

**NOISE & VIBRATION IMPACT STUDY
CONDOMINIUM DEVELOPMENT
70 OLD MILL ROAD
TOWN OF OAKVILLE**

FOR

2317511 ONTARIO INC.

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1. INTRODUCTION

At the request of 2317511 Ontario Inc., J.E. COULTER ASSOCIATES LIMITED has prepared a Noise Impact Study for the proposed mixed-use residential development at 70 Old Mill Road in the Town of Oakville (see Appendix A, Figure 1). The study's objectives include determining the required extent of noise control measures such as ventilation upgrades, appropriate warning clauses, and examples of required building façade component construction.

An analysis of the potential noise impact on this proposed condominium development has been conducted using road data for Cornwall Road and rail traffic data for CN/Metrolinx. The sound levels generated by the CN Rail operations are estimated based on the projected future rail traffic. Predicted sound levels are compared to the Ministry of the Environment, Conservation and Parks (MECP), Metrolinx, and CN Rail's sound level criteria, in order to establish the required noise control measures.

2. SITE DESCRIPTION

The proposed development is to be situated at the northwest corner of Cornwall Road and Old Mill Road, south of the CN/Metrolinx Rail corridor. This development would consist of a 12-storey building (see Appendix A, Figures 2 to 4). The building setback is 30m from the common R-O-W.

The nearest rail line is set back approximately 45m from the proposed building. The layout of the proposed building envelope is shown in Appendix A.

There is an existing 6-storey GO parking structure to the north, set back approximately 150m from the closest façade.

Directly to the south of this site are three existing condominium towers east of the railway.

3. CRITERIA FOR ACCEPTABLE SOUND LEVELS

3.1 Transportation Sources

Outdoor Living Areas

The MECP and the Railway's noise criterion for new residential developments is 55 dB L_{eq} daytime in the outdoor amenity areas. If the 16-Hour Equivalent Sound Level, L_{eq} (16) in the OLA is greater than 55 dB L_{eq} and less than or equal to 60 dBA, noise control measures may be applied to reduce the sound level to 55 dBA. If measures are not provided, prospective purchasers or tenants should be informed of potential noise problems by a warning clause Type A. If the 16-Hour Equivalent Sound Level, L_{eq} (16), 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. In the above situations, any excess above the limit will not be acceptable if it exceeds 55 dBA.

Ventilation Requirements – Daytime Period, 07:00–23:00 Hours

Noise control measures may not be required if the L_{eq} (16) daytime sound level in the plane of a bedroom or living/dining room window is less than or equal to 55 dBA. If the sound level in the plane of a bedroom or living/dining room window is greater than 55 dBA and less than or equal to 65 dBA, the dwelling should be designed with a provision for the installation of central air conditioning in the future, at the occupant's discretion. Warning clause Type C is also recommended.

If the daytime sound level in the plane of a bedroom or living/dining room window is greater than 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 1. The location and installation of the outdoor air conditioning device should comply with sound level limits of Publication *NPC-216* and guidelines contained in Environmental Noise Guidelines for Installation of Residential Air Conditioning Devices or should comply with other criteria specified by the municipality.

Ventilation Requirements – Nighttime Period, 23:00–07:00 Hours

Noise control measures may not be required if the L_{eq} (8) nighttime sound level in the plane of a bedroom or living/dining room window is less than or equal to 50 dBA. If the sound level in the plane of a bedroom or living/dining room window is greater than 50 dBA and less than or equal to 60 dBA, the dwelling should be designed with a provision for the installation of central air conditioning in the future, at the occupant's discretion. Warning clause Type C is also recommended. If the nighttime sound level in the plane of a bedroom or living/dining room window is greater than 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 1. The location and installation of the outdoor air conditioning device should comply with sound level limits of Publication *NPC-216* and guidelines contained in, or should comply with other criteria specified by the municipality.

The MECP has set indoor and outdoor noise level limits for residential uses due to road and rail traffic noise. These sound level limits, contained in the Ministry's Publication *NPC-300*, are summarized as follows:

Table 1: Sound Level Limits (Road and Rail)			
Type of Space	Time Period	L_{eq} (dBA)	
		Road	Rail
INDOOR LIMITS			
Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc.	07:00 – 23:00	45	40
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	23:00 – 07:00	45	40
Sleeping quarters	07:00 – 23:00	45	40
	23:00 – 07:00	40	35
OUTDOOR LIMITS			
Outdoor recreation areas ^{1 2}	07:00 – 23:00	55	55
Outside bedroom window	23:00 – 07:00	50	50
Outside living room window	07:00 – 23:00	55	55

¹ Up to 5 dB excess above criteria is allowed, provided a warning clause is given. Above 60 dB L_{eq}, exterior noise mitigation measures (i.e., noise barriers, intervening structures, additional set back from source) are required.

² An outdoor living area is defined as a private recreation area such as a rear yard, patio or terrace whose depth is at least 4m. At depths less than 4m, noise control measures are not considered.

These noise criteria also meet the Railway's noise standards in its proposed Provincial policy on the *Environmental Protection of New Residential Development Adjacent to Railways*.

Air conditioning is required for units where the nighttime sound level at bedroom windows is 60 dB L_{eq} or greater, or the daytime levels are 65 dB L_{eq} or greater. Forced air heating with provision for central air conditioning is required when nighttime outdoor sound levels are above 50 and below 60 dB L_{eq}, or daytime levels between 56 and 65 dB L_{eq}.

4. IDENTIFICATION OF TRANSPORTATION SOURCES

The following table summarizes the road traffic volume on Cornwall and Old Mill Roads:

	Cornwall Road	Old Mill Road
AADT (2017)	19,716 (west of Old Mill) 19,406 (east of Old Mill)	2,790
AADT (2031)	28,192 (west of Old Mill) 27,794 (east of Old Mill)	3,681
% Medium Trucks	1.95%	0.6%
% Heavy Trucks	1.95%	0.6%
Speed Limit (kph)	60	50
Road Gradient	2.0%	5.0%
Number of Lanes	4	2

Note: Traffic data was provided by the Town of Oakville. Projected 24-hour AADT volumes are based on 8-hour count (2017) multiplied by 2. Traffic on Cornwall and Old Mill roads has been projected at a rate of 2% per annum (compounded) from 2017 to 2031 (10-year projection from 2021). Total truck mix is 3.9% and 1.2% on Cornwall and Old Mill, respectively. Medium and heavy trucks have been divided equally. Old Mill Road includes the movements related to the GO parking lot.

It is anticipated that weekday GO Transit commuter rail service on the nearby Lakeshore West Line (CN Oakville Subdivision) will comprise a mix of diesel and electric trains. The commuter train volume forecast at this location is in the order of 255 trains per day. Commuter trains will comprise up to 2 locomotives and 12 passenger cars.

The railway traffic data for the CN Oakville Subdivision are summarized as follows (see Appendix B for details):

Table 3: Rail Data					
Time Period	Train Type	# of Trains	# of Cars (max)	# of Loco	Maximum Speed (kph)
CN OAKVILLE SUBDIVISION					
07:00 – 23:00	Freight ¹	2	140	4	100
	Commuter (Diesel) ²	60	12	1	129
	Commuter (Diesel) ²	11	12	2	129
	Commuter (Electric) ²	101	12	1	129
	Commuter (Electric) ²	42	12	2	129
	Passenger ¹	12	10	2	153
23:00 – 07:00	Freight ¹	2	140	4	100
	Commuter (Diesel) ²	8	12	1	129
	Commuter (Diesel) ²	4	12	1	129
	Commuter (Electric) ²	21	12	1	129
	Commuter (Electric) ²	8	12	1	129
	Passenger ¹	1	10	2	153

¹ For noise control purposes, the existing rail data (except for commuter trains) have been projected at 2.5% per annum (compounded) over 10 years, equivalent to a 28% overall increase.

² The commuter traffic represents the future projections by Metrolinx. The electric trains have been modelled with diesel locomotives.

The train station is modelled as equivalent to a full-speed passby in terms of the average sound levels.

5. TRAFFIC DATA ANALYSIS AND SOUND LEVEL PREDICTIONS

The transportation-related sound levels have been calculated at various locations throughout the development exposed to the CN rail line and Cornwall Road (see Appendix A, Figure 5).

The sound level calculations have been performed using *STAMSON Version 5.04*, a program designed by the Ontario Ministry of the Environment. These sound levels are based on a minimum 10-year traffic projection to the year 2031 for the CN rail line and the projected volume on Cornwall Road. Prediction samples are given in Appendix C. The results of these predictions are summarized for daytime and nighttime in Table 4, below.

Location	Daytime Sound Level at Exterior Façade, dB L _{eq}				Nighttime Sound Level at Exterior Façade, dB L _{eq}			
	CNR	Cornwall	Old Mill	Total	CNR	Cornwall	Old Mill	Total
Loc 1– NW Corner Façade	78	59	56	78	74	53	49	74
Loc 2 – NE Corner Façade	73	66	52	74	70	60	45	70
Loc 3 – South Façade	68	70	49	71	64	63	42	67
Loc 4 – SE Corner Façade	67	70	49	72	63	63	42	66
Loc 5 – SW Corner Façade	77	56	47	77	74	50	40	74

The combined sound level of the rail movements and Cornwall Road will generate relatively high noise impact at those areas closest to the road or rail line. The rail movements are the dominant transportation noise source at most façades for this development at all times of the day or night. Cornwall and Old Mill roads have little influence on the overall sound levels at the exterior façades. Noise mitigation measures (upgraded façades, ventilation, and warning clause requirements) will be necessary as a result of the noise. The measures outlined below are typical of those required for all housing adjacent to Principal Main Lines.

6. VENTILATION AND WARNING CLAUSE REQUIREMENTS

Central air conditioning is required only if the daytime sound level exceeds 65 dB L_{eq} or the nighttime sound level exceeds 60 dB L_{eq}. For this development, the sound levels exceed these limits. Thus, central air conditioning is to be incorporated into the units prior to occupancy.

All residential units will require the Railway's warning clause (see Appendix C, CN and Metrolinx Railway Warning Clauses) to be incorporated into all development agreements, and Agreements of Purchase and Sale or lease of each dwelling unit within 300m of the railway right-of-way.

The following table summarizes the ventilation and warning clause requirements (see Warning Clauses, Appendix C).

Location	Ventilation Requirements	Warning Clause Types
All units	Central Air Conditioning	A, D, CNR, Metrolinx

7. FAÇADE COMPONENTS

To meet the Railway's interior sound level criteria of 35 dB L_{eq} nighttime for the worst-case bedrooms and 40 dB L_{eq} daytime in the living/dining room areas, significant exterior building components are required on the most exposed façades. Significant upgrades to the exterior glazing, well above the minimum Ontario Building Code (OBC) is required. This is a result of the proposed GO Transit expansion that significantly increases the train movements, (255 per day).

The following table outlines various possible window types, based on a range of window-area to floor-area ratios for the façades of the apartment buildings directly exposed to the rail line. The window requirements for the east façade, directly facing Cornwall Road, will be less than those required for the north, west, and south façades noted below. It is assumed the exterior wall consists of spandrel panels rated at STC 55. Doors (sliding or hinged) may also need to be upgraded based on the final configuration. This may include double sliding doors and insulated metal doors with limited glazing.

Total Window-Area to Floor-Area Ratio	Fixed Window/STC Rating	Operable Window/STC Rating
Up to 14%	6(25)6 – STC 39	6(13)6 – STC 33
15 to 25%	6(25)6Lam – STC 41	6(13)6 – STC 33
26 to 35%	6Lam(25)6Lam – STC 43	4(63)3 – STC 39 (Double slider)
36 to 45%	6Lam(25)6Lam – STC 43	4(63)3 – STC 39 (Double slider)
46 to 55%	6Lam(25)6Lam – STC 45	4(63)3 – STC 39 (Double slider)
56 to 65%	6Lam(25)6Lam – STC 45	4(63)3 – STC 39 (Double slider)

Total Window-Area to Floor-Area Ratio	Fixed Window/STC Rating	Operable Window/STC Rating
Up to 17%	6(25)6 – STC 39	6(13)6 – STC 33
18 to 30%	6(25)6Lam – STC 42	6(13)6 – STC 33
31 to 40%	6Lam(25)6Lam – STC 43	6(13)6 – STC 33
41 to 50%	6Lam(25)6Lam – STC 44	6(13)6 – STC 33
51 to 60%	6Lam(25)6Lam – STC 45	6(13)6 – STC 33
61 to 70%	6Lam(25)6Lam – STC 45	6(25)6 – STC 36

Notes: Glazing denoted as 6Lam(25)6Lam refers to 6mm laminated glazing, a 25mm air space, and 6mm laminated glazing. Above STC ratings are estimated and are to be confirmed by the window supplier.

Note that the ratio of window area to floor area can be increased (i.e., larger window areas for the same floor area can be used) by installing thicker glazing and/or a larger air gap between the panes of glass. The acoustical consultant should verify the final façade requirements once the final layouts are prepared, to ensure the interior noise criteria are satisfied for the living/dining rooms and bedrooms.

The MECP and the Railway require brick veneering, concrete, masonry, or its acoustical equivalent to be applied. Exterior walls are to be rated at STC 55 (minimum). This measure is applicable to the entire building.

Standard ceiling construction can be used. There are no special requirements or measures needed.

8. VIBRATION MONITORING

Vibration measurements were conducted for the train passbys at this site. The monitoring occurred on January 30, 2013, between 1:30 p.m. and 5:30 p.m. The accelerometer (vibration pickup) was mounted in undisturbed soil 30m from the CN Right-of-Way. A total of 12 trains (freight, commuter, and passenger) were recorded, the results of which are summarized in Table 8, below. A sample frequency spectrum is attached (see Appendix B).

Ground-borne vibration levels generated by train passbys were found to be well below the criterion level of perception, 0.14mm/s velocity, and thus vibration mitigation will not be required for the building.

Table 8: Vibration Monitoring 30m from CNR R-O-W	
Train Type/Time/Est. Speed	Maximum Vibration Level (Velocity, mm/sec), Limit (0.14 mm/sec)
GO WB / 2:25 p.m. (Est. Speed <25 kph)	0.02
GO EB / 2:27 p.m. (Est. Speed <40 kph)	0.02
GO WB / 3:25 p.m. (Est. Speed <25 kph)	0.02
GO EB / 3:37 p.m. (Est. Speed <40 kph)	0.02
GO WB / 3:57 p.m. (Est. Speed <25 kph)	0.02
GO WB / 4:23 p.m. (Est. Speed <25 kph)	0.02
GO EB / 4:27 p.m. (Est. Speed <40 kph)	0.02
CN EB (Shunting) / 4:40 p.m. (Est. Speed <15 kph)	0.04
GO WB / 4:44 p.m. (Est. Speed <25 kph)	0.02
GO EB / 4:59 p.m. (Est. Speed <40 kph)	0.02
GO WB / 5:03 p.m. (Est. Speed <25 kph)	0.02
VIA WB / 5:08 p.m. (Est. Speed 80 kph)	0.02

9. CONCLUSIONS

The analysis indicates the combined effect of the road and rail sources creates a moderately high noise impact on the site. The impact is dominated by the rail noise. Noise control measures including central air conditioning, upgraded exterior façades (windows and walls), and warning clauses have been recommended to deal with the noise excess.

Outdoor terraces were found to meet MECP's noise guideline without the need for additional noise control measures using a standard solid panel 1.1m high parapet railing.

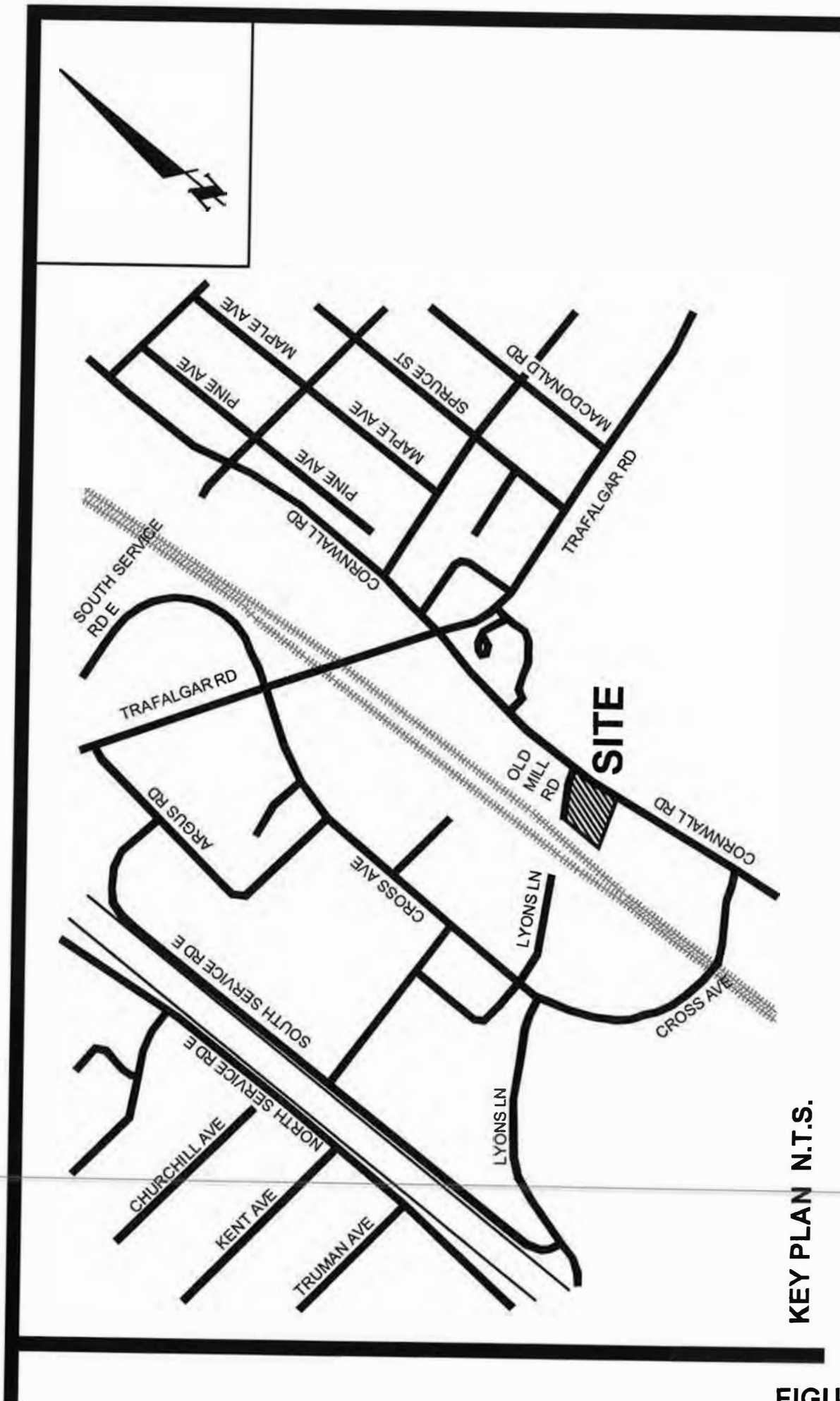
The results of the vibration monitoring found that the ground-borne rail vibration levels are well below the level of perception. Vibration control measures are not required for this project.

10. RECOMMENDATIONS

To meet the requirements of the Town of Oakville, CN Railway and MECP, the following noise mitigation measures are proposed:

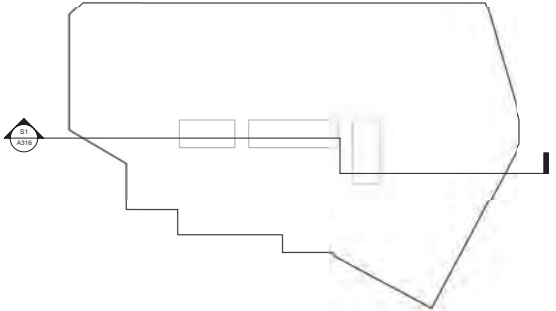
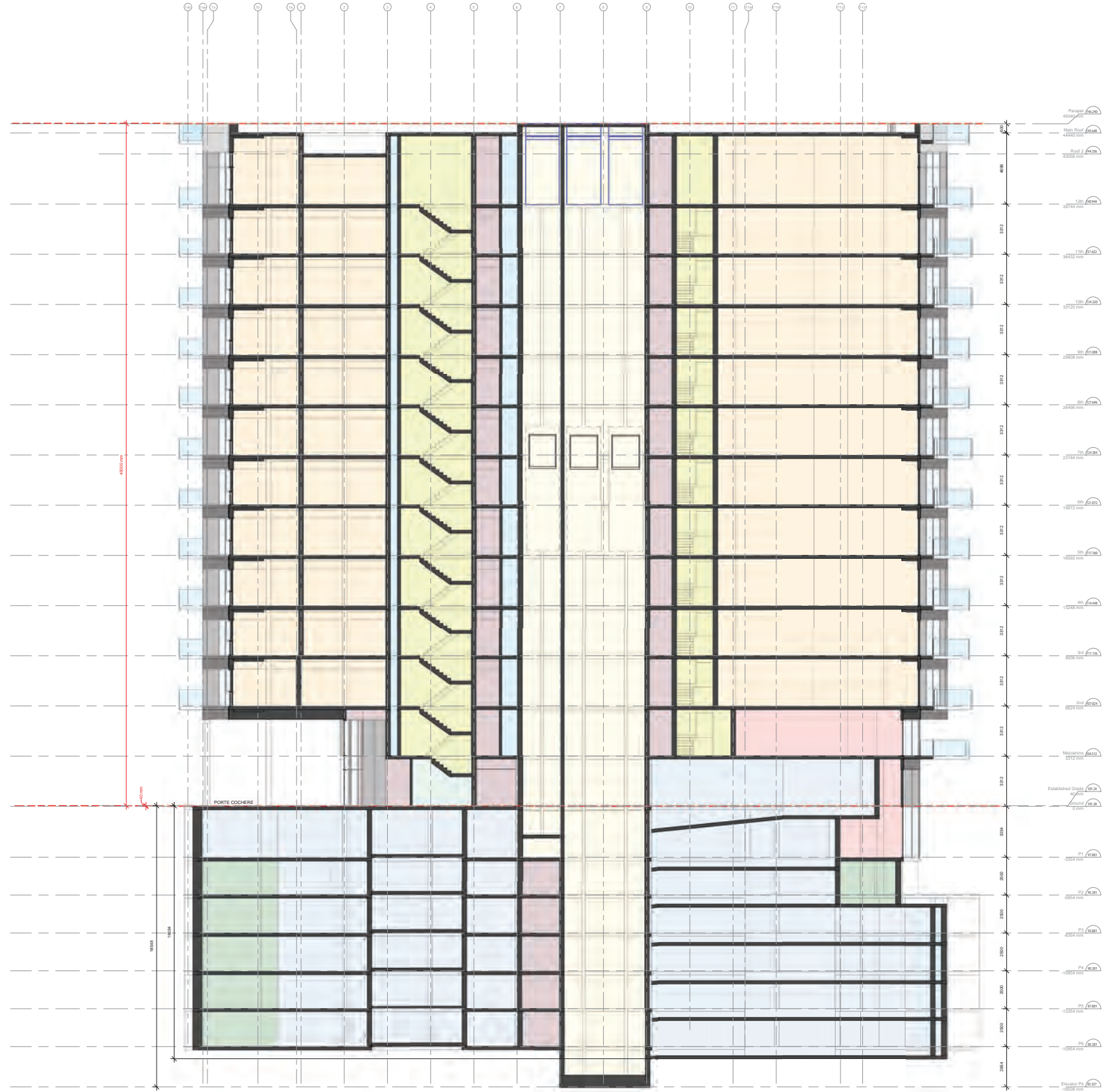
1. To control the interior sound level criteria in the living rooms (40 dB L_{eq}) and bedrooms (35 dB L_{eq} nighttime) upgraded building treatments (windows, doors, and walls) are required. The general requirements are noted in Tables 6 and 7 where 6mm double laminated fixed glazing (single and double) may be required to meet the criteria. Operable windows may require double sliding windows. STC ratings noted are to be confirmed by the window supplier. For a typical window wall, building upgrades to the glazing requirements are necessary. Once final architectural plans are available, the acoustic consultant should review the final exterior façade requirements. Punched windows of limited size will lessen the glazing challenges.
2. All residential units in this development will require central air conditioning prior to occupancy. Given that the building will be using a central system in any case, this is not an onerous requirement.
3. It is recommended all *Agreements of Purchase and Sale or Lease* include MECP's and the Railway's warning clauses (see Appendix C: Warning Clauses).

APPENDIX A: FIGURES



KEY PLAN N.T.S.

FIGURE 1



- SUITES
- STAIRCASES | TRANSFER CORRIDORS
- ELEVATORS
- LOBBY | CORRIDORS
- AMENITIES
- MANAGER OFFICE
- MAIL ROOM
- PARKING
- BICYCLE PARKING
- MECHANICAL ROOM / SHAFT
- ELECTRICAL ROOM
- LOCKERS
- GARBAGE ROOM

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project
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title
Section 1

drawn by **M.Sh.** date **SEPT 2021**
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FIGURE 3

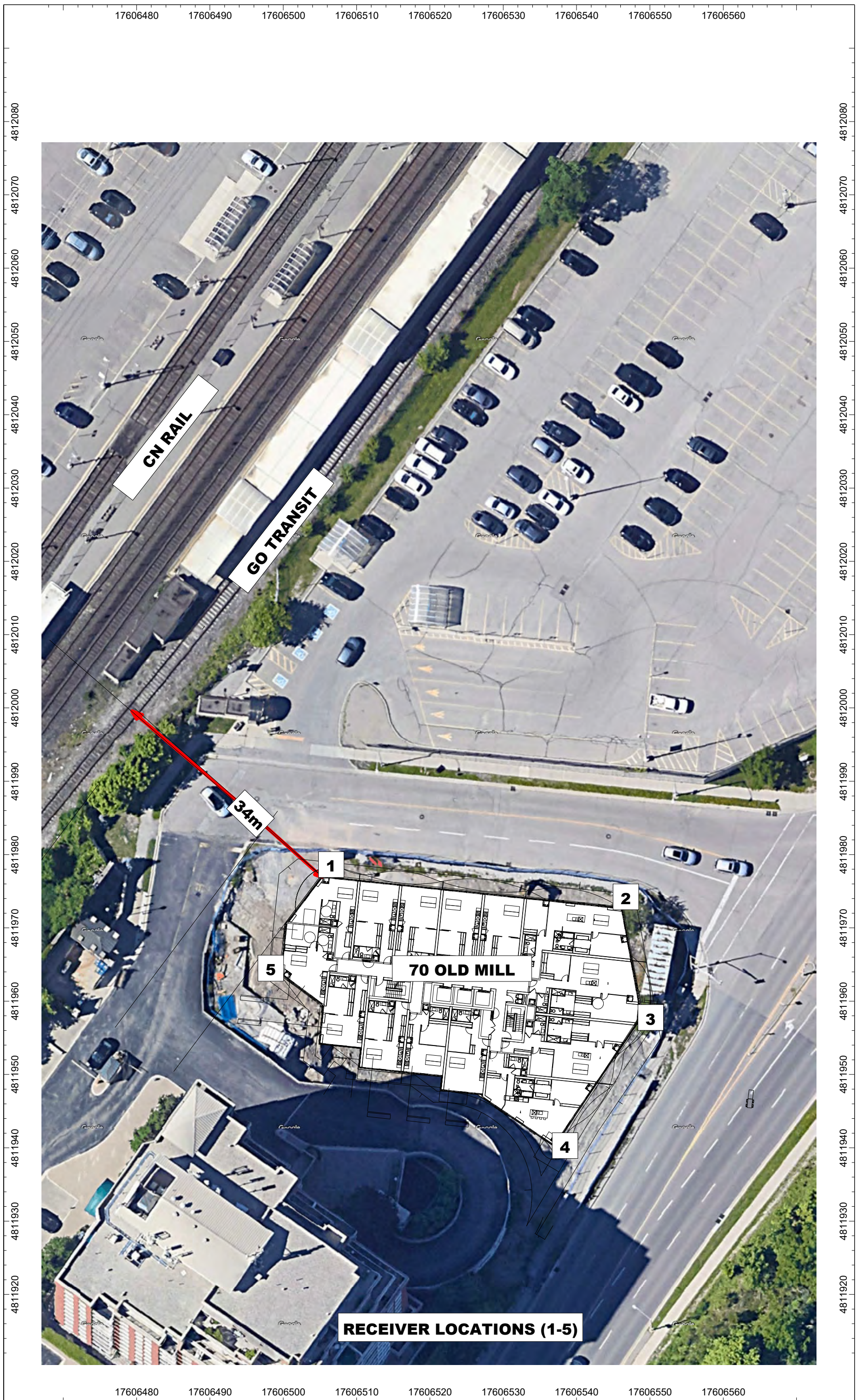


FIGURE 5

APPENDIX B: SOUND LEVEL CALCULATIONS

Filename: loclnw.te Time Period: Day/Night 16/8 hours
 Description: Loc 1 - NW Facade - All Floors

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

Train Type	! Trains	! Speed (km/h)	!# loc /Train	!# Cars /Train	! Eng type	!Cont !weld
* 1. Freight	2.6/2.6	100.0	4.0	140.0	Diesel	Yes
* 2. Passenger	15.4/1.3	150.0	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	2.0/2.0	2.50	10.00
2. Passenger	12.0/1.0	2.50	10.00

Data for Segment # 1: CNR Oakville (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 : 49.00 / 49.00 m
 Receiver height : 41.24 / 41.24 m
 Topography : 1 (Flat/gentle slope; no barrier)
 No Whistle

Rail data, segment # 2: GO Transit (day/night)

Train Type	! Trains	! Speed (km/h)	!# loc /Train	!# Cars /Train	! Eng type	!Cont !weld
* 1. GO 1Dies Loc	60.0/8.0	129.0	1.0	12.0	Diesel	Yes
* 2. GO 2Dies Loc	11.0/4.0	129.0	2.0	12.0	Diesel	Yes
* 3. GO 1Elec Loc	101.0/21.0	129.0	1.0	10.0	Diesel	Yes
* 4. GO 2Elec Loc	42.0/8.0	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. GO 1Dies Loc	60.0/8.0	0.00	10.00
2. GO 2Dies Loc	11.0/4.0	0.00	10.00
3. GO 1Elec Loc	101.0/21.0	0.00	10.00
4. GO 2Elec Loc	42.0/8.0	0.00	10.00

Data for Segment # 2: GO Transit (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 : 34.00 / 34.00 m
 Receiver height : 41.24 / 41.24 m
 Topography : 1 (Flat/gentle slope; no barrier)
 No Whistle

Results segment # 1: CNR Oakville (day)

LOCOMOTIVE (0.00 + 67.74 + 0.00) = 67.74 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	72.88	-5.14	0.00	0.00	0.00	0.00	67.74

WHEEL (0.00 + 59.72 + 0.00) = 59.72 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	64.86	-5.14	0.00	0.00	0.00	0.00	59.72

Segment Leq : 68.38 dBA

Results segment # 2: GO Transit (day)

LOCOMOTIVE (0.00 + 76.47 + 0.00) = 76.47 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	80.02	-3.55	0.00	0.00	0.00	0.00	76.47

WHEEL (0.00 + 68.51 + 0.00) = 68.51 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	72.06	-3.55	0.00	0.00	0.00	0.00	68.51

Segment Leq : 77.11 dBA

Total Leq All Segments: 77.66 dBA

Results segment # 1: CNR Oakville (night)

LOCOMOTIVE (0.00 + 66.87 + 0.00) = 66.87 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	72.01	-5.14	0.00	0.00	0.00	0.00	66.87

WHEEL (0.00 + 60.19 + 0.00) = 60.19 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.33	-5.14	0.00	0.00	0.00	0.00	60.19

Segment Leq : 67.71 dBA

Results segment # 2: GO Transit (night)

LOCOMOTIVE (0.00 + 72.40 + 0.00) = 72.40 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-90 90 0.00 75.95 -3.55 0.00 0.00 0.00 0.00 72.40

WHEEL (0.00 + 64.33 + 0.00) = 64.33 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-90 90 0.00 67.88 -3.55 0.00 0.00 0.00 0.00 64.33

Segment Leq : 73.03 dBA

Total Leq All Segments: 74.15 dBA

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

Car traffic volume : 22500/2500 veh/TimePeriod *
Medium truck volume : 457/51 veh/TimePeriod *
Heavy truck volume : 457/51 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): 19716
Percentage of Annual Growth : 2.00
Number of Years of Growth : 14.00
Medium Truck % of Total Volume : 1.95
Heavy Truck % of Total Volume : 1.95
Day (16 hrs) % of Total Volume : 90.00

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

Angle1 Angle2 : -90.00 deg -30.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 62.50 / 62.50 m
Receiver height : 41.24 / 41.24 m
Topography : 1 (Flat/gentle slope; no barrier)

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

Car traffic volume : 3293/366 veh/TimePeriod *
Medium truck volume : 10/1 veh/TimePeriod *
Heavy truck volume : 10/1 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 5 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 2790
Percentage of Annual Growth : 2.00
Number of Years of Growth : 14.00
Medium Truck % of Total Volume : 0.30
Heavy Truck % of Total Volume : 0.30
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 2: Old Mill (day/night)

Angle1 Angle2 : -45.00 deg 70.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 11.00 / 11.00 m
Receiver height : 41.24 / 41.24 m
Topography : 1 (Flat/gentle slope; no barrier)

Results segment # 1: Cornwall (day)

Source height = 1.18 m

ROAD (0.00 + 58.85 + 0.00) = 58.85 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-30	0.00	69.82	0.00	-6.20	-4.77	0.00	0.00	0.00	58.85

Segment Leq : 58.85 dBA

Results segment # 2: Old Mill (day)

Source height = 0.74 m

ROAD (0.00 + 55.88 + 0.00) = 55.88 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	70	0.00	56.47	0.00	1.35	-1.95	0.00	0.00	0.00	55.88

Segment Leq : 55.88 dBA

Total Leq All Segments: 60.62 dBA

Results segment # 1: Cornwall (night)

Source height = 1.18 m

ROAD (0.00 + 52.33 + 0.00) = 52.33 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-30	0.00	63.30	0.00	-6.20	-4.77	0.00	0.00	0.00	52.33

Segment Leq : 52.33 dBA

Results segment # 2: Old Mill (night)

Source height = 0.72 m

ROAD (0.00 + 49.23 + 0.00) = 49.23 dBA

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

-45	70	0.00	49.83	0.00	1.35	-1.95	0.00	0.00	0.00	49.23
-----	----	------	-------	------	------	-------	------	------	------	-------

Segment Leq : 49.23 dBA

Total Leq All Segments: 54.06 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 77.74
(NIGHT): 74.19

Filename: loc2ne.te Time Period: Day/Night 16/8 hours
 Description: Loc 2 - NE Facade - All Floors

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

Train Type	! Trains	! Speed (km/h)	!# loc /Train!	!# Cars /Train!	! Eng type	!Cont !weld
* 1. Freight	2.6/2.6	100.0	4.0	140.0	Diesel	Yes
* 2. Passenger	15.4/1.3	150.0	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	2.0/2.0	2.50	10.00
2. Passenger	12.0/1.0	2.50	10.00

Data for Segment # 1: CNR Oakville (day/night)

Angle1 Angle2 : -35.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 83.30 / 83.30 m
 Receiver height : 41.24 / 41.24 m
 Topography : 1 (Flat/gentle slope; no barrier)
 No Whistle

Rail data, segment # 2: GO Transit (day/night)

Train Type	! Trains	! Speed (km/h)	!# loc /Train!	!# Cars /Train!	! Eng type	!Cont !weld
* 1. GO 1Dies Loc!	60.0/8.0	129.0	1.0	12.0	Diesel	Yes
* 2. GO 2Dies Loc!	11.0/4.0	129.0	2.0	12.0	Diesel	Yes
* 3. GO 1Elec Loc!	101.0/21.0	129.0	1.0	10.0	Diesel	Yes
* 4. GO 2Elec Loc!	42.0/8.0	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. GO 1Dies Loc	60.0/8.0	0.00	10.00
2. GO 2Dies Loc	11.0/4.0	0.00	10.00
3. GO 1Elec Loc	101.0/21.0	0.00	10.00
4. GO 2Elec Loc	42.0/8.0	0.00	10.00

Data for Segment # 2: GO Transit (day/night)

Angle1 Angle2 : -35.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 68.50 / 68.50 m
 Receiver height : 41.24 / 41.24 m
 Topography : 1 (Flat/gentle slope; no barrier)
 No Whistle

Results segment # 1: CNR Oakville (day)

LOCOMOTIVE (0.00 + 63.85 + 0.00) = 63.85 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-35	90	0.00	72.88	-7.45	-1.58	0.00	0.00	0.00	63.85

WHEEL (0.00 + 55.83 + 0.00) = 55.83 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-35	90	0.00	64.86	-7.45	-1.58	0.00	0.00	0.00	55.83

Segment Leq : 64.49 dBA

Results segment # 2: GO Transit (day)

LOCOMOTIVE (0.00 + 71.84 + 0.00) = 71.84 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-35	90	0.00	80.02	-6.60	-1.58	0.00	0.00	0.00	71.84

WHEEL (0.00 + 63.88 + 0.00) = 63.88 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-35	90	0.00	72.06	-6.60	-1.58	0.00	0.00	0.00	63.88

Segment Leq : 72.48 dBA

Total Leq All Segments: 73.12 dBA

Results segment # 1: CNR Oakville (night)

LOCOMOTIVE (0.00 + 62.98 + 0.00) = 62.98 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-35	90	0.00	72.01	-7.45	-1.58	0.00	0.00	0.00	62.98

WHEEL (0.00 + 56.30 + 0.00) = 56.30 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-35	90	0.00	65.33	-7.45	-1.58	0.00	0.00	0.00	56.30

Segment Leq : 63.82 dBA

Results segment # 2: GO Transit (night)

LOCOMOTIVE (0.00 + 67.77 + 0.00) = 67.77 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-35 90 0.00 75.95 -6.60 -1.58 0.00 0.00 0.00 67.77

WHEEL (0.00 + 59.70 + 0.00) = 59.70 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-35 90 0.00 67.88 -6.60 -1.58 0.00 0.00 0.00 59.70

Segment Leq : 68.40 dBA

Total Leq All Segments: 69.70 dBA

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

Car traffic volume : 22500/2500 veh/TimePeriod *
Medium truck volume : 457/51 veh/TimePeriod *
Heavy truck volume : 457/51 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): 19716
Percentage of Annual Growth : 2.00
Number of Years of Growth : 14.00
Medium Truck % of Total Volume : 1.95
Heavy Truck % of Total Volume : 1.95
Day (16 hrs) % of Total Volume : 90.00

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

Angle1 Angle2 : -90.00 deg 40.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.50 / 25.50 m
Receiver height : 41.24 / 41.24 m
Topography : 1 (Flat/gentle slope; no barrier)

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

Car traffic volume : 3293/366 veh/TimePeriod *
Medium truck volume : 10/1 veh/TimePeriod *
Heavy truck volume : 10/1 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 5 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 2790
Percentage of Annual Growth : 2.00
Number of Years of Growth : 14.00
Medium Truck % of Total Volume : 0.30
Heavy Truck % of Total Volume : 0.30
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 2: Old Mill (day/night)

```

-----
Angle1  Angle2      : -75.00 deg   90.00 deg
Wood depth      :      0      (No woods.)
No of house rows :      0 / 0
Surface         :      1      (Absorptive ground surface)
Receiver source distance : 41.24 / 41.24 m
Receiver height  : 41.24 / 41.24 m
Topography      :      1      (Flat/gentle slope; no barrier)

```

Results segment # 1: Cornwall (day)

Source height = 1.18 m

ROAD (0.00 + 66.10 + 0.00) = 66.10 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	40	0.00	69.82	0.00	-2.30	-1.41	0.00	0.00	0.00	66.10

Segment Leq : 66.10 dBA

Results segment # 2: Old Mill (day)

Source height = 0.74 m

ROAD (0.00 + 51.70 + 0.00) = 51.70 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-75	90	0.00	56.47	0.00	-4.39	-0.38	0.00	0.00	0.00	51.70

Segment Leq : 51.70 dBA

Total Leq All Segments: 66.25 dBA

Results segment # 1: Cornwall (night)

Source height = 1.18 m

ROAD (0.00 + 59.58 + 0.00) = 59.58 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	40	0.00	63.30	0.00	-2.30	-1.41	0.00	0.00	0.00	59.58

Segment Leq : 59.58 dBA

Results segment # 2: Old Mill (night)

Source height = 0.72 m

ROAD (0.00 + 45.06 + 0.00) = 45.06 dBA

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

-75	90	0.00	49.83	0.00	-4.39	-0.38	0.00	0.00	0.00	45.06
-----	----	------	-------	------	-------	-------	------	------	------	-------

Segment Leq : 45.06 dBA

Total Leq All Segments: 59.73 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 73.93

(NIGHT): 70.11

Filename: loc3s.te Time Period: Day/Night 16/8 hours
 Description: Loc 3 - S Facade - All Floors

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

```

-----
Train          ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type           !              ! (km/h) !/Train!/Train! type !weld
-----+-----+-----+-----+-----+-----
* 1. Freight   !  2.6/2.6    ! 100.0 !  4.0 !140.0 !Diesel! Yes
* 2. Passenger ! 15.4/1.3    ! 150.0 !  2.0 ! 10.0 !Diesel! Yes
  
```

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

```

Train type:      ! Unadj. ! Annual % ! Years of !
No Name         ! Trains ! Increase ! Growth  !
-----+-----+-----+-----+-----
  1. Freight     !  2.0/2.0 !   2.50 !   10.00 !
  2. Passenger   ! 12.0/1.0 !   2.50 !   10.00 !
  
```

Data for Segment # 1: CNR Oakville (day/night)

```

-----
Angle1  Angle2      :  55.00 deg  90.00 deg
Wood depth      :           0   (No woods.)
No of house rows :           0 / 0
Surface         :           1   (Absorptive ground surface)
Receiver source distance : 83.30 / 83.30 m
Receiver height  : 41.24 / 41.24 m
Topography      :           1   (Flat/gentle slope; no barrier)
No Whistle
  
```

Rail data, segment # 2: GO Transit (day/night)

```

-----
Train          ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type           !              ! (km/h) !/Train!/Train! type !weld
-----+-----+-----+-----+-----
* 1. GO 1Dies Loc! 60.0/8.0    ! 129.0 !  1.0 ! 12.0 !Diesel! Yes
* 2. GO 2Dies Loc! 11.0/4.0    ! 129.0 !  2.0 ! 12.0 !Diesel! Yes
* 3. GO 1Elec Loc!101.0/21.0  ! 129.0 !  1.0 ! 10.0 !Diesel! Yes
* 4. GO 2Elec Loc! 42.0/8.0    ! 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:      ! Unadj. ! Annual % ! Years of !
No Name         ! Trains ! Increase ! Growth  !
-----+-----+-----+-----+-----
  1. GO 1Dies Loc ! 60.0/8.0 !   0.00 !   10.00 !
  2. GO 2Dies Loc ! 11.0/4.0 !   0.00 !   10.00 !
  3. GO 1Elec Loc !101.0/21.0 !   0.00 !   10.00 !
  4. GO 2Elec Loc ! 42.0/8.0 !   0.00 !   10.00 !
  
```

Data for Segment # 2: GO Transit (day/night)

```

-----
Angle1  Angle2      :  55.00 deg  90.00 deg
Wood depth      :           0   (No woods.)
No of house rows :           0 / 0
Surface         :           1   (Absorptive ground surface)
Receiver source distance : 68.50 / 68.50 m
Receiver height  : 41.24 / 41.24 m
Topography      :           1   (Flat/gentle slope; no barrier)
No Whistle
  
```

Results segment # 1: CNR Oakville (day)

LOCOMOTIVE (0.00 + 58.32 + 0.00) = 58.32 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	72.88	-7.45	-7.11	0.00	0.00	0.00	58.32

WHEEL (0.00 + 50.30 + 0.00) = 50.30 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	64.86	-7.45	-7.11	0.00	0.00	0.00	50.30

Segment Leq : 58.96 dBA

Results segment # 2: GO Transit (day)

LOCOMOTIVE (0.00 + 66.31 + 0.00) = 66.31 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	80.02	-6.60	-7.11	0.00	0.00	0.00	66.31

WHEEL (0.00 + 58.35 + 0.00) = 58.35 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	72.06	-6.60	-7.11	0.00	0.00	0.00	58.35

Segment Leq : 66.95 dBA

Total Leq All Segments: 67.59 dBA

Results segment # 1: CNR Oakville (night)

LOCOMOTIVE (0.00 + 57.45 + 0.00) = 57.45 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	72.01	-7.45	-7.11	0.00	0.00	0.00	57.45

WHEEL (0.00 + 50.78 + 0.00) = 50.78 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	65.33	-7.45	-7.11	0.00	0.00	0.00	50.78

Segment Leq : 58.30 dBA

Results segment # 2: GO Transit (night)

LOCOMOTIVE (0.00 + 62.25 + 0.00) = 62.25 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

55 90 0.00 75.95 -6.60 -7.11 0.00 0.00 0.00 62.25

WHEEL (0.00 + 54.17 + 0.00) = 54.17 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

55 90 0.00 67.88 -6.60 -7.11 0.00 0.00 0.00 54.17

Segment Leq : 62.88 dBA

Total Leq All Segments: 64.18 dBA

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

Car traffic volume : 22500/2500 veh/TimePeriod *
Medium truck volume : 457/51 veh/TimePeriod *
Heavy truck volume : 457/51 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): 19716
Percentage of Annual Growth : 2.00
Number of Years of Growth : 14.00
Medium Truck % of Total Volume : 1.95
Heavy Truck % of Total Volume : 1.95
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Cornwall (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 : 15.50 / 15.50 m
Receiver height : 41.24 / 41.24 m
Topography : 1 (Flat/gentle slope; no barrier)

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

Car traffic volume : 3293/366 veh/TimePeriod *
Medium truck volume : 10/1 veh/TimePeriod *
Heavy truck volume : 10/1 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 5 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 2790
Percentage of Annual Growth : 2.00
Number of Years of Growth : 14.00
Medium Truck % of Total Volume : 0.30
Heavy Truck % of Total Volume : 0.30
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 2: Old Mill (day/night)

```

-----
Angle1   Angle2           : -10.00 deg   60.00 deg
Wood depth      :           0       (No woods.)
No of house rows :           0 / 0
Surface         :           1       (Absorptive ground surface)
Receiver source distance : 33.00 / 33.00 m
Receiver height  : 41.24 / 41.24 m
Topography      :           1       (Flat/gentle slope; no barrier)

```

Results segment # 1: Cornwall (day)

Source height = 1.18 m

ROAD (0.00 + 69.68 + 0.00) = 69.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	69.82	0.00	-0.14	0.00	0.00	0.00	0.00	69.68

Segment Leq : 69.68 dBA

Results segment # 2: Old Mill (day)

Source height = 0.74 m

ROAD (0.00 + 48.95 + 0.00) = 48.95 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	60	0.00	56.47	0.00	-3.42	-4.10	0.00	0.00	0.00	48.95

Segment Leq : 48.95 dBA

Total Leq All Segments: 69.72 dBA

Results segment # 1: Cornwall (night)

Source height = 1.18 m

ROAD (0.00 + 63.16 + 0.00) = 63.16 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.30	0.00	-0.14	0.00	0.00	0.00	0.00	63.16

Segment Leq : 63.16 dBA

Results segment # 2: Old Mill (night)

Source height = 0.72 m

ROAD (0.00 + 42.31 + 0.00) = 42.31 dBA

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

-10	60	0.00	49.83	0.00	-3.42	-4.10	0.00	0.00	0.00	42.31
-----	----	------	-------	------	-------	-------	------	------	------	-------

Segment Leq : 42.31 dBA

Total Leq All Segments: 63.20 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 71.79
(NIGHT): 66.72

Filename: loc4se.te Time Period: Day/Night 16/8 hours
 Description: Loc 4 - SE Facade - All Floors

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

Train Type	! Trains	! Speed (km/h)	!# loc /Train	!# Cars /Train	! Eng type	!Cont !weld
* 1. Freight	2.6/2.6	100.0	4.0	140.0	Diesel	Yes
* 2. Passenger	15.4/1.3	150.0	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	2.0/2.0	2.50	10.00
2. Passenger	12.0/1.0	2.50	10.00

Data for Segment # 1: CNR Oakville (day/night)

Angle1 Angle2 : 55.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 96.40 / 96.40 m
 Receiver height : 41.24 / 41.24 m
 Topography : 1 (Flat/gentle slope; no barrier)
 No Whistle

Rail data, segment # 2: GO Transit (day/night)

Train Type	! Trains	! Speed (km/h)	!# loc /Train	!# Cars /Train	! Eng type	!Cont !weld
* 1. GO 1Dies Loc	60.0/8.0	129.0	1.0	12.0	Diesel	Yes
* 2. GO 2Dies Loc	11.0/4.0	129.0	2.0	12.0	Diesel	Yes
* 3. GO 1Elec Loc	101.0/21.0	129.0	1.0	10.0	Diesel	Yes
* 4. GO 2Elec Loc	42.0/8.0	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. GO 1Dies Loc	60.0/8.0	0.00	10.00
2. GO 2Dies Loc	11.0/4.0	0.00	10.00
3. GO 1Elec Loc	101.0/21.0	0.00	10.00
4. GO 2Elec Loc	42.0/8.0	0.00	10.00

Data for Segment # 2: GO Transit (day/night)

Angle1 Angle2 : 55.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 82.00 / 82.00 m
 Receiver height : 41.24 / 41.24 m
 Topography : 1 (Flat/gentle slope; no barrier)
 No Whistle

Results segment # 1: CNR Oakville (day)

LOCOMOTIVE (0.00 + 57.69 + 0.00) = 57.69 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	72.88	-8.08	-7.11	0.00	0.00	0.00	57.69

WHEEL (0.00 + 49.66 + 0.00) = 49.66 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	64.86	-8.08	-7.11	0.00	0.00	0.00	49.66

Segment Leq : 58.32 dBA

Results segment # 2: GO Transit (day)

LOCOMOTIVE (0.00 + 65.53 + 0.00) = 65.53 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	80.02	-7.38	-7.11	0.00	0.00	0.00	65.53

WHEEL (0.00 + 57.57 + 0.00) = 57.57 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	72.06	-7.38	-7.11	0.00	0.00	0.00	57.57

Segment Leq : 66.17 dBA

Total Leq All Segments: 66.83 dBA

Results segment # 1: CNR Oakville (night)

LOCOMOTIVE (0.00 + 56.82 + 0.00) = 56.82 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	72.01	-8.08	-7.11	0.00	0.00	0.00	56.82

WHEEL (0.00 + 50.14 + 0.00) = 50.14 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	65.33	-8.08	-7.11	0.00	0.00	0.00	50.14

Segment Leq : 57.66 dBA

Results segment # 2: GO Transit (night)

LOCOMOTIVE (0.00 + 61.46 + 0.00) = 61.46 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	75.95	-7.38	-7.11	0.00	0.00	0.00	61.46

WHEEL (0.00 + 53.39 + 0.00) = 53.39 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
55	90	0.00	67.88	-7.38	-7.11	0.00	0.00	0.00	53.39

Segment Leq : 62.09 dBA

Total Leq All Segments: 63.43 dBA

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

Car traffic volume : 22500/2500 veh/TimePeriod *

Medium truck volume : 457/51 veh/TimePeriod *

Heavy truck volume : 457/51 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): 19716

Percentage of Annual Growth : 2.00

Number of Years of Growth : 14.00

Medium Truck % of Total Volume : 1.95

Heavy Truck % of Total Volume : 1.95

Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Cornwall (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 : 15.50 / 15.50 m

Receiver height : 41.24 / 41.24 m

Topography : 1 (Flat/gentle slope; no barrier)

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

Car traffic volume : 3293/366 veh/TimePeriod *

Medium truck volume : 10/1 veh/TimePeriod *

Heavy truck volume : 10/1 veh/TimePeriod *

Posted speed limit : 50 km/h

Road gradient : 5 %

Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 2790

Percentage of Annual Growth : 2.00

Number of Years of Growth : 14.00

Medium Truck % of Total Volume : 0.30

Heavy Truck % of Total Volume : 0.30

Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 2: Old Mill (day/night)

Angle1 Angle2 : -10.00 deg 60.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 33.00 / 33.00 m
Receiver height : 41.24 / 41.24 m
Topography : 1 (Flat/gentle slope; no barrier)

Results segment # 1: Cornwall (day)

Source height = 1.18 m

ROAD (0.00 + 69.68 + 0.00) = 69.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	69.82	0.00	-0.14	0.00	0.00	0.00	0.00	69.68

Segment Leq : 69.68 dBA

Results segment # 2: Old Mill (day)

Source height = 0.74 m

ROAD (0.00 + 48.95 + 0.00) = 48.95 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	60	0.00	56.47	0.00	-3.42	-4.10	0.00	0.00	0.00	48.95

Segment Leq : 48.95 dBA

Total Leq All Segments: 69.72 dBA

Results segment # 1: Cornwall (night)

Source height = 1.18 m

ROAD (0.00 + 63.16 + 0.00) = 63.16 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.30	0.00	-0.14	0.00	0.00	0.00	0.00	63.16

Segment Leq : 63.16 dBA

Results segment # 2: Old Mill (night)

Source height = 0.72 m

ROAD (0.00 + 42.31 + 0.00) = 42.31 dBA

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

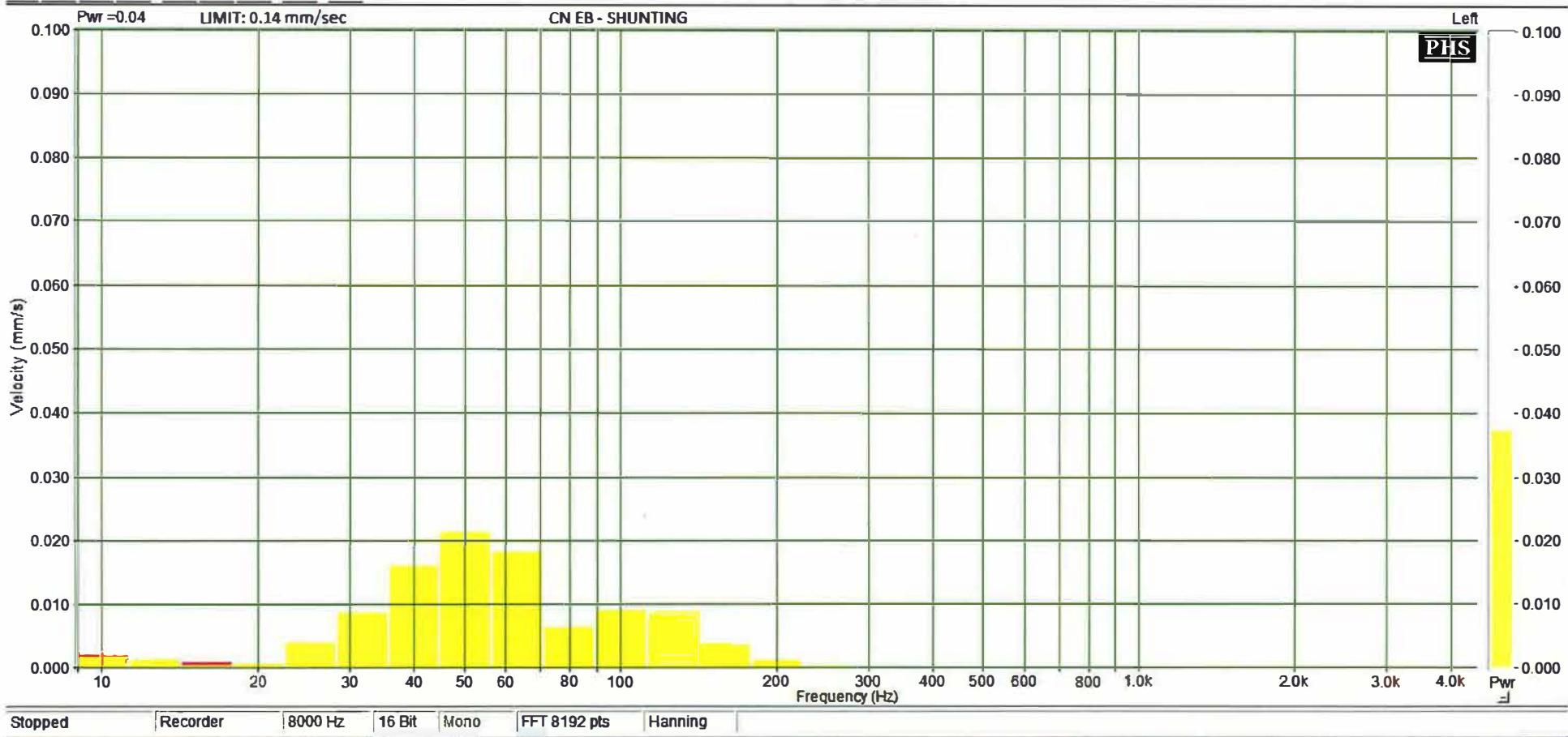
-10 60 0.00 49.83 0.00 -3.42 -4.10 0.00 0.00 0.00 42.31

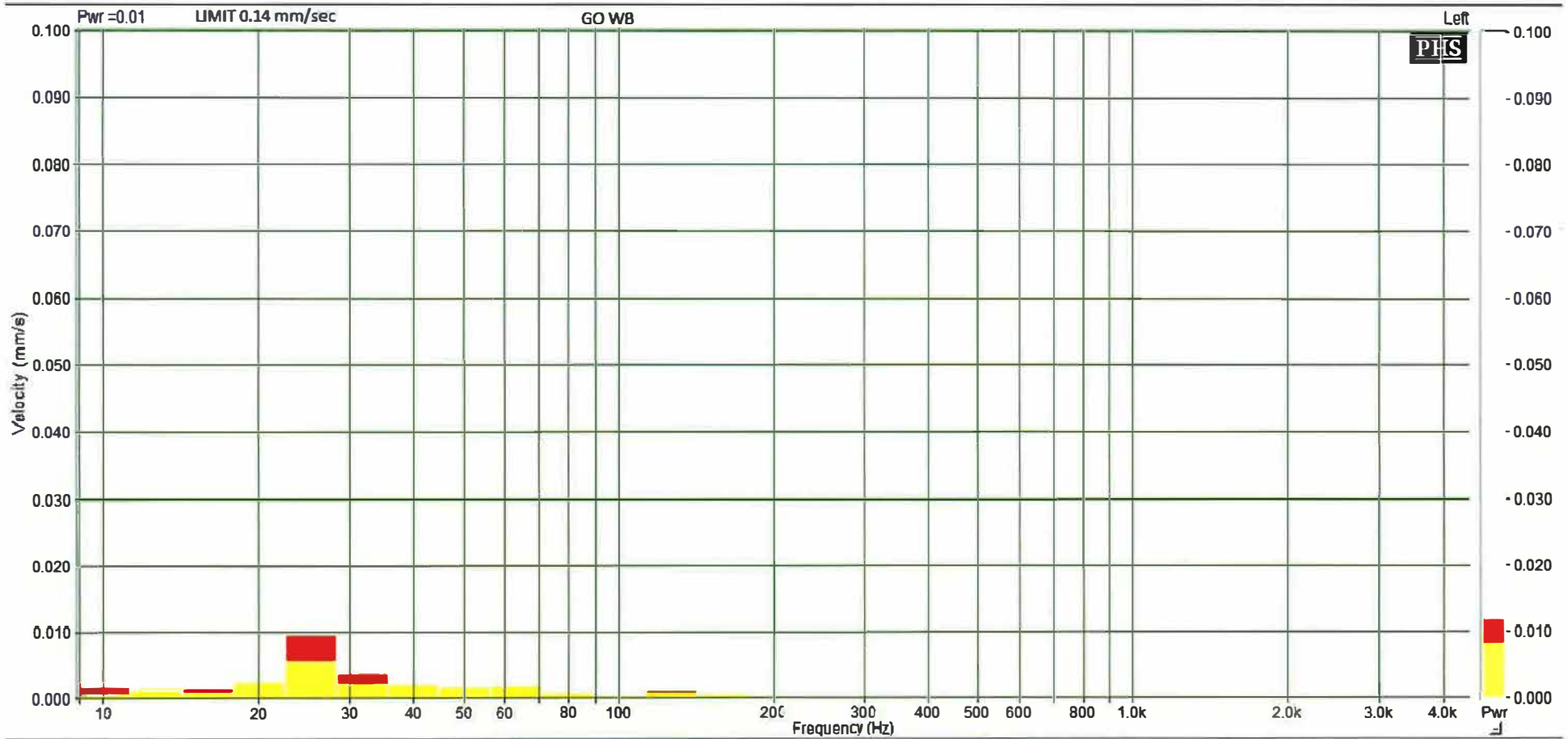
Segment Leq : 42.31 dBA

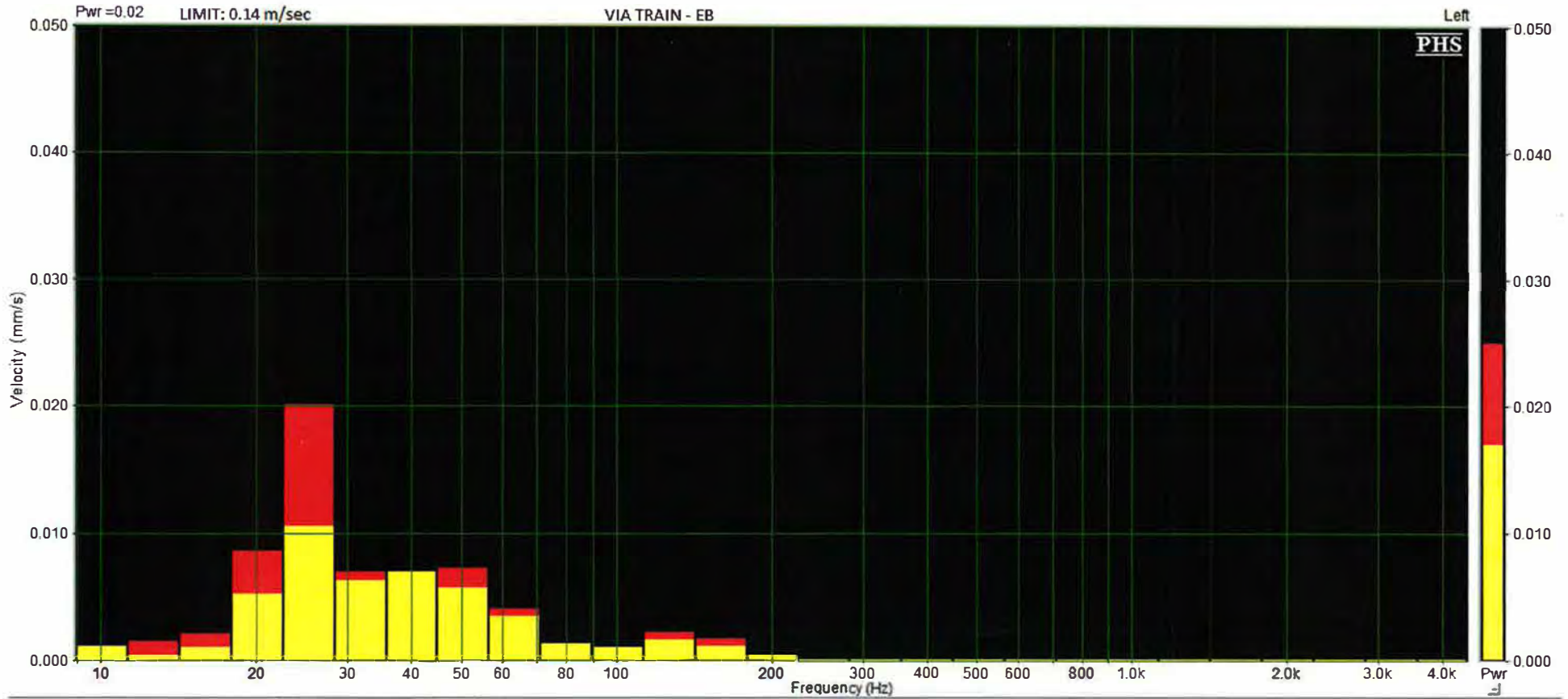
Total Leq All Segments: 63.20 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 71.52
(NIGHT): 66.32

RAIL VIBRATION MONITORING FREQUENCY CHARTS







Stopped Recorder 8000 Hz 16 Bit Mono FFT 8192 pts Hanning

APPENDIX D: NOISE CRITERIA

CRITERIA

The noise study will be based on the following criteria for residential units as required by the Ministry of the Environment, Conservation and Parks:

TABLE C-2 SOUND LEVEL LIMITS (ROAD AND RAIL)			
Type of Space	Time Period	L _{eq} (dBA)	
		Road	Rail
INDOOR LIMITS			
Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc.	07:00 – 23:00	45	40
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	23:00 – 07:00	45	40
Sleeping quarters	07:00 – 23:00	45	40
	23:00 – 07:00	40	35
OUTDOOR LIMITS			
Outdoor recreation areas ¹	07:00 – 23:00	55	55
Outside bedroom window	23:00 – 07:00	50	50
Outside living room window	07:00 – 23:00	55	55

¹ Up to 5 dB excess above criteria is allowed, provided a warning clause is given. Above 60 dB L_{eq}, exterior noise mitigation measures (i.e., noise barriers, intervening structures, additional setback from source) are required.

All calculations are based on the site and Architectural Plans by Ava Janikowski Inc., dated September 2, 2021.

L_{eq}

The L_{eq} is defined as the mean energy of the sound level averaged over the measurement period. It can be considered as the continuous steady sound level which would have the same acoustic energy as the real fluctuating noise measured over the same period of time.

APPENDIX E: REFERENCES

1. Ministry of the Environment's *STAMSON* Computer Programme (*Version 5.04*) for the IBM PC.
2. Ministry of the Environment, *ORNAMENT*, "Ontario Road Noise Analysis Method for Environment and Transportation," November 1988.