit in which physical attenuation is required in the outdoor living areas (OLAs) for 'noise-sensitive' uses. For OLA receptor locations between the 60 dBA and 55 dBA contours, physical attenuation may not be required but should be considered as stated in Part 4, Section 3.4 of the ENC Guidelines. As noted in Section 3.2 of this study, noise contours have not been adjusted to account for screening by the proposed buildings. The location and limits of any Outdoor Living Areas (OLAs) within the resulting property parcels of the subject site will be defined as part of the Site Plan Control (SPC) application process and, at that time, the need for any specific noise mitigation measures (i.e. noise barriers or berm combinations) for these amenity areas will be identified.

A summary of the results for each roadway is as follows:

Earl Armstrong Road & Limebank Road (4-UAD 80km/h) – The 60 dBA noise criteria was determined to be 115.4 metres from the roadway centreline (or 93.2 metres from the right-of-way limits) for either arterial road, therefore any outdoor living areas (OLAs) in this range may require physical attenuation.

Similar to the Indoor Noise Analysis, the 55 dBA noise contour extends approximately 231.0 metres beyond the right-of-way centreline for both arterial roads encompasses the entirety of the subject property. As such, any 'noise-sensitive' OLAs beyond the 60 dBA threshold may still require the application of warning clause Type 'A'.

Collector Streets (2-UCU 40km/h) – As the 60 dBA outdoor contour is located approximately 21.2 metres from the centreline all collector streets proposed within the Draft Plan, all outdoor living areas (OLAs) in this range will require further evaluation to determine the need for physical attenuation. At locations where the noise level is below 60 dBA but above 55 dBA, warning clause Type 'A' could be considered in lieu of a barrier.

BRT Corridor – As the 60 dBA outdoor contour is located approximately 50.1 metres from the centreline of the BRT corridor, all outdoor living areas (OLA) for the units directly flanking the BRT will require physical attenuation. At locations where the noise level is below 60 dBA but above 55 dBA, which may extend as far as 101.4 metres from the centreline of the future BRT ROW corridor, a Type 'A' warning clause could be considered in lieu of a barrier.

Trillium Line LRT Corridor & Bus Loop – As the 60 dBA outdoor contour is located approximately 118.4 metres from the centreline of the Trillium Line LRT Corridor & Bus Loop, all outdoor living areas (OLA) for the units directly flanking this transit corridor will require physical attenuation. At locations where the noise level is below 60 dBA but above 55 dBA, which may extend beyond the limits of the adjacent Blocks 6 & 12 and up to a distance of 239.5 metres, a Type 'A' warning clause could be considered in lieu of a barrier.

Due to overland flow routes drainage and access easements it may not be practical to construct a continuous barrier along either the above noted collector (2-UCU) streets located within the proposed development. In these situations, implementing a partial barrier will help reduce the noise levels below 60 dBA but may not reduce below 55 dBA, therefore a Type 'B' warning clause may still be required for select units.

Warning clauses for outdoor noise are as follows:

Type 'A'

"Purchasers/tenants are advised that sound levels due to increasing Earl Armstrong Road, Limebank Road, Portico Way, Street 2, Street 3, Street 6, Street 7 (Borbridge Avenue extension), Street 8, the BRT corridor or LRT/bus loop traffic volumes may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria."

Type 'B'

"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing Earl Armstrong Road, Limebank Road traffic Portico Way, Street 2 or Street 3, Street 6, Street 7 (Borbridge Avenue extension), Street 8 the BRT corridor or LRT/bus loop traffic volumes may on occasion interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria."

4.3 Aircraft Noise

Given that the site is entirely located within the Airport Vicinity Development Zone (ADVZ), the following warning clause will apply to Indoor or Outdoor Living Areas which conform to the City's criteria for 'noise-sensitive' land uses, as prescribed in the ENC Guidelines.

The standard warning clause for aircraft noise is as follows:

"Purchasers/tenants are advised that due to the proximity of the Ottawa Macdonald-Cartier International Airport, noise from the airport and individual aircraft may at times interfere with indoor or outdoor activities".

5 Conclusion

Arcadis was retained by Riverside South Development Corporation (RSDC) to undertake a Noise Control Feasibility Study in support of a Draft Plan of Subdivision application for the proposed development to be located at 980 Earl Armstrong Road and 4700 Limebank Road, Ottawa. Upon redevelopment, these lands will serve as the Riverside South Town Centre.

Through preliminary noise investigations conducted as part of this study, contour lines were established to define the limits of the noise criteria for road, rail and aircraft noise and identify any potential constraints which may exist for 'noise-sensitive' land uses through the site's future development.

It is anticipated that a more fulsome analysis will be required in the form of Environmental Noise Impact Assessment(s) to inform recommendations for appropriate warning clauses or other mitigation strategies, as required, with respect to road, rail or aircraft traffic noise in support of separate Site Plan Control (SPC) applications for resulting property parcels and subsequent to the successful completion of the Draft Plan of Subdivision (DPS) approvals process.

6 Professional Authorization

Prepared By:

Ben Pascolo-Neveu, P.Eng.

Appendix A

Noise Parameters

Noise barriers can be formed of earthen berms, engineered noise walls, or some combination of the two. Where earthen berms are used, side slopes of 3:1 should be used for drainage and erosion control and right-of-way maintenance. Where noise walls are to be used, they should be free of gaps and cracks, and have a minimum surface density (mass per unit of face area) of 20 kg/m^2 (4 lb. per sq. ft.).

3. SURFACE TRANSPORTATION IMPACT ASSESSMENT

Surface transportation corridor modelling was performed to determine future daytime ($L_{EQ,16hr}$) sound levels in the two distinct regions of the BRT corridor: the dedicated BRT and the median BRT. All dedicated BRT sections of the corridor were assumed to be the same from an acoustic perspective (same basic design and traffic volumes). The Transit Street median BRT portion of the corridor (which runs through the Riverside South Community Town Centre), was assumed to be representative of all median BRT sections within the project study area.

3.1 Surface Transportation Corridor Model Inputs

Surface transportation corridor modelling used bus and road traffic information and drawings of the proposed BRT route provided by MRC. For pieces of information that were not directly available, RWDI adopted estimates based on Table 1.7 of the ENCG, and confirmed these estimates with MRC. The traffic data used in this assessment are for the future horizon year of 2031. This is the point at which the project is predicted to reach maturity. A summary of the information used in the analysis is listed in the Utilized Document Log in Appendix B.

The ENCG accepts noise models based on the Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT), including the computerized version, STAMSON (MOE 1996). These models have built-in sound power data for road vehicles; however, they do not specify values specifically for buses. Based on ENCG section 2.4.1, transitway buses should be classified as “medium trucks” for modeling purposes using STAMSON. However, the buses operating on the BRT are 60 foot articulating buses, with three axles and a weight over 18,000 kg. Based on the MOE “STAMSON Version 4.1 User’s Guide”, a vehicle with three or more axles and a weight greater than 12,000 kg should be considered as a “heavy truck” for modelling. Therefore, the proposed BRT buses were modelled as “heavy trucks”.

A summary of the model inputs is presented below in Table 3.

Table 3: Traffic Inputs for Surface Transportation Corridor Modelling

	Dedicated BRT Sections of Project	Transit Street without Proposed BRT	Transit Street with Median BRT
AADT	600	14000	14600
Speed Limit	80 km/h	60 km/h	60 km/h
Day / Night Split	74% / 26%	92% / 8%	91% / 9%
% Medium / % Heavy of Total Traffic	0% / 100%	7% / 5%	7% / 8%

TABLE 5: AADT TRAFFIC AND RAIL VOLUMES (EXISTING AND FUTURE)

Road Segment	AADT		Speed (km/h)
	Existing (2015)	Projected (2031)	
Bayview Road	5,518	6,731	50
Gladstone Avenue	4,758	5,804	40
Highway 417 (/direction)	93,000	11,3450	100
Preston Street	19,976	24,369	50
Airport Parkway	24,879	33,359	80
Airport Parkway (SB Walkley Exit)	5,891	7,899	80
Walkley Road	21,390	26,093	50
Huntclub Road	28,986	35,360	60
Flannery Drive	9,648	11,769	40
O-Train LRT	180	216	70
VIA Rail	14	20	150

Transportation noise calculations have been based on the Ontario Road Noise Analysis Method for Environmental and Transportation (ORNAMENT), and calculated using the MOECC approved software STAMSON (5.04). This method calculates noise levels based on: (i) AADT volumes, posted speed limits, and vehicle mix data for roadways, representing the source; and (ii) source-receiver distance, exposure angles and intermediate ground surface characteristics, and source-receiver ground elevation, as characterizing the path of noise. This method was developed by the MOECC and satisfies City of Ottawa requirements. Unless otherwise specified in Table 5, AADT volumes on surrounding streets were considered to be split 92% daytime, and 8% nighttime, for each roadway segment, as well as a vehicle mix of 7% and 5% for medium and heavy trucks, respectively. Speed limits used in the calculations are presented in Table 5.

The O-Train was modelled in STAMSON as a 4-car SRT (Scarborough Rapid Transit) vehicle; operating at an assumed speed of 70 km/h. Daytime and nighttime split is based on current train schedules obtained from OC Transpo.

Appendix B

STAMSON Output Reports

```
STAMSON 5.0        NORMAL REPORT        Date: 20-09-2023 17:22:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4uad6560.te          Time Period: Day/Night 16/8 hours
Description: 4-UAD 65 dBA (day)/ 60 dBA (night) Indoor


Road data, segment # 1: 4uad dir 1 (day/night)
----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    veh/TimePeriod  *
Posted speed limit  :    80 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: 4uad dir 1 (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  : 196.00 / 108.00 m
Receiver height           :  76.50 / 76.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

FF
Road data, segment # 2: 4uad dir 1 (day/night)
----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    veh/TimePeriod  *
Posted speed limit  :    80 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: 4uad dir 1 (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  : 196.00 / 108.00 m
Receiver height           :  76.50 / 76.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

FF
Results segment # 1: 4uad dir 1 (day)

Source height = 1.50 m

ROAD (0.00 + 61.99 + 0.00) = 61.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	73.16	0.00	-11.16	0.00	0.00	0.00	0.00	61.99

Segment Leq : 61.99 dBA

FF
Results segment # 2: 4uad dir 1 (day)

Source height = 1.50 m

ROAD (0.00 + 61.99 + 0.00) = 61.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	73.16	0.00	-11.16	0.00	0.00	0.00	0.00	61.99

Segment Leq : 61.99 dBA

Total Leq All Segments: 65.00 dBA

FF
Results segment # 1: 4uad dir 1 (night)

Source height = 1.50 m

ROAD (0.00 + 56.99 + 0.00) = 56.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.56	0.00	-8.57	0.00	0.00	0.00	0.00	56.99

Segment Leq : 56.99 dBA

FF
Results segment # 2: 4uad dir 1 (night)

Source height = 1.50 m

ROAD (0.00 + 56.99 + 0.00) = 56.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.56	0.00	-8.57	0.00	0.00	0.00	0.00	56.99

Segment Leq : 56.99 dBA

Total Leq All Segments: 60.00 dBA

FF

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 60.00

```
STAMSON 5.0        NORMAL REPORT        Date: 22-09-2023 39:05:20
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4uad5550.te          Time Period: Day/Night 16/8 hours
Description: 4UAD 80km/h 55 dba (day)/50 dba (night) indoor


Road data, segment # 1: 4uad dir 1 (day/night)
----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    veh/TimePeriod  *
Posted speed limit  :    80 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: 4uad dir 1 (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  : 500.00 / 500.00 m
Receiver height           :  76.50 / 76.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

FF
Road data, segment # 2: 4uad dir 1 (day/night)
----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    veh/TimePeriod  *
Posted speed limit  :    80 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  17500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: 4uad dir 1 (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  : 500.00 / 500.00 m
Receiver height           :  76.50 / 76.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

FF
Results segment # 1: 4uad dir 1 (day)

Source height = 1.50 m

ROAD (0.00 + 57.93 + 0.00) = 57.93 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	73.16	0.00	-15.23	0.00	0.00	0.00	0.00	57.93

Segment Leq : 57.93 dBA

FF
Results segment # 2: 4uad dir 1 (day)

Source height = 1.50 m

ROAD (0.00 + 57.93 + 0.00) = 57.93 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	73.16	0.00	-15.23	0.00	0.00	0.00	0.00	57.93

Segment Leq : 57.93 dBA

Total Leq All Segments: 60.94 dBA

FF
Results segment # 1: 4uad dir 1 (night)

Source height = 1.50 m

ROAD (0.00 + 50.33 + 0.00) = 50.33 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.56	0.00	-15.23	0.00	0.00	0.00	0.00	50.33

Segment Leq : 50.33 dBA

FF
Results segment # 2: 4uad dir 1 (night)

Source height = 1.50 m

ROAD (0.00 + 50.33 + 0.00) = 50.33 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.56	0.00	-15.23	0.00	0.00	0.00	0.00	50.33

Segment Leq : 50.33 dBA

Total Leq All Segments: 53.34 dBA

FF

TOTAL Leq FROM ALL SOURCES (DAY): 60.94
(NIGHT): 53.34

STAMSON 5.0 NORMAL REPORT Date: 06-05-2022 17:15:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4uad.te Time Period: Day/Night 16/8 hours
Description: 4uad 60 dba (day) OLA

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

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: (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 : 115.41 / 188.80 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: (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 : 115.41 / 188.80 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

FF
Results segment # 1: (day)

Source height = 1.50 m

ROAD (0.00 + 56.99 + 0.00) = 56.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	73.16	0.00	-14.71	-1.46	0.00	0.00	0.00	56.99

Segment Leq : 56.99 dBA

FF
Results segment # 2: (day)

Source height = 1.50 m

ROAD (0.00 + 56.99 + 0.00) = 56.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	73.16	0.00	-14.71	-1.46	0.00	0.00	0.00	56.99

Segment Leq : 56.99 dBA

Total Leq All Segments: 60.00 dBA

FF
Results segment # 1: (night)

Source height = 1.50 m

ROAD (0.00 + 46.99 + 0.00) = 46.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	65.56	0.00	-17.27	-1.30	0.00	0.00	0.00	46.99

Segment Leq : 46.99 dBA

FF
Results segment # 2: (night)

Source height = 1.50 m

ROAD (0.00 + 46.99 + 0.00) = 46.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	65.56	0.00	-17.27	-1.30	0.00	0.00	0.00	46.99

Segment Leq : 46.99 dBA

Total Leq All Segments: 50.00 dBA

FF

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 50.00

STAMSON 5.0 NORMAL REPORT Date: 27-08-2020 11:39:17
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4-UAD.te Time Period: Day/Night 16/8 hours
Description: 4-UAD 55 dBA (day) OLA

Road data, segment # 1: 4-UAD (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: 4-UAD (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 : 230.98 / 43.54 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: 4-UAD (day/night)

Car traffic volume : 14168/1232 veh/TimePeriod *
Medium truck volume : 1127/98 veh/TimePeriod *
Heavy truck volume : 805/70 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 17500
Percentage of Annual Growth : 0.00

```
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: 4-UAD (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  : 230.98 / 43.54  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: 4-UAD (day)
---------------------------------

Source height = 1.50 m

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   0.66  73.16   0.00 -19.71  -1.46   0.00   0.00   0.00  51.99
-------------------------------------------------------------------------------

Segment Leq : 51.99 dBA


Results segment # 2: 4-UAD (day)
---------------------------------

Source height = 1.50 m

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   0.66  73.16   0.00 -19.71  -1.46   0.00   0.00   0.00  51.99
-------------------------------------------------------------------------------

Segment Leq : 51.99 dBA

Total Leq All Segments: 55.00 dBA


Results segment # 1: 4-UAD (night)
---------------------------------
```

Source height = 1.50 m

ROAD (0.00 + 56.99 + 0.00) = 56.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	65.56	0.00	-7.27	-1.30	0.00	0.00	0.00	56.99

Segment Leq : 56.99 dBA

Results segment # 2: 4-UAD (night)

Source height = 1.50 m

ROAD (0.00 + 56.99 + 0.00) = 56.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	65.56	0.00	-7.27	-1.30	0.00	0.00	0.00	56.99

Segment Leq : 56.99 dBA

Total Leq All Segments: 60.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.00
(NIGHT): 60.00

```
STAMSON 5.0        NORMAL REPORT        Date: 20-09-2023 15:49:52
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2UCU6560.te          Time Period: Day/Night 16/8 hours
Description: 2-UCU 65 DBA (DAY)/60 DBA (NIGHT)


Road data, segment # 1: 2-ucu (day/night)
----------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    40 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: 2-ucu (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  :  15.00 / 15.00  m
Receiver height           :  76.50 / 76.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

FF
Results segment # 1: 2-ucu (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.96 + 0.00) = 63.96 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  63.96   0.00   0.00   0.00   0.00   0.00   0.00  63.96
-------------------------------------------------------------------------------

Segment Leq : 63.96 dBA

Total Leq All Segments: 63.96 dBA

FF
Results segment # 1: 2-ucu (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 56.36 + 0.00) = 56.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  56.36   0.00   0.00   0.00   0.00   0.00   0.00  56.36
-------------------------------------------------------------------------------

Segment Leq : 56.36 dBA
```

Total Leq All Segments: 56.36 dBA

FF

TOTAL Leq FROM ALL SOURCES (DAY): 63.96
(NIGHT): 56.36

FF

FF

```
STAMSON 5.0        NORMAL REPORT        Date: 20-09-2023 15:09:59
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2ucu5550.te          Time Period: Day/Night 16/8 hours
Description: 2-ucu 40km/h - 55 dBA (day)/ 50 dBA (night)


Road data, segment # 1: 2-ucu (day/night)
----------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    40 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: 2-ucu (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  : 118.02 / 64.97  m
Receiver height           :  76.50 / 76.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

FF
Results segment # 1: 2-ucu (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.00 + 0.00) = 55.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  63.96   0.00  -8.96   0.00   0.00   0.00   0.00  55.00
-------------------------------------------------------------------------------

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA

FF
Results segment # 1: 2-ucu (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.00 + 0.00) = 50.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  56.36   0.00  -6.37   0.00   0.00   0.00   0.00  50.00
-------------------------------------------------------------------------------

Segment Leq : 50.00 dBA
```

Total Leq All Segments: 50.00 dBA

FF

TOTAL Leq FROM ALL SOURCES (DAY): 55.00
(NIGHT): 50.00

FF

FF

```
STAMSON 5.0        NORMAL REPORT        Date: 20-09-2023 16:54:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2ucu60.te            Time Period: Day/Night 16/8 hours
Description: 2-ucu 60 dBA (day) OLA


Road data, segment # 1: 2-ucu (day/night)
----------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    40 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: 2-ucu (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  :  21.22 / 15.00  m
Receiver height           :   1.50 / 76.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

FF
Results segment # 1: 2-ucu (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  63.96   0.00  -2.50  -1.46   0.00   0.00   0.00  60.00
-------------------------------------------------------------------------------

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

FF
Results segment # 1: 2-ucu (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 56.36 + 0.00) = 56.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  56.36   0.00   0.00   0.00   0.00   0.00   0.00  56.36
-------------------------------------------------------------------------------

Segment Leq : 56.36 dBA
```

Total Leq All Segments: 56.36 dBA

FF

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 56.36

FF

FF

```
STAMSON 5.0        NORMAL REPORT        Date: 20-09-2023 16:23:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2UCU55.te            Time Period: Day/Night 16/8 hours
Description: 2-UCU 55 DBA (DAY)


Road data, segment # 1: 2-ucu (day/night)
----------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    40 km/h
Road gradient       :     1 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: 2-ucu (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  :  42.47 / 64.97  m
Receiver height           :   1.50 / 76.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

FF
Results segment # 1: 2-ucu (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.00 + 0.00) = 55.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  63.96   0.00  -7.50  -1.46   0.00   0.00   0.00  55.00
-------------------------------------------------------------------------------

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA

FF
Results segment # 1: 2-ucu (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.00 + 0.00) = 50.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  56.36   0.00  -6.37   0.00   0.00   0.00   0.00  50.00
-------------------------------------------------------------------------------

Segment Leq : 50.00 dBA
```

Total Leq All Segments: 50.00 dBA

FF

TOTAL Leq FROM ALL SOURCES (DAY): 55.00
(NIGHT): 50.00

FF

FF

STAMSON 5.0 NORMAL REPORT Date: 22-09-2023 17:29:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt6560.te Time Period: Day/Night 16/8 hours
Description: lrt 65 dba (day)/ 60 dba (night) indoor

RT/Custom data, segment # 1: brt eb (day/night)
---
1 - Custom (87.0 dBA):
Traffic volume : 534/66 veh/TimePeriod
Speed : 40 km/h

Data for Segment # 1: brt eb (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 : 192.00 / 150.00 m
Receiver height : 76.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

RT/Custom data, segment # 2: brt eb (day/night)
---
1 - Custom (87.0 dBA):
Traffic volume : 534/66 veh/TimePeriod
Speed : 40 km/h

Data for Segment # 2: brt eb (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 : 192.00 / 150.00 m
Receiver height : 76.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

RT/Custom data, segment # 3: lrt (day/night)
---
1 - 4-car SRT:
Traffic volume : 192/24 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 3: lrt (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 : 192.00 / 150.00 m
Receiver height : 76.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: brt eb (day)

Source height = 2.40 m

RT/Custom (0.00 + 61.90 + 0.00) = 61.90 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	72.97	-11.07	0.00	0.00	0.00	0.00	61.90

Segment Leq : 61.90 dBA

Results segment # 2: brt eb (day)

Source height = 2.40 m

RT/Custom (0.00 + 61.90 + 0.00) = 61.90 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	72.97	-11.07	0.00	0.00	0.00	0.00	61.90

Segment Leq : 61.90 dBA

Results segment # 3: lrt (day)

Source height = 0.50 m

RT/Custom (0.00 + 47.87 + 0.00) = 47.87 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	58.95	-11.07	0.00	0.00	0.00	0.00	47.87

Segment Leq : 47.87 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: brt eb (night)

Source height = 2.40 m

RT/Custom (0.00 + 56.90 + 0.00) = 56.90 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.90	-10.00	0.00	0.00	0.00	0.00	56.90

Segment Leq : 56.90 dBA

Results segment # 2: brt eb (night)

Source height = 2.40 m

RT/Custom (0.00 + 56.90 + 0.00) = 56.90 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.90	-10.00	0.00	0.00	0.00	0.00	56.90

Segment Leq : 56.90 dBA

Results segment # 3: lrt (night)

Source height = 0.50 m

RT/Custom (0.00 + 42.93 + 0.00) = 42.93 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	52.93	-10.00	0.00	0.00	0.00	0.00	42.93

Segment Leq : 42.93 dBA

Total Leq All Segments: 60.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 60.00

STAMSON 5.0 NORMAL REPORT Date: 22-09-2023 17:29:13
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt5550.te Time Period: Day/Night 16/8 hours
Description: lrt 55 dba (day)/50 dba (night) indoor

RT/Custom data, segment # 1: brt eb (day/night)
---
1 - Custom (87.0 dBA):
Traffic volume : 534/66 veh/TimePeriod
Speed : 40 km/h

Data for Segment # 1: brt eb (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 : 500.00 / 500.00 m
Receiver height : 76.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

RT/Custom data, segment # 2: brt eb (day/night)
---
1 - Custom (87.0 dBA):
Traffic volume : 534/66 veh/TimePeriod
Speed : 40 km/h

Data for Segment # 2: brt eb (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 : 500.00 / 500.00 m
Receiver height : 76.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

RT/Custom data, segment # 3: lrt (day/night)
---
1 - 4-car SRT:
Traffic volume : 192/24 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 3: lrt (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 : 500.00 / 500.00 m
Receiver height : 76.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: brt eb (day)

Source height = 2.40 m

RT/Custom (0.00 + 57.75 + 0.00) = 57.75 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	72.97	-15.23	0.00	0.00	0.00	0.00	57.75

Segment Leq : 57.75 dBA

Results segment # 2: brt eb (day)

Source height = 2.40 m

RT/Custom (0.00 + 57.75 + 0.00) = 57.75 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	72.97	-15.23	0.00	0.00	0.00	0.00	57.75

Segment Leq : 57.75 dBA

Results segment # 3: lrt (day)

Source height = 0.50 m

RT/Custom (0.00 + 43.72 + 0.00) = 43.72 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	58.95	-15.23	0.00	0.00	0.00	0.00	43.72

Segment Leq : 43.72 dBA

Total Leq All Segments: 60.85 dBA

Results segment # 1: brt eb (night)

Source height = 2.40 m

RT/Custom (0.00 + 51.68 + 0.00) = 51.68 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.90	-15.23	0.00	0.00	0.00	0.00	51.68

Segment Leq : 51.68 dBA

Results segment # 2: brt eb (night)

Source height = 2.40 m

RT/Custom (0.00 + 51.68 + 0.00) = 51.68 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.90	-15.23	0.00	0.00	0.00	0.00	51.68

Segment Leq : 51.68 dBA

Results segment # 3: lrt (night)

Source height = 0.50 m

RT/Custom (0.00 + 37.70 + 0.00) = 37.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	52.93	-15.23	0.00	0.00	0.00	0.00	37.70

Segment Leq : 37.70 dBA

Total Leq All Segments: 54.78 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.85
(NIGHT): 54.78

STAMSON 5.0 NORMAL REPORT Date: 22-09-2023 17:38:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt60.te Time Period: Day/Night 16/8 hours
Description: lrt 60 dba (day) ola

RT/Custom data, segment # 1: brt eb (day/night)
---
1 - Custom (87.0 dBA):
Traffic volume : 534/66 veh/TimePeriod
Speed : 40 km/h

Data for Segment # 1: brt eb (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 : 118.40 / 150.00 m
Receiver height : 1.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

RT/Custom data, segment # 2: brt eb (day/night)
---
1 - Custom (87.0 dBA):
Traffic volume : 534/66 veh/TimePeriod
Speed : 40 km/h

Data for Segment # 2: brt eb (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 : 118.40 / 150.00 m
Receiver height : 1.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

RT/Custom data, segment # 3: lrt (day/night)
---
1 - 4-car SRT:
Traffic volume : 192/24 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 3: lrt (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 : 118.40 / 150.00 m
Receiver height : 1.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: brt eb (day)

Source height = 2.40 m

RT/Custom (0.00 + 56.91 + 0.00) = 56.91 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.63	72.97	-14.65	-1.41	0.00	0.00	0.00	56.91

Segment Leq : 56.91 dBA

Results segment # 2: brt eb (day)

Source height = 2.40 m

RT/Custom (0.00 + 56.91 + 0.00) = 56.91 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.63	72.97	-14.65	-1.41	0.00	0.00	0.00	56.91

Segment Leq : 56.91 dBA

Results segment # 3: lrt (day)

Source height = 0.50 m

RT/Custom (0.00 + 42.60 + 0.00) = 42.60 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	58.95	-14.89	-1.46	0.00	0.00	0.00	42.60

Segment Leq : 42.60 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: brt eb (night)

Source height = 2.40 m

RT/Custom (0.00 + 56.90 + 0.00) = 56.90 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.90	-10.00	0.00	0.00	0.00	0.00	56.90

Segment Leq : 56.90 dBA

Results segment # 2: brt eb (night)

Source height = 2.40 m

RT/Custom (0.00 + 56.90 + 0.00) = 56.90 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.90	-10.00	0.00	0.00	0.00	0.00	56.90

Segment Leq : 56.90 dBA

Results segment # 3: lrt (night)

Source height = 0.50 m

RT/Custom (0.00 + 42.93 + 0.00) = 42.93 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	52.93	-10.00	0.00	0.00	0.00	0.00	42.93

Segment Leq : 42.93 dBA

Total Leq All Segments: 60.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 60.00

STAMSON 5.0 NORMAL REPORT Date: 22-09-2023 17:34:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt55.te Time Period: Day/Night 16/8 hours
Description: lrt 55 dba (day) ola

RT/Custom data, segment # 1: brt eb (day/night)
---
1 - Custom (87.0 dBA):
Traffic volume : 534/66 veh/TimePeriod
Speed : 40 km/h

Data for Segment # 1: brt eb (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 : 239.50 / 150.00 m
Receiver height : 1.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

RT/Custom data, segment # 2: brt eb (day/night)
---
1 - Custom (87.0 dBA):
Traffic volume : 534/66 veh/TimePeriod
Speed : 40 km/h

Data for Segment # 2: brt eb (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 : 239.50 / 150.00 m
Receiver height : 1.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

RT/Custom data, segment # 3: lrt (day/night)
---
1 - 4-car SRT:
Traffic volume : 192/24 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 3: lrt (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 : 239.50 / 150.00 m
Receiver height : 1.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: brt eb (day)

Source height = 2.40 m

RT/Custom (0.00 + 51.91 + 0.00) = 51.91 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.63	72.97	-19.65	-1.41	0.00	0.00	0.00	51.91

Segment Leq : 51.91 dBA

Results segment # 2: brt eb (day)

Source height = 2.40 m

RT/Custom (0.00 + 51.91 + 0.00) = 51.91 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.63	72.97	-19.65	-1.41	0.00	0.00	0.00	51.91

Segment Leq : 51.91 dBA

Results segment # 3: lrt (day)

Source height = 0.50 m

RT/Custom (0.00 + 37.52 + 0.00) = 37.52 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	58.95	-19.97	-1.46	0.00	0.00	0.00	37.52

Segment Leq : 37.52 dBA

Total Leq All Segments: 55.00 dBA

Results segment # 1: brt eb (night)

Source height = 2.40 m

RT/Custom (0.00 + 56.90 + 0.00) = 56.90 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.90	-10.00	0.00	0.00	0.00	0.00	56.90

Segment Leq : 56.90 dBA

Results segment # 2: brt eb (night)

Source height = 2.40 m

RT/Custom (0.00 + 56.90 + 0.00) = 56.90 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.90	-10.00	0.00	0.00	0.00	0.00	56.90

Segment Leq : 56.90 dBA

Results segment # 3: lrt (night)

Source height = 0.50 m

RT/Custom (0.00 + 42.93 + 0.00) = 42.93 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	52.93	-10.00	0.00	0.00	0.00	0.00	42.93

Segment Leq : 42.93 dBA

Total Leq All Segments: 60.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.00
(NIGHT): 60.00

STAMSON 5.0 NORMAL REPORT Date: 21-09-2023 23:01:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: brt6560.te Time Period: Day/Night 16/8 hours
Description: brt 65 dba (day)/60 dba (night) indoor

RT/Custom data, segment # 1: brt (day/night)
---
1 - Custom (87.0 dBA):
Traffic volume : 534/66 veh/TimePeriod
Speed : 80 km/h

Data for Segment # 1: brt (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 : 47.09 / 15.00 m
Receiver height : 76.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: brt (day)

Source height = 2.40 m

RT/Custom (0.00 + 65.00 + 0.00) = 65.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	69.96	-4.97	0.00	0.00	0.00	0.00	65.00

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: brt (night)

Source height = 2.40 m

RT/Custom (0.00 + 63.89 + 0.00) = 63.89 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.89	0.00	0.00	0.00	0.00	0.00	63.89

Segment Leq : 63.89 dBA

Total Leq All Segments: 63.89 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 63.89

STAMSON 5.0 NORMAL REPORT Date: 21-09-2023 23:03:44
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: brt5550.te Time Period: Day/Night 16/8 hours
Description: brt 55 dba (day)/ 50 dba (night) indoor

RT/Custom data, segment # 1: brt (day/night)
---
1 - Custom (87.0 dBA):
Traffic volume : 534/66 veh/TimePeriod
Speed : 80 km/h

Data for Segment # 1: brt (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 : 470.60 / 367.38 m
Receiver height : 76.50 / 76.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: brt (day)

Source height = 2.40 m

RT/Custom (0.00 + 55.00 + 0.00) = 55.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	69.96	-14.97	0.00	0.00	0.00	0.00	55.00

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA

Results segment # 1: brt (night)

Source height = 2.40 m

RT/Custom (0.00 + 50.00 + 0.00) = 50.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.89	-13.89	0.00	0.00	0.00	0.00	50.00

Segment Leq : 50.00 dBA

Total Leq All Segments: 50.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.00
(NIGHT): 50.00

STAMSON 5.0 NORMAL REPORT Date: 21-09-2023 23:05:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: brt60.te Time Period: Day/Night 16/8 hours
Description: brt 60 dba (day) ola

RT/Custom data, segment # 1: brt (day/night)
---
1 - Custom (87.0 dBA):
Traffic volume : 534/66 veh/TimePeriod
Speed : 80 km/h

Data for Segment # 1: brt (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 : 50.11 / 43.06 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: brt (day)

Source height = 2.40 m

RT/Custom (0.00 + 60.00 + 0.00) = 60.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.63	69.96	-8.55	-1.41	0.00	0.00	0.00	60.00

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: brt (night)

Source height = 2.40 m

RT/Custom (0.00 + 55.00 + 0.00) = 55.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.63	63.89	-7.48	-1.41	0.00	0.00	0.00	55.00

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 55.00

STAMSON 5.0 NORMAL REPORT Date: 21-09-2023 23:06:22
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: brt55.te Time Period: Day/Night 16/8 hours
Description: brt 55 dba (day) ola

RT/Custom data, segment # 1: brt (day/night)
---
1 - Custom (87.0 dBA):
Traffic volume : 534/66 veh/TimePeriod
Speed : 80 km/h

Data for Segment # 1: brt (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 : 101.44 / 43.06 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: brt (day)

Source height = 2.40 m

RT/Custom (0.00 + 55.00 + 0.00) = 55.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.63	69.96	-13.56	-1.41	0.00	0.00	0.00	55.00

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA

Results segment # 1: brt (night)

Source height = 2.40 m

RT/Custom (0.00 + 55.00 + 0.00) = 55.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.63	63.89	-7.48	-1.41	0.00	0.00	0.00	55.00

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.00
(NIGHT): 55.00

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