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**To: Glen Schnarr & Associates Inc.
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Enclosing Herewith: Report

Via: E-mail

**Title: Noise & Vibration Impact Feasibility Study
For Townhouse Residential Development
Lindsay Court
Town of Halton Hills
Regional Municipality of Halton**

Comments:

**Distribution: Mr. Jason Afonso
Mr. Brian Tilley**

Per: Daniela Filiberto

**NOISE & VIBRATION IMPACT FEASIBILITY STUDY
FOR TOWNHOUSE RESIDENTIAL DEVELOPMENT
LINDSAY COURT
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON**

FOR

2301132 ONTARIO INC.

BY


HOWARD R. PATLIK, C.E.T.

CHECKED BY


JOHN E. COULTER, B.A.Sc., P.ENG.



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JULY 14, 2015

TABLE OF CONTENTS

1.0	INTRODUCTION.....	Page 1
2.0	NOISE CRITERIA	Page 1
3.0	TRANSPORTATION SOURCES	Page 3
3.1	Goderich-Exeter Railway	Page 3
3.2	Highway 7	Page 4
3.3	Trafalgar Road	Page 4
3.4	Local On-site Generated Traffic.....	Page 4
4.0	PROJECTED SOUND LEVELS	Page 4
5.0	NOISE CONTROL MEASURES	Page 6
	Locations 1 and 8	Page 6
	Location 9.....	Page 6
	Safety Berm	Page 6
6.0	ACOUSTIC FENCE REQUIREMENTS	Page 7
7.0	VENTILATION AND WARNING CLAUSE REQUIREMENTS.....	Page 8
8.0	FAÇADE COMPONENTS	Page 8
9.0	RAIL VIBRATION MONITORING	Page 9
10.0	CONCLUSIONS	Page 9
11.0	RECOMMENDATIONS	Page 10

LIST OF TABLES

TABLE 1: NOISE CRITERIA.....	Page 2
TABLE 2: GODERICH-EXETER RAILWAY – RAIL TRAFFIC VOLUMES	Page 3
TABLE 3: PROJECTED UNMITIGATED SOUND LEVELS	Page 5
TABLE 4: PROJECTED SOUND LEVELS WITH BARRIERS.....	Page 7

APPENDICES

APPENDIX A: FIGURES
APPENDIX B: SOUND LEVEL CALCULATIONS
APPENDIX C: WARNING CLAUSES
APPENDIX D: NOISE CRITERIA
APPENDIX E: REFERENCES AND CORRESPONDENCE

1.0 INTRODUCTION

At the request of 2301132 Ontario Inc., J.E. COULTER ASSOCIATES LIMITED has conducted a review of the proposed residential development (Part West Half Lot 20, Concession 8 Esquesing) in the Town of Halton Hills, Regional Municipality of Halton for potential noise and vibration impact. The purpose of this study is to establish whether or not it is necessary to incorporate noise and vibration control measures into the development in order to satisfy the noise requirements of the Ministry of the Environment and Climate Change (MOECC), CN Rail and the Regional Municipality of Halton.

The site is located approximately 100m east of Trafalgar Road, south of Highway 7 and north of the Goderich-Exeter Railway in the Town of Halton Hills (see Appendix A, Figures 1 and 2). The proposed residential development consists of 15 townhouse blocks with a total of 110 dwelling units.

The sound generated from the operation of the Goderich-Exeter Railway (CN Guelph Subdivision), a principal mainline, Highway 7 and Trafalgar Road have been identified as potential sources of transportation noise.

2.0 NOISE CRITERIA

The MOECC guidelines that apply to a residential development site such as this is the guideline Publication *NPC-300*. MOECC will permit sound levels up to 60 dB L_{eq} daytime (5 dB above the criterion level of 55 dB L_{eq}) in private outdoor amenity areas without noise barriers if the residential unit affected is provided with a warning clause in the *Agreement of Purchase and Sale* of the unit and subdivision agreement notifying the owner of the excess. Where the levels exceed 60 dB L_{eq} , noise mitigation measures must be incorporated into the subdivision design (i.e., intervening structures such as acoustic barriers or buildings and/or greater setbacks from the noise source). Where the criterion levels are marginally exceeded, a warning clause is required in the *Agreement of Purchase and Sale* and the Subdivision Agreement.

For residential buildings, the Ministry's ventilation requirements are based on the sound level at the exterior building façade. Where the sound levels at the exterior of the building façade exceed 55 dB L_{eq} daytime at the living room window or 50 dB L_{eq} night time at the bedroom window, the unit must be provided with forced air heating, with a provision for future air conditioning by the owner. An excess up to 10 dB is permissible, provided a warning clause is given. Where the sound levels exceed this limit (i.e., 65 dB daytime or 60 dB night time), air-conditioning must be incorporated into the building design prior to occupancy. Warning clauses are applicable as well.

Air-conditioning requirements are applied so that adequate interior sound levels can be maintained with the windows closed.

Table 1, below, gives a summary of the above criteria.

The railway normally requests a minimum 30m setback and a combination of 2.5m high safety berm and acoustic fence for a minimum height of 5.5m above top-of-rail adjoining and parallel to the railway Right-Of-Way (R-O-W) for a principal mainline, and having returns at the ends for any proposed development adjacent to its operating R-O-W or equivalent noise and safety features. In this case, the barrier height required to meet 55 dB L_{eq} daytime would need to be 7m high relative to the base of the berm (i.e., a 4.5m high acoustic fence and 2.5m high earth berm). An alternative to constructing an acoustic barrier on top of the safety berm would be to use local barriers close to the dwellings to meet the noise criteria.

In the case of the GEXR, if the railway's standard mitigation were used, the sound level in the amenity areas would be 55 dB L_{eq} daytime, without the whistle noise. Thus, the outdoor amenity area will be designed to meet 55 dB L_{eq} for the Guelph Subdivision.

TABLE 1: NOISE CRITERIA		
Living Area	Daytime (dB L_{eq}) (0700-2300)	Night Time (dB L_{eq}) (2300-0700)
Outdoor Living Area (O.L.A.)	55	--
Bedrooms	(35)	40(35)
Living/Dining	45(40)	(40)
Kitchen/Baths	50(45)	--

Note: () indicates criteria levels required for the railways.

An outdoor living area in the residential subdivision is used in reference to a private outdoor patio or backyard. According to MOECC practice, backyards, outdoor patios or walkout patios are not considered as part of outdoor living areas when they are less than 4m in depth.

3.0 TRANSPORTATION SOURCES

The main sources of transportation noise in this development are the rail traffic on the Goderich-Exeter Railway, Highway 7 and Trafalgar Road. This report will focus on these sources and recommend the noise control measures that may be necessary to satisfy the criteria.

3.1 Goderich-Exeter Railway

The rail traffic data were provided in the attached letter from Goderich-Exeter Railway in Appendix B and summarized in Table 2 below. This rail line is situated along the south side of the proposed development. The rail line is elevated approximately 5 to 6.5m above the site. The Goderich-Exeter Railway (CN Guelph Subdivision) is classified as a Principal Mainline with freight and passenger traffic. Rail traffic is present during both the daytime and night-time periods. All rail traffic whistles at the Trafalgar Road crossing. The whistling activity commences 400m east and west of the grade level crossing.

Time	Train Type	# of Trains	Max. # of Cars	Max. # of Locomotives	Maximum Speed (kph)
Daytime (0700-2300)	Freight	2 (3.6)	59	2	88
	Commuter	3 (7.6)	5	1	113
	Passenger (VIA)	5 (14.8)	5	1	113
Night Time (2300-0700)	Freight	0 (0)	59	2	88
	Commuter	1 (2.6)	5	1	113
	Passenger (VIA)	1 (3)	5	1	113

Notes: Values are denoted as current and projected [in parentheses ()] rail traffic.
The projection is for the year 2025 (minimum).

3.2 Highway 7

Highway 7 to the north of the development is a two-lane highway with a posted speed limit of 80 kph. The latest traffic count (2010) from MTO indicates Highway 7 carried 14,700 vehicles Summer Average Weekday Traffic (SAWT). Based on information provided by MTO and the historical growth rate (1%), the projected SAWT volume on Highway 7 is 17,066 vehicles SAWDT (2025) with 6.5% commercial trucks (split 40/60 between medium and heavy trucks). The highway is elevated approximately 2m above the site.

3.3 Trafalgar Road

Trafalgar Road carried 10,531 vehicles (24 hours, April 29, 2015) with 1.9% and 3.6% medium and heavy trucks, respectively. The posted speed limit is 80 kph. The Region has indicated that the growth rate on this road is 2.5% per annum. Therefore, the projected traffic in the year 2031 (16-year projection) is 15,633 vehicles AADT, a 48% growth from 2015.

3.4 Local On-site Generated Traffic

Acoustically, the site-generated noise and that from the immediately abutting roadways are anticipated to be minor. Thus, the sound levels generated by this traffic will not be incorporated into the calculations.

4.0 PROJECTED SOUND LEVELS

The Ministry of the Environment and Climate Change (MOECC) requires that any road or rail traffic control measures recommended must be based on a minimum 10-year traffic volume projection. All recommendations are based on the rail traffic volumes anticipated for the year 2025.

The daytime L_{eq} at grade receiver level and night-time 3rd-storey road and rail traffic sound levels were determined utilizing methods as outlined in the MOECC's *ORNAMENT* and *STEAM* modelling procedures, MOECC's *STAMSON* computer programme, *Version 5.03* (see attached printouts).

The following Table 3 provides the sound levels at various locations throughout the development. The "no barrier" conditions are provided to determine if noise control measures are necessary to meet the MOECC's noise guidelines.

TABLE 3: PROJECTED UNMITIGATED SOUND LEVELS								
LOCATION	L _{eq} DAYTIME SOUND LEVEL AT EXTERIOR FAÇADE (GRADE LEVEL)				L _{eq} NIGHT-TIME SOUND LEVEL AT EXTERIOR FAÇADE (TOP FLOOR)			
	GEXR	TRAFAL-GAR	HWY 7	TOTAL	GEXR	TRAFAL-GAR	HWY 7	TOTAL
1 (Rear yard)	62	53	--	62	64	51	--	64
2 (South Façade)	67	50	--	67	64	44	--	64
3 (South Façade)	67	--	--	67	64	--	--	64
3 (Rear yard)	55	--	--	55	--	--	--	--
4 (East Façade)	59	--	--	59	57	--	--	57
5 (East Façade)	54	--	--	54	51	--	--	51
6 (North Façade)	63	--	48	63	59	--	45	59
7 (North Façade)	38	--	62	62	45	--	59	59
8 (Rear yard)	58	54	--	59	54	51	--	56
9 (Rear yard)	57	--	--	57	56	--	--	56

Notes:

1. For the grade level outdoor amenity areas, the receiver is assumed to be 3m from the rear façade of the unit and 1.5m above grade.
2. During the night time, the receiver location is assumed to be at the exterior window (3rd storey, 7.5m above grade level) and closest to the rail line.
3. Night-time sound levels at the façade include whistle noise.

From the above Table 3, the projected sound levels in the amenity areas for Locations 1 and 8 (7-unit townhouse block) will exceed the MOECC's and the railway's noise criteria of 55 dB L_{eq} daytime. Therefore, noise barriers are required to shield the amenity areas to achieve 55 dB L_{eq} where it is technically feasible. The sound levels at the exterior façade are also above the MOECC's and railway's noise criteria requiring ventilation and façade requirements.

5.0 NOISE CONTROL MEASURES

To satisfy the noise requirements of 55 dB L_{eq} in the rear yards, acoustic barriers are required for the units closest to the rail line and Trafalgar Road.

Locations 1 and 8

An acoustic barrier is required because of the combination of the GEXR Railway and Trafalgar Road sound levels. The barrier should commence at the southwest corner of the southernmost unit (Location 1) extending to the rear property line. The barrier then wraps to the north, continuing along the rear yard of the first five townhouse units, terminating at Location 8. The acoustic barrier is approximately 30m long. The height of the acoustic fence is 3.9m along its entire length. Details are provided in Appendix A, Figure 3.

If the lands directly to the west (southeast corner of Lindsay Court and Trafalgar Road) are developed in conjunction with these lands, the extent of the acoustic barrier will be reduced. In this case, the barrier at Location 1 will continue, parallel to the rail line, to the adjacent lands; the wrap along the western property will no longer be required.

Consideration was given to placing an acoustic fence on top of the safety berm. However, because of the height of the tracks above the site (about 5.6m), the total barrier height would need to be more than 9m (i.e., 6.5m fence and 2.5m berm) and continue to the west, terminating at Trafalgar Road. Given the impracticality of this measure, it is not recommended.

Location 9

An acoustic barrier is required to shield the rear yard at Location 9 (westernmost unit in 8-unit townhouse block). The barrier is to extend along the west and southern limits at a height of 2.6m (see Appendix A, Figure 3).

The rear yards of all other townhouse blocks are set back sufficiently or shielded by the townhouse units themselves, eliminating the need for acoustic barriers to shield the rear yards because the sound levels meet 55 dB L_{eq} daytime or less.

Safety Berm

A 2.5m high earth berm is required along the southern part of the development. This berm has been designed to meet the railways requirement for a Principal Mainline. Therefore, the berm height is a minimum of 2.5m. The berm is to extend along the southerly portion of the property in the railway buffer, as shown in Appendix A, Figure 4. The safety berm does not provide any noise attenuation benefit because the tracks are elevated 5 to 6m above the site.

All barriers can be a combination of acoustic fencing and an earth berm, as applicable. The barrier height and final top of barrier elevation will need to be detailed once the final site grading plans are available. The barrier heights may change slightly ($\pm 0.3\text{m}$).

TABLE 4: PROJECTED SOUND LEVELS WITH BARRIERS		
Location	Minimum Barrier (Fence and/or Berm) Height (m)	Grade Level, Daytime (dB L_{eq})
Location 1 (southernmost unit)	3.9	55
Location 8 (4 th northernmost unit)	3.9	55
Location 9 (west end unit)	2.6	54

Note: For the outdoor living area (OLA) grade level sound calculations (daytime), the receiver is assumed to be 3m from the rear façade of the unit.

6.0 ACOUSTIC FENCE REQUIREMENTS

All acoustical barriers (fence and/or earth berming) must be solid. Any gaps at the base of the acoustic fence must be minimized and localized so as not to significantly affect the acoustical performance of the fence. As required by the MOECC guidelines, all acoustical fences must have a minimum surface density of 20 kg/m² (4 lbs./ft.²). As required by the Region, all noise barriers shall be constructed of Western Red Cedar or concrete and can be a combination of an acoustic wall and earth berm.

7.0 VENTILATION AND WARNING CLAUSE REQUIREMENTS

The MOECC requires that air conditioning be provided where the exterior sound levels at the building façade exceed 60 dB L_{eq} at night. Based on a 10-year traffic prediction and the requirements of the MOECC, central air conditioning prior to occupancy will be required for the following units (see Appendix A, Figure 4 for Noise Control Map):

- a) The two southernmost units in 7-unit townhouse block (closest to Trafalgar Road)
- b) The 7-unit townhouses directly facing the railway
- c) The 19-unit townhouses directly facing the railway.

The above-noted units will also require a warning clause to be incorporated into the *Agreements of Purchase and Sale*. Warning Clause "A" is applicable (see Appendix C).

When the night-time sound levels are above 50 dB L_{eq} and less than 60 dB L_{eq} at the bedroom windows, MOECC requires the installation of a forced air heating system with provisions for future air conditioning (at owners' option and cost) and Warning Clause "B." This is applicable to the balance of the site.

A warning clause must be inserted into the *Agreements of Purchase and Sale* (or Leases) and Subdivision Agreement indicating that the sound levels have exceeded the MOECC's noise guidelines (See Appendix C, Warning Clauses).

The railway requests that its warning clause be used for all units within 300m of the railway Right-of-Way. The proponent should discuss this matter directly with CN Rail (see Warning Clause "C" in Appendix C).

8.0 FAÇADE COMPONENTS

The MOECC's noise criteria for interior sound levels are 40 dB L_{eq} night time for bedrooms and 45 dB L_{eq} daytime for living/dining rooms. Due to the presence of railway-generated noise (locomotive and wheel/rail noise), the Ministry requests that 5 dB be added to the rail levels (i.e., stricter criterion of 35 dB L_{eq} in the bedrooms) to account for the low-frequency components of the locomotives.

For the purpose of controlling the transportation noise sources, the windows will require an STC rating of 27 (3mm double glazing with a 13mm gap between the lites, provided the maximum bedroom and living/diningroom window-area-to-floor-area ratios are 20% or less). This is a standard, readily available window. Larger window-area-to-floor-area ratios will require upgrades to the glazing thickness and/or air space. Once the final architectural plans are ready, the acoustic consultant should confirm the final façade requirements for these areas.

The MOECC will require brick veneering to be applied from the top of the foundation wall up to the soffits when the night-time 3rd-storey L_{eq} sound level exceeds 60 dB L_{eq} . This is applicable to all dwellings within 45m of the south property line limit and will assist in reducing the low frequency engine throbbing that causes the walls to vibrate. Walls facing away from the tracks do not need this treatment.

9.0 RAIL VIBRATION MONITORING

The tracks are elevated 5 to 6m above grade at the closest units. An accelerometer (vibration pickup) was mounted approximately 6 inches below surface grade on undisturbed soil, along with the amplifier and recorder. The line carries freight and passenger traffic. The train passbys (2 freight and 2 passenger trains) did not exceed the overall level of perception, 0.14 mm/s RMS velocity. Since the monitored levels are below the railway's guidelines, no mitigation measures for vibration are required for the proposed residential subdivision.

10.0 CONCLUSIONS

This site is subject to a noise impact from the Goderich-Exeter Railway, Highway 7 and Trafalgar Road. Noise control measures in the form of a berm/barrier combination, central air conditioning and the provision for future central air conditioning and warning clauses are required.

Monitoring indicates the vibration levels are below the railway's guidelines and thus vibration mitigation measures are not required for the proposed residential subdivision.

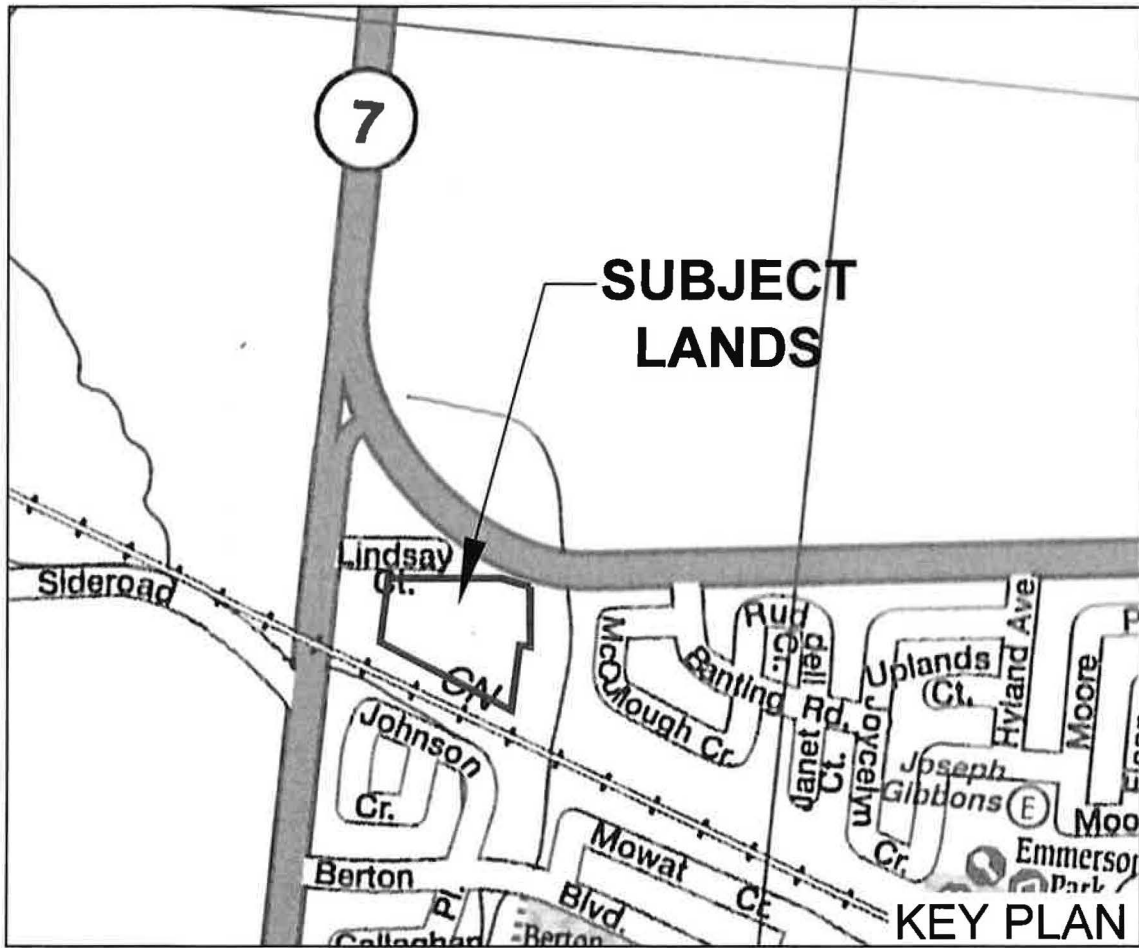
11.0 RECOMMENDATIONS

To meet the noise criteria of the Ministry of the Environment and Climate Change, CN Rail, and the Region of Halton, the following recommendations are proposed:

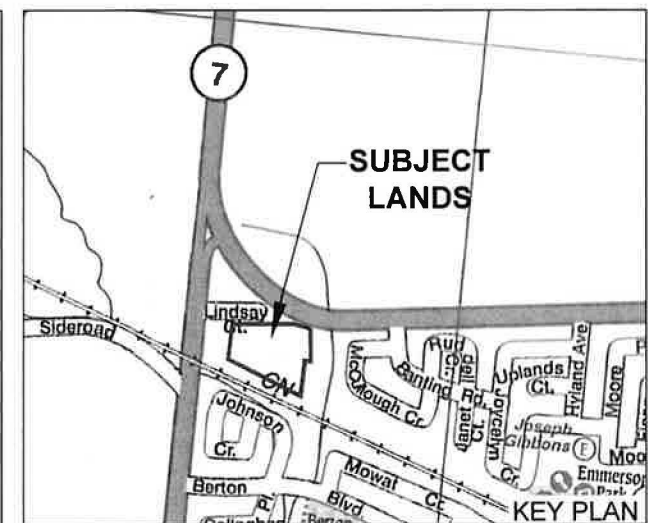
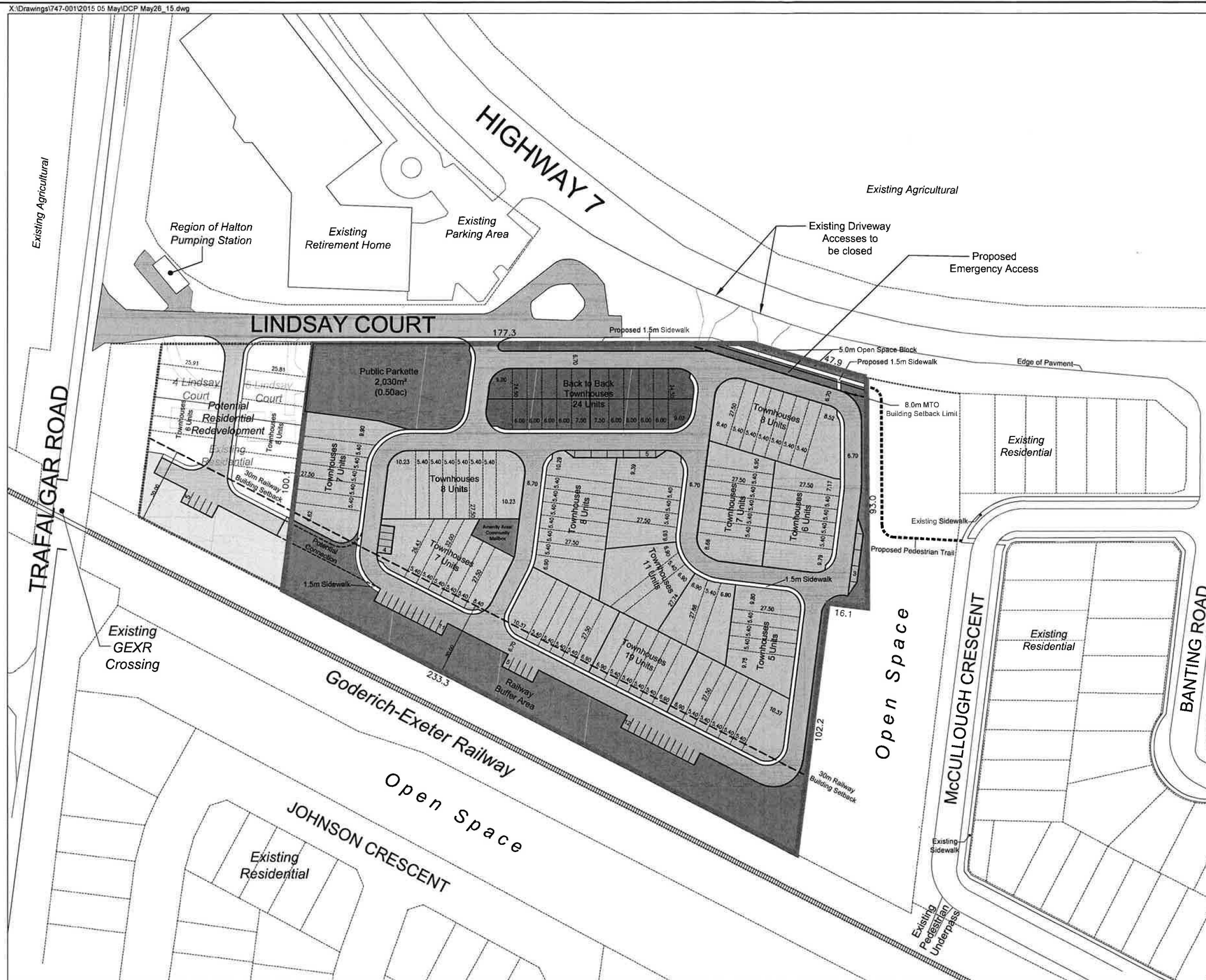
1. The barrier should commence at the southwest corner of the southernmost unit (Location 1) extending to the rear property line. The barrier then wraps to the north continuing along the rear yard of the first five townhouse units, terminating at Location 8. The acoustic barrier is approximately 30m long. The height of the acoustic fence is 3.9m along its entire length. Details are provided in Appendix A, Figure 3. If the lands directly to the west (southeast corner of Lindsay Court and Trafalgar Road) are developed in conjunction with these lands, the extent of the acoustic barrier will be reduced. In this case, the barrier at Location 1 will continue, parallel to the rail line, to the adjacent lands; the wrap along the western property will no longer be required.
2. An acoustic barrier is required to shield the rear yard at Location 9 (westernmost unit in 8-unit townhouse block). The barrier is to extend along the west and southern limits at a height of 2.6m (see Appendix A, Figure 3).
3. A 2.5m high earth berm is required along the southern part of the development. This berm has been designed to meet the railways' safety requirement for a Principal Mainline. Therefore, the berm height is a minimum of 2.5m. The berm extends along the southerly portion of the property, as shown in Appendix A, Figure 4. The safety berm does not provide any noise attenuation benefit because the tracks are elevated 5 to 6m above the site.
4. It is recommended the acoustic consultant confirm the final barrier alignments and top-of-barrier elevations once the final grading plan is available.
5. All acoustical barriers (fence and/or earth berming) must be solid. Any gaps at the base of the acoustic fence must be minimized and localized so as not to significantly affect the acoustical performance of the fence. As required by the MOECC's guidelines, all acoustical fences must have a minimum surface density of 20 kg/m² (4 lbs./ft.²). Acoustical fences may be constructed of heavy wood or concrete.
6. It is recommended the following units incorporate central air conditioning prior to occupancy:
 - a) The two southernmost units in 7-unit townhouse block (closest to Trafalgar Road)
 - b) The 7-unit townhouses directly facing the railway
 - c) The 19-unit townhouses directly facing the railway.

7. It is recommended the units noted in Item 5, above, incorporate a warning clause into the *Agreements of Purchase and Sale* (see Appendix C, Warning Clause "A").
8. It is recommended the remainder of the development incorporate a forced air heating system, with provisions for future air conditioning at owners' option and cost.
9. It is recommended the remainder of the development incorporate a warning clause into the *Agreements of Purchase and Sale* (see Appendix C, Warning Clause "B").
10. The railway requests a warning clause be incorporated into the *Agreements of Purchase and Sale or Occupancy/Offers to Lease* (see Appendix C, Warning Clause "C"). This is applicable to the entire development.
11. All noise control measures are summarized in Appendix A, Figure 4.
12. For the purpose of controlling the transportation noise sources, the windows will require an STC rating of 27 (3mm double glazing with a 13mm gap between the lites) provided the maximum bedroom and living/diningroom window-area-to-floor-area ratios are 20% or less). This is a standard, readily available window. Larger window-area-to-floor-area ratios will require upgrades to the glazing thickness and/or air space. Once the final architectural plans are ready, the acoustic consultant should confirm the final façade requirements for these areas.
13. The MOECC will require brick veneering to be applied from the top of the foundation wall up to the soffits for all units within 45m of the southern property line limit. The additional mass will assist in controlling the low-frequency engine throbbing sound that causes the walls to vibrate. Walls facing away from the tracks do not need this treatment.

APPENDIX A: FIGURES



**DEVELOPMENT CONCEPT PLAN
CATALINA DEVELOPMENTS
8,10,12 LINDSAY COURT &
13758 & 13764 HIGHWAY 7**



**DEVELOPMENT CONCEPT PLAN
CATALINA DEVELOPMENTS
8,10,12 LINDSAY COURT &
13758 & 13764 HIGHWAY 7**

PART OF LOT 20, CONCESSION 8,
TOWN OF HALTON HILLS, REGION OF HALTON

Development Statistics

Gross Site Area:	3.44ha (8.50ac)
5.0m Open Space Block:	0.03ha (0.07ac)
Public Parkette Area:	0.20ha (0.50ac)
Net Site Area:	3.21ha (7.93ac)

Proposed Development Unit Breakdown:

5.4m Townhouses -	86 Units
6.0m Back to Back Townhouses -	24 Units
Total -	110 Units

Site Density: 34.3 UPH (110 Units / 3.21ha)
 Visitor Parking Required: 33 Spaces (0.3 / Unit)
 Visitor Parking Provided: 40 Spaces (0.36 / Unit)

Neighbourhood Statistics

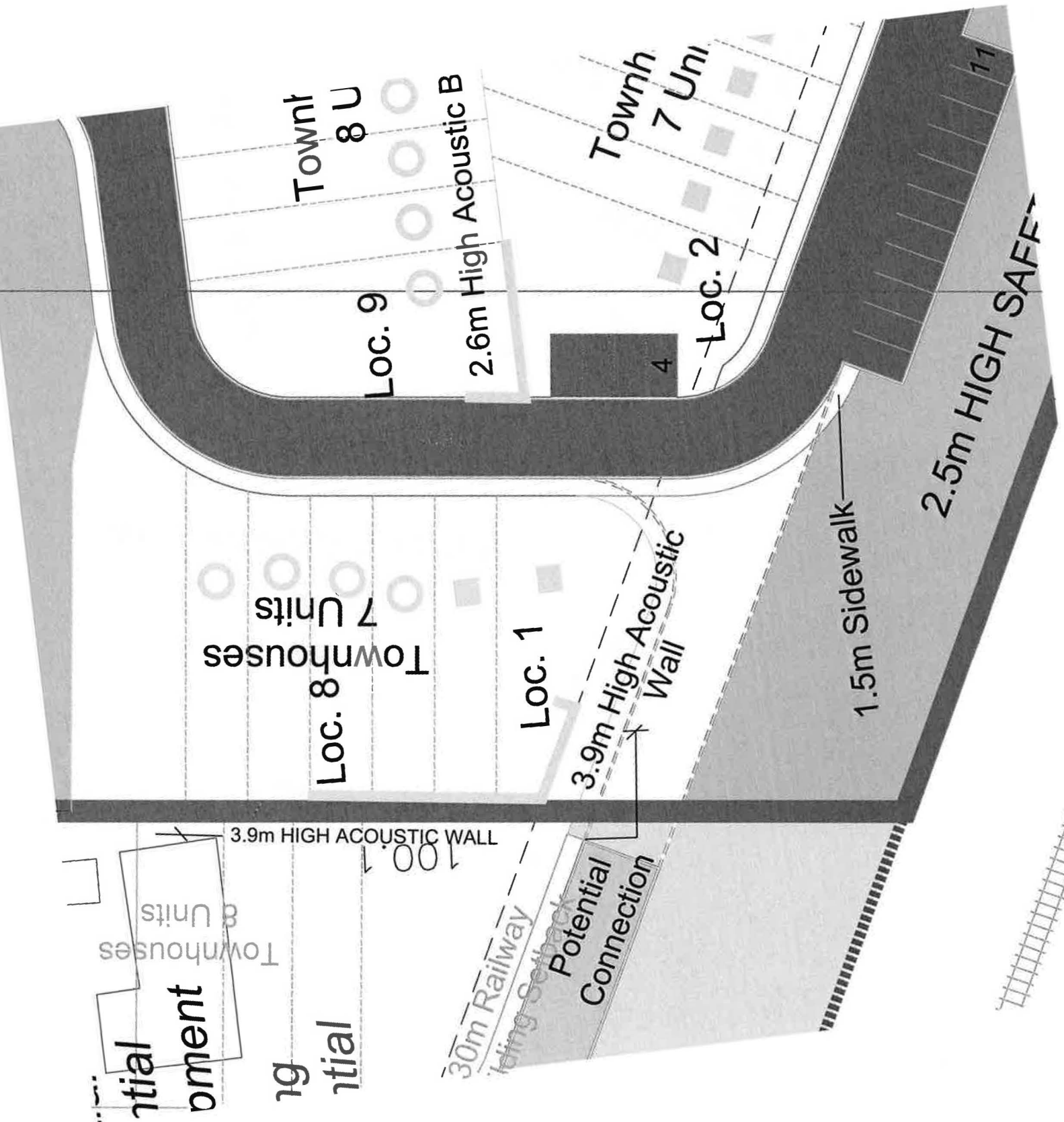
Total Net Neighbourhood Area:	3.73ha (9.22ac)
Proposed Development (3.21ha):	110 Units
Potential Development (0.52ha):	14 Units
Neighbourhood Density*:	33.2 UPH (124 Units / 3.73ha)

- Notes:**
- Typical Visitor Parking Perpendicular Space: 2.75m x 5.5m
 - Typical Visitor Parking Parallel Space: 2.75m x 6.5m
 - Fire Centre line Turning Radii dimension = 12m
 - Front Yard setback = 4.5m, RY = 7.5m, ISY = 1.5m, ESY = 3.0m

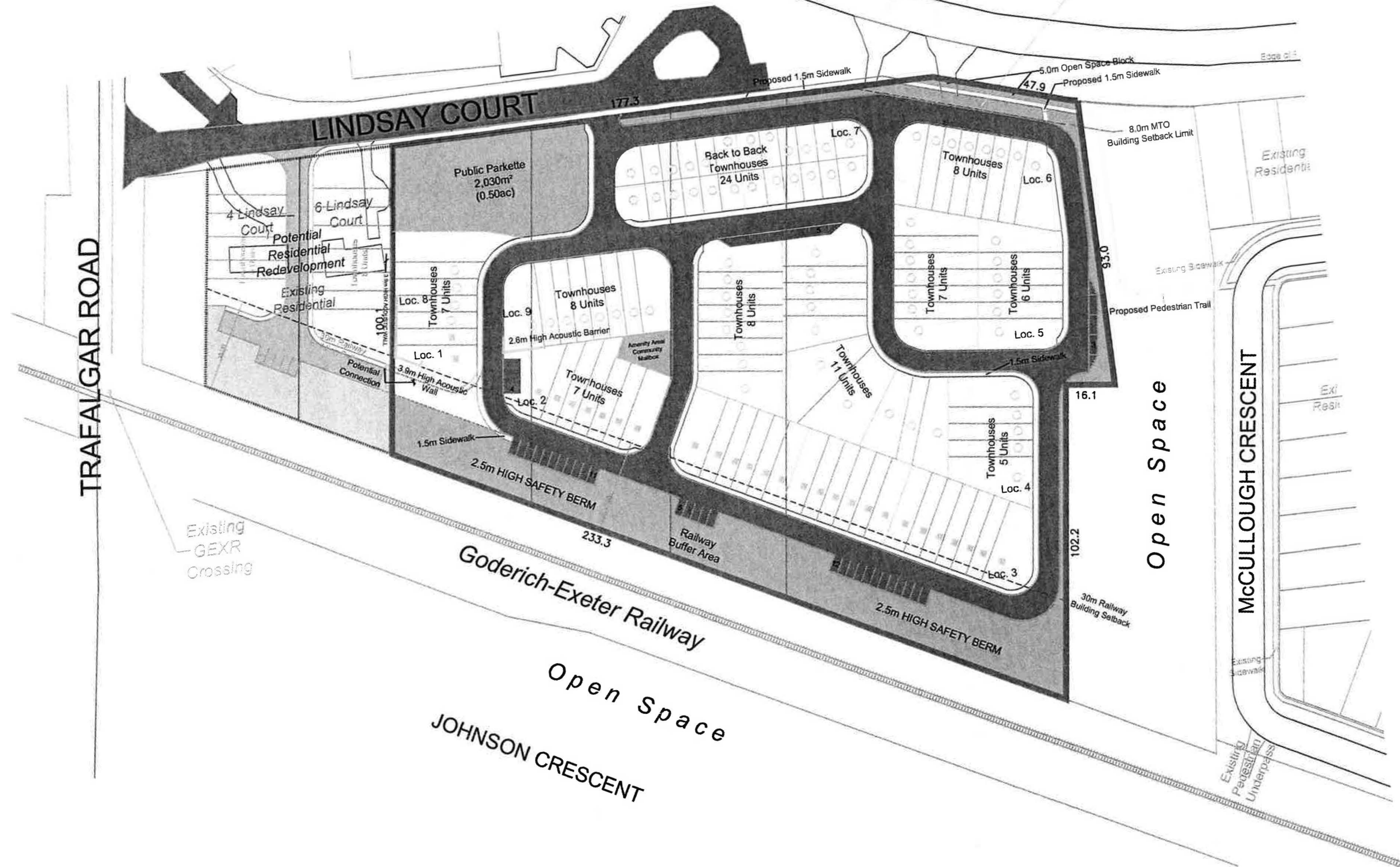
Scale 1:1500
May 26, 2015

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FIGURE 2



FIGURE



NOISE CONTROL MEASURES

LEGEND

- CENTRAL A/C + WARNING CLAUSES "A" & "D"
- ▨ FORCED AIR HEATING w/PROVISION FOR CENTRAL A/C + WARNING CLAUSES "A" & "C"

APPENDIX B: SOUND LEVEL CALCULATIONS



GODERICH-EXETER RAILWAY LIMITED

101 Shakespeare Street • 2nd • Stratford Ontario • N5A 3W5 • Phone: 519 271-4441 • Fax: 519 271-1337

Howard R. Patlik C.E.T.
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December 21, 2011

(hpatlik@jecoulterassoc.com)
(via email only)

Re: Rail Traffic – Guelph Subdivision –Halton Hills ON

As per your request, the following information is provided for the area in the vicinity of Trafalgar Road, Halton Hills Ontario.

The typical daily rail traffic volumes are representative of a twenty four (24) hour period, but I must caution that such volumes are subject to overall economic conditions and will fluctuate with varying traffic demands, weather conditions, track maintenance programs and statutory holidays.

The Guelph Subdivision is a single track main line, considered as principal main track where within the area that was referenced, trains are required to whistle for level road crossings.

At present the number of trains which are scheduled to operate between 0700 and 2300 there are five (5) passenger trains, three (3) commuter trains and two (2) freight trains.

Between the hours of 2300 to 0700, there is currently one (1) passenger train and one (1) commuter train.

Passenger trains normally operate on average with one (1) locomotive and five (5) coaches, commuter trains normally operate on average with two (2) locomotives and ten (10) bi-level coaches and freight trains are normally operated with two (2) locomotives and fifty nine (59) rail cars.

Passenger and commuter trains may operate at up to a maximum speed of seventy (70) miles per hour while freight train speeds are a maximum of fifty five (55) miles per hour.

Based on current forecasts, passenger and commuter trains may increase by 100 percent, times of operation are unknown at this time, while freight traffic is expected to grow between five (5%) and ten (10%) per cent annually over the next three (3) years without any additional freight trains.



A RailAmerica Company

GODERICH-EXETER RAILWAY LIMITED

101 Shakespeare Street • 2nd • Stratford Ontario • N5A 3W5 • Phone: 519 271-4441 • Fax: 519 271-1337

In view of the increased use of this line, it is anticipated that additional infrastructure improvements may be completed that would allow for faster train speeds over this portion of the Guelph Subdivision.

If you have any further questions please feel free to contact me at 519 271-4441 Extension 3.

Yours truly,

Doug MacKenzie
General Manager
Goderich-Exeter Railway



A RailAmerica Company

Highway	Location Description	Dist	Year	Patt Type	AADT	SADT	SAWDT	WADT	AR
			2001	C	14,200	16,000	16,000	12,800	0.0
			2002	C	14,300	16,000	16,100	12,900	1.1
			2003	C	14,100	15,800	15,900	12,700	0.4
			2004	C	14,100	15,700	15,900	12,700	0.0
			2005	C	14,200	15,800	15,900	12,800	0.0
			2006	C	14,200	15,800	15,900	12,800	0.0
			2007	C	14,200	15,800	16,000	12,800	0.0
			2008	C	14,300	15,800	15,600	12,800	0.0
			2009	C	14,300	15,800	15,900	12,900	0.0
			2010	C	14,400	15,900	16,000	13,000	0.0
7	HAL RD 19-WINSTON CHURCHILL BVD	1.6	1988	UC	16,300	17,100	18,400	15,300	0.3
			1989	UC	16,800	17,600	18,900	15,900	0.9
			1990	UC	16,300	17,400	18,900	15,400	1.3
			1991	UC	15,700	16,600	18,000	15,200	1.3
			1992	UC	15,900	16,500	17,900	14,700	0.8
			1993	UC	17,050	18,000	19,600	16,300	0.3
			1994	UC	16,700	17,700	19,400	15,200	1.1
			1995	UC	17,600	18,300	20,100	16,400	0.4
			1996	UC	17,200	18,300	20,100	16,300	0.8
			1997	UC	17,400	18,300	20,400	16,400	0.5
			1998	UC	17,600	18,700	20,600	16,700	0.3
			1999	UC	17,300	18,400	20,200	16,400	0.2
			2000	UC	17,000	18,100	20,000	16,000	0.5
			2001	UC	17,400	18,600	20,500	16,400	0.5
			2002	UC	17,400	18,500	20,500	16,300	1.4
			2003	UC	17,400	18,400	20,500	16,400	0.3
			2004	UC	17,400	18,400	20,400	16,400	0.7
			2005	UC	17,500	18,500	20,500	16,400	0.6
			2006	UC	17,500	18,500	20,400	16,500	0.0
			2007	UC	17,500	18,600	20,300	16,400	0.1
			2008	UC	17,500	18,500	17,400	16,400	0.1
			2009	UC	17,600	18,600	20,500	16,600	0.0
			2010	UC	17,600	18,600	20,500	16,500	0.0
7	HALL RD-START OF NA FORMER GEORGETOWN	5.0							
7	HALTON RD 32-HALTON HILLS-END OF NA	1.4	1988	C	10,600	11,700	11,700	9,500	0.4
			1989	C	10,850	12,000	12,100	9,700	0.4
			1990	UC	11,050	11,800	12,800	10,400	0.4
			1991	UC	11,400	12,000	13,100	11,000	0.5
			1992	UC	11,600	12,200	13,300	11,100	0.3
			1993	UC	11,200	11,800	12,600	10,300	0.3
			1994	UC	11,600	12,300	13,000	10,700	0.8
			1995	UC	11,800	12,500	13,100	10,900	0.7
			1996	UC	11,000	11,700	12,900	10,500	0.4
			1997	IC	12,100	13,500	13,700	10,600	0.2

Highway	Location Description	Dist	Year	Patt Type	AADT	SADT	SAWDT	WADT	AR
			1998	IC	12,500	13,900	14,000	11,100	0.2
			1999	IC	12,100	13,500	13,600	10,700	0.8
			2000	IC	12,200	13,600	13,700	10,800	1.0
			2001	IC	12,300	13,800	13,800	10,800	0.5
			2002	IC	12,400	13,800	13,900	10,900	0.3
			2003	IC	12,300	13,700	13,800	10,800	0.3
			2004	IC	12,600	14,000	14,200	11,200	0.3
			2005	IC	12,700	14,100	14,300	11,200	0.5
			2006	IC	12,800	14,200	14,400	11,300	0.2
			2007	IC	12,900	14,300	14,800	11,400	0.3
			2008	IC	13,000	14,400	13,900	11,500	0.3
			2009	IC	13,100	14,500	14,600	11,600	0.0
			2010	IC	13,200	14,600	14,700	11,700	0.0
7	S JCT HALTON RD 3-TRAFALGAR RD	3.5	1988	C	13,950	15,400	15,400	12,500	1.1
			1989	C	14,150	15,700	15,800	12,700	1.2
			1990	UC	14,700	15,700	17,000	13,900	0.8
			1991	UC	15,100	16,000	17,300	14,600	1.0
			1992	UC	15,300	16,200	17,500	14,600	1.0
			1993	UC	14,850	15,700	16,700	13,600	1.0
			1994	UC	15,100	16,000	16,900	13,900	0.6
			1995	UC	15,300	16,200	17,000	14,100	0.8
			1996	UC	14,800	15,700	17,300	14,100	1.1
			1997	UC	14,900	15,600	17,400	14,000	1.3
			1998	UC	16,200	17,200	19,000	15,400	0.7
			1999	UC	16,200	17,200	19,000	15,400	0.7
			2000	C	16,700	18,800	18,900	15,000	1.1
			2001	C	16,700	18,900	18,900	15,000	0.5
			2002	C	17,000	19,000	19,200	15,300	0.9
			2003	C	17,300	19,400	19,500	15,600	0.5
			2004	C	17,600	19,700	19,800	15,900	0.6
			2005	C	17,900	19,900	20,100	16,100	0.6
			2006	C	18,200	20,200	20,400	16,400	0.6
			2007	C	18,400	20,400	20,700	16,500	0.6
			2008	C	18,700	20,600	20,400	16,800	0.7
			2009	C	19,000	21,000	21,200	17,100	0.3
			2010	C	19,300	21,300	21,500	17,400	0.1
7	N JCT HALTON RD 3	5.7	1988	C	7,950	8,800	8,800	7,100	1.5
			1989	C	8,050	8,900	9,000	7,200	0.9
			1990	UC	8,200	8,700	9,500	7,700	1.5
			1991	UC	8,450	8,900	9,700	8,100	0.8
			1992	UC	8,500	9,000	9,700	8,100	1.0
			1993	UC	8,300	8,700	9,300	7,600	1.1
			1994	UC	8,500	9,000	9,500	7,800	1.0
			1995	UC	8,600	9,100	9,550	7,900	1.2

Filename: loclr.te Time Period: Day/Night 16/8 hours
 Description: Loc 1 - Rear yard - No Barrier

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

Train Type	! Trains	! Speed ! (km/h)	!# loc !/Train!	!# Cars !/Train!	! Eng type	!Cont !weld
* 1. Freight	! 3.5/0.0	! 88.0	! 2.0	! 59.0	!Diesel!	! Yes
* 2. Passenger	! 14.8/3.0	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes
* 3. Commuter	! 7.6/2.6	! 113.0	! 1.0	! 5.0	!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	! 3.2/0.0	! 3.24	! 3.00
2. Passenger	! 12.0/2.4	! 7.18	! 3.00
3. Commuter	! 7.1/2.4	! 2.50	! 3.00

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

Angle1 Angle2 : -64.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 47.00 / 47.00 m
 Receiver height : 1.50 / 4.50 m
 Topography : 3 (Elevated; no barrier)
 No Whistle
 Elevation : 5.65 m

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

Train Type	! Trains	! Speed ! (km/h)	!# loc !/Train!	!# Cars !/Train!	! Eng type	!Cont !weld
* 1. Freight	! 3.5/0.0	! 88.0	! 2.0	! 59.0	!Diesel!	! Yes
* 2. Passenger	! 14.8/3.0	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes
* 3. Commuter	! 7.6/2.6	! 113.0	! 1.0	! 5.0	!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	! 3.2/0.0	! 3.24	! 3.00
2. Passenger	! 12.0/2.4	! 7.18	! 3.00
3. Commuter	! 7.1/2.4	! 2.50	! 3.00

Data for Segment # 2: GEXR (day/night)

```

-----
Angle1  Angle2      : 0.00 deg  44.00 deg
Wood depth      : 0          (No woods.)
No of house rows : 0 / 0
Surface         : 1          (Absorptive ground surface)
Receiver source distance : 47.00 / 47.00 m
Receiver height  : 1.50 / 4.50 m
Topography      : 3          (Elevated; no barrier)
No Whistle
Elevation       : 5.65 m
  
```

Rail data, segment # 3: GEXR (day/night)

```

-----
Train      ! Trains    ! Speed !# loc !# Cars! Eng  !Cont
Type       !           ! (km/h) !/Train! /Train! type !weld
-----+-----+-----+-----+-----+-----+-----
* 1. Freight ! 3.5/0.0  ! 88.0 ! 2.0 ! 59.0 !Diesel! Yes
* 2. Passenger ! 14.8/3.0 ! 113.0 ! 1.0 ! 5.0 !Diesel! Yes
* 3. Commuter  ! 7.6/2.6  ! 113.0 ! 1.0 ! 5.0 !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       ! 3.2/0.0 ! 3.24 ! 3.00 !
2. Passenger     ! 12.0/2.4 ! 7.18 ! 3.00 !
3. Commuter      ! 7.1/2.4 ! 2.50 ! 3.00 !
  
```

Data for Segment # 3: GEXR (day/night)

```

-----
Angle1  Angle2      : 44.00 deg  90.00 deg
Wood depth      : 0          (No woods.)
No of house rows : 0 / 0
Surface         : 1          (Absorptive ground surface)
Receiver source distance : 47.00 / 47.00 m
Receiver height  : 1.50 / 4.50 m
Topography      : 3          (Elevated; no barrier)
No Whistle
Elevation       : 5.65 m
  
```

Results segment # 1: GEXR (day)

```

-----
LOCOMOTIVE (0.00 + 57.82 + 0.00) = 57.82 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----+-----+-----+-----+-----+-----+-----+-----+-----+
-64     0     0.42  69.75  -7.02  -4.91  0.00  0.00  0.00  57.82
-----+-----+-----+-----+-----+-----+-----+-----+
  
```

```

-----
WHEEL (0.00 + 48.99 + 0.00) = 48.99 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----+-----+-----+-----+-----+-----+-----+-----+
-64     0     0.52  61.54  -7.54  -5.01  0.00  0.00  0.00  48.99
-----+-----+-----+-----+-----+-----+-----+-----+
  
```

Segment Leq : 58.35 dBA

Results segment # 2: GEXR (day)

LOCOMOTIVE (0.00 + 56.42 + 0.00) = 56.42 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	44	0.42	69.75	-7.02	-6.30	0.00	0.00	0.00	56.42

WHEEL (0.00 + 47.65 + 0.00) = 47.65 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	44	0.52	61.54	-7.54	-6.35	0.00	0.00	0.00	47.65

Segment Leq : 56.96 dBA

Results segment # 3: GEXR (day)

LOCOMOTIVE (0.00 + 54.82 + 0.00) = 54.82 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
44	90	0.42	69.75	-7.02	-7.91	0.00	0.00	0.00	54.82

WHEEL (0.00 + 45.66 + 0.00) = 45.66 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
44	90	0.52	61.54	-7.54	-8.35	0.00	0.00	0.00	45.66

Segment Leq : 55.32 dBA

Total Leq All Segments: 61.82 dBA

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

Car traffic volume : 13296/1477 veh/TimePeriod *

Medium truck volume : 267/30 veh/TimePeriod *

Heavy truck volume : 507/56 veh/TimePeriod *

Posted speed limit : 80 km/h

Road gradient : 0 %

Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 10531

Percentage of Annual Growth : 2.50

Number of Years of Growth : 16.00

Medium Truck % of Total Volume : 1.90

Heavy Truck % of Total Volume : 3.60

Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Trafalgar Rd (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 97.00 / 97.00 m
Receiver height : 1.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)

Results segment # 1: Trafalgar Rd (day)

Source height = 1.38 m

ROAD (0.00 + 53.47 + 0.00) = 53.47 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-90 90 0.66 71.03 0.00 -13.46 -1.46 0.00 -2.64 0.00 53.47

Segment Leq : 53.47 dBA

Total Leq All Segments: 53.47 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.41

Filename: loclr.te Time Period: Day/Night 16/8 hours
 Description: Loc 1 - Rear yard - With 3.9m Barrier

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

Train Type	! Trains !	! Speed ! (km/h)	!# loc !/Train!	!# Cars !/Train!	! Eng ! type	!Cont !weld
* 1. Freight	! 3.5/0.0	! 88.0	! 2.0	! 59.0	!Diesel!	! Yes
* 2. Passenger	! 14.8/3.0	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes
* 3. Commuter	! 7.6/2.6	! 113.0	! 1.0	! 5.0	!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	! 3.2/0.0	! 3.24	! 3.00
2. Passenger	! 12.0/2.4	! 7.18	! 3.00
3. Commuter	! 7.1/2.4	! 2.50	! 3.00

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

Angle1 Angle2 : -64.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 47.00 / 47.00 m
 Receiver height : 1.50 / 4.50 m
 Topography : 4 (Elevated; with barrier)
 No Whistle
 Barrier angle1 : -64.00 deg Angle2 : 0.00 deg
 Barrier height : 3.90 m
 Elevation : 5.65 m
 Barrier receiver distance : 2.60 / 2.60 m
 Source elevation : 277.50 m
 Receiver elevation : 271.85 m
 Barrier elevation : 271.85 m

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

Train Type	! Trains !	! Speed ! (km/h)	!# loc !/Train!	!# Cars !/Train!	! Eng ! type	!Cont !weld
* 1. Freight	! 3.5/0.0	! 88.0	! 2.0	! 59.0	!Diesel!	! Yes
* 2. Passenger	! 14.8/3.0	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes
* 3. Commuter	! 7.6/2.6	! 113.0	! 1.0	! 5.0	!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	! 3.2/0.0	! 3.24	! 3.00
2. Passenger	! 12.0/2.4	! 7.18	! 3.00
3. Commuter	! 7.1/2.4	! 2.50	! 3.00

Data for Segment # 2: GEXR (day/night)

```

-----
Angle1  Angle2      : 0.00 deg   44.00 deg
Wood depth      : 0          (No woods.)
No of house rows : 0 / 0
Surface         : 1          (Absorptive ground surface)
Receiver source distance : 47.00 / 47.00 m
Receiver height  : 1.50 / 4.50 m
Topography      : 4          (Elevated; with barrier)
No Whistle
Barrier angle1   : 0.00 deg   Angle2 : 44.00 deg
Barrier height   : 3.90 m
Elevation        : 5.65 m
Barrier receiver distance : 2.60 / 2.60 m
Source elevation : 277.50 m
Receiver elevation : 271.85 m
Barrier elevation : 271.85 m

```

Rail data, segment # 3: GEXR (day/night)

```

-----
Train      ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type       !              ! (km/h) !/Train! /Train! type !weld
-----+-----+-----+-----+-----+-----+
* 1. Freight      ! 3.5/0.0      ! 88.0 ! 2.0 ! 59.0 !Diesel! Yes
* 2. Passenger    ! 14.8/3.0     ! 113.0 ! 1.0 ! 5.0 !Diesel! Yes
* 3. Commuter     ! 7.6/2.6      ! 113.0 ! 1.0 ! 5.0 !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      ! 3.2/0.0 ! 3.24 ! 3.00 !
2. Passenger    ! 12.0/2.4 ! 7.18 ! 3.00 !
3. Commuter     ! 7.1/2.4 ! 2.50 ! 3.00 !

```

Data for Segment # 3: GEXR (day/night)

```

-----
Angle1  Angle2      : 44.00 deg   90.00 deg
Wood depth      : 0          (No woods.)
No of house rows : 0 / 0
Surface         : 1          (Absorptive ground surface)
Receiver source distance : 47.00 / 47.00 m
Receiver height  : 1.50 / 4.50 m
Topography      : 4          (Elevated; with barrier)
No Whistle
Barrier angle1   : 44.00 deg   Angle2 : 90.00 deg
Barrier height   : 3.90 m
Elevation        : 5.65 m
Barrier receiver distance : 1.15 / 1.15 m
Source elevation : 277.50 m
Receiver elevation : 271.85 m
Barrier elevation : 271.85 m

```

Results segment # 1: GEXR (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	1.95	273.80
0.50	1.50	1.76	273.61

LOCOMOTIVE (0.00 + 44.85 + 0.00) = 44.85 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-64	0	0.18	69.75	-5.86	-4.68	0.00	0.00	-14.35	44.85

WHEEL (0.00 + 35.05 + 0.00) = 35.05 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-64	0	0.29	61.54	-6.38	-4.78	0.00	0.00	-15.33	35.05

Segment Leq : 45.28 dBA

Results segment # 2: GEXR (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	1.95	273.80
0.50	1.50	1.76	273.61

LOCOMOTIVE (0.00 + 42.66 + 0.00) = 42.66 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	44	0.18	69.75	-5.86	-6.20	0.00	0.00	-15.02	42.66

WHEEL (0.00 + 32.91 + 0.00) = 32.91 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	44	0.29	61.54	-6.38	-6.25	0.00	0.00	-16.01	32.91

Segment Leq : 43.10 dBA

Results segment # 3: GEXR (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	1.70	273.55
0.50	1.50	1.61	273.46

LOCOMOTIVE (0.00 + 44.89 + 0.00) = 44.89 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
44	90	0.18	69.75	-5.86	-6.85	0.00	0.00	-12.15	44.89

WHEEL (0.00 + 35.26 + 0.00) = 35.26 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
44	90	0.29	61.54	-6.38	-7.34	0.00	0.00	-12.56	35.26

Segment Leq : 45.34 dBA

Total Leq All Segments: 49.46 dBA

Results segment # 1: GEXR (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	4.50	4.78	276.63
0.50	4.50	4.59	276.44

LOCOMOTIVE (0.00 + 53.52 + 0.00) = 53.52 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-64	0	0.09	64.92	-5.41	-4.59	0.00	0.00	0.00	54.92*
-64	0	0.33	64.92	-6.57	-4.82	0.00	0.00	0.00	53.52

* Bright Zone !

WHEEL (0.00 + 43.35 + 0.00) = 43.35 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-64	0	0.20	55.37	-5.93	-4.69	0.00	0.00	-0.26	44.47*
-64	0	0.43	55.37	-7.10	-4.92	0.00	0.00	0.00	43.35

* Bright Zone !

Segment Leq : 53.92 dBA

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

```

-----
Car traffic volume : 13296/1477 veh/TimePeriod *
Medium truck volume : 267/30 veh/TimePeriod *
Heavy truck volume : 507/56 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

```

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

```

24 hr Traffic Volume (AADT or SADT): 10531
Percentage of Annual Growth : 2.50
Number of Years of Growth : 16.00
Medium Truck % of Total Volume : 1.90
Heavy Truck % of Total Volume : 3.60
Day (16 hrs) % of Total Volume : 90.00

```

Data for Segment # 1: Trafalgar Rd (day/night)

```

-----
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 97.00 / 97.00 m
Receiver height : 1.50 / 7.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 0.00 deg Angle2 : 90.00 deg
Barrier height : 3.00 m
Barrier receiver distance : 4.50 / 4.50 m
Source elevation : 276.00 m
Receiver elevation : 271.85 m
Barrier elevation : 271.65 m

```

Results segment # 1: Trafalgar Rd (day)

Source height = 1.38 m

Barrier height for grazing incidence

```

-----
Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
-----+-----+-----+-----
1.38 ! 1.50 ! 1.89 ! 273.54

```

ROAD (50.46 + 46.75 + 0.00) = 52.00 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.66	71.03	0.00	-13.46	-4.47	0.00	-2.64	0.00	50.46
0	90	0.66	71.03	0.00	-13.46	-4.47	0.00	-2.64	0.00	50.46
0	90	0.48	71.03	0.00	-12.03	-4.16	0.00	0.00	-8.09	46.75

Segment Leq : 52.00 dBA

Total Leq All Segments: 52.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.92

Filename: loc2f.te Time Period: Day/Night 16/8 hours
 Description: Loc 2 - Facade

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

Train Type	! Trains ! ! (Left)	! Trains ! ! (Right)	! Speed ! ! (km/h)	!# loc ! !/Train!	!# Cars! !/Train!	Eng type	!Cont !weld
* 1. Freight	! 1.8/0.0	! 1.8/0.0	! 88.0	! 2.0	! 59.0	!Diesel!	! Yes
* 2. Passenger	! 7.4/1.5	! 7.4/1.5	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes
* 3. Commuter	! 3.8/1.3	! 3.8/1.3	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes

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

Train type: No Name	! Unadj. Trains ! ! Left ! Right	! Annual % ! ! Increase !	! Years of ! ! Growth !
1. Freight	! 1.6/0.0	! 1.6/0.0	! 3.24
2. Passenger	! 6.0/1.2	! 6.0/1.2	! 7.18
3. Commuter	! 3.5/1.2	! 3.5/1.2	! 2.50

Data for Segment # 1: GEXR (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 : 44.00 / 44.00 m
 Receiver height : 1.50 / 7.50 m
 Topography : 3 (Elevated; no barrier)
 Whistle Angle : 71 deg Track 1
 Elevation : 6.50 m

Results segment # 1: GEXR (day)

LOCOMOTIVE (0.00 + 62.33 + 0.00) = 62.33 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.39	69.79	-6.50	-0.96	0.00	0.00	0.00	62.33

WHEEL (0.00 + 53.45 + 0.00) = 53.45 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.50	61.61	-6.99	-1.17	0.00	0.00	0.00	53.45

LEFT WHISTLE (0.00 + 64.60 + 0.00) = 64.60 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-81	71	0.39	72.44	-6.50	-1.34	0.00	0.00	0.00	64.60

RIGHT WHISTLE (0.00 + 52.17 + 0.00) = 52.17 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
71	85	0.39	72.44	-6.50	-13.77	0.00	0.00	0.00	52.17

Segment Leq : 66.97 dBA
 Total Leq All Segments: 66.97 dBA

Results segment # 1: GEXR (night)

LOCOMOTIVE (0.00 + 58.70 + 0.00) = 58.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.21	64.92	-5.66	-0.56	0.00	0.00	0.00	58.70

WHEEL (0.00 + 48.42 + 0.00) = 48.42 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.31	55.37	-6.15	-0.80	0.00	0.00	0.00	48.42

LEFT WHISTLE (0.00 + 61.88 + 0.00) = 61.88 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-81	71	0.21	68.61	-5.66	-1.08	0.00	0.00	0.00	61.88

RIGHT WHISTLE (0.00 + 50.45 + 0.00) = 50.45 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
71	85	0.21	68.61	-5.66	-12.51	0.00	0.00	0.00	50.45

Segment Leq : 63.92 dBA

Total Leq All Segments: 63.92 dBA

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

Car traffic volume : 13296/1477 veh/TimePeriod *

Medium truck volume : 267/30 veh/TimePeriod *

Heavy truck volume : 507/56 veh/TimePeriod *

Posted speed limit : 80 km/h

Road gradient : 0 %

Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 10531

Percentage of Annual Growth : 2.50

Number of Years of Growth : 16.00

Medium Truck % of Total Volume : 1.90

Heavy Truck % of Total Volume : 3.60

Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Trafalgar Rd (day/night)

Angle1 Angle2 : -90.00 deg -36.00 deg

Wood depth : 0 (No woods.)

No of house rows : 1 / 1

House density : 75 %

Surface : 1 (Absorptive ground surface)

Receiver source distance : 129.00 / 129.00 m

Receiver height : 1.50 / 7.50 m

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

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

```

-----
Car traffic volume : 10030/1114 veh/TimePeriod *
Medium truck volume : 202/22 veh/TimePeriod *
Heavy truck volume : 382/42 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

```

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

```

24 hr Traffic Volume (AADT or SADT): 9485
Percentage of Annual Growth : 2.00
Number of Years of Growth : 11.00
Medium Truck % of Total Volume : 1.90
Heavy Truck % of Total Volume : 3.60
Day (16 hrs) % of Total Volume : 90.00

```

Data for Segment # 2: Trafalgar Rd (day/night)

```

-----
Angle1 Angle2 : -36.00 deg 19.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 1
House density : 20 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 129.00 / 129.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)

```

Results segment # 1: Trafalgar Rd (day)

Source height = 1.38 m

ROAD (0.00 + 42.74 + 0.00) = 42.74 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-36	0.66	71.03	0.00	-15.51	-7.79	0.00	-4.98	0.00	42.74

Segment Leq : 42.74 dBA

Results segment # 2: Trafalgar Rd (day)

Source height = 1.38 m

ROAD (0.00 + 48.99 + 0.00) = 48.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-36	19	0.66	69.80	0.00	-15.51	-5.29	0.00	0.00	0.00	48.99

Segment Leq : 48.99 dBA

Total Leq All Segments: 49.91 dBA

Results segment # 1: Trafalgar Rd (night)

Source height = 1.38 m

ROAD (0.00 + 38.44 + 0.00) = 38.44 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-36	0.48	64.48	0.00	-13.87	-7.20	0.00	-4.98	0.00	38.44

Segment Leq : 38.44 dBA

Results segment # 2: Trafalgar Rd (night)

Source height = 1.37 m

ROAD (0.00 + 42.36 + 0.00) = 42.36 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-36	19	0.57	63.24	0.00	-14.71	-5.27	0.00	-0.89	0.00	42.36

Segment Leq : 42.36 dBA

Total Leq All Segments: 43.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.05
(NIGHT): 63.96

Filename: loc3f.te Time Period: Day/Night 16/8 hours
 Description: Location 3 - South Facade

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

Train Type	! Trains ! ! (Left)	! Trains ! ! (Right)	! Speed ! !(km/h)	!# loc ! !/Train!	!# Cars! !/Train!	Eng type	!Cont !weld
* 1. Freight	! 1.8/0.0	! 1.8/0.0	! 88.0	! 2.0	! 59.0	!Diesel!	! Yes
* 2. Passenger	! 7.4/1.5	! 7.4/1.5	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes
* 3. Commuter	! 3.8/1.3	! 3.8/1.3	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes

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

Train type: No Name	! Unadj. Trains ! ! Left !	! Right !	! Annual % ! ! Increase !	! Years of ! ! Growth !
1. Freight	! 1.6/0.0	! 1.6/0.0	! 3.24	! 3.00
2. Passenger	! 6.0/1.2	! 6.0/1.2	! 7.18	! 3.00
3. Commuter	! 3.5/1.2	! 3.5/1.2	! 2.50	! 3.00

Data for Segment # 1: GEXR (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 : 44.00 / 44.00 m
 Receiver height : 1.50 / 7.50 m
 Topography : 3 (Elevated; no barrier)
 Whistle Angle : 81 deg Track 1
 Elevation : 6.50 m

Results segment # 1: GEXR (day)

LOCOMOTIVE (0.00 + 62.33 + 0.00) = 62.33 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.39	69.79	-6.50	-0.96	0.00	0.00	0.00	62.33

WHEEL (0.00 + 53.45 + 0.00) = 53.45 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.50	61.61	-6.99	-1.17	0.00	0.00	0.00	53.45

LEFT WHISTLE (0.00 + 64.58 + 0.00) = 64.58 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-70	81	0.39	72.44	-6.50	-1.36	0.00	0.00	0.00	64.58

RIGHT WHISTLE (0.00 + 46.86 + 0.00) = 46.86 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
81	86	0.39	72.44	-6.50	-19.08	0.00	0.00	0.00	46.86

Segment Leq : 66.86 dBA

Total Leq All Segments: 66.86 dBA

Results segment # 1: GEXR (night)

LOCOMOTIVE (0.00 + 58.70 + 0.00) = 58.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.21	64.92	-5.66	-0.56	0.00	0.00	0.00	58.70

WHEEL (0.00 + 48.42 + 0.00) = 48.42 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.31	55.37	-6.15	-0.80	0.00	0.00	0.00	48.42

LEFT WHISTLE (0.00 + 61.86 + 0.00) = 61.86 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-70	81	0.21	68.61	-5.66	-1.09	0.00	0.00	0.00	61.86

RIGHT WHISTLE (0.00 + 45.61 + 0.00) = 45.61 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
81	86	0.21	68.61	-5.66	-17.35	0.00	0.00	0.00	45.61

Segment Leq : 63.77 dBA

Total Leq All Segments: 63.77 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.86
(NIGHT): 63.77

Filename: loc3r.te Time Period: Day/Night 16/8 hours
 Description: Location 3 - Rear yard

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

Train Type	! Trains !	! Speed ! (km/h)	!# loc !/Train!	!# Cars !/Train!	! Eng type !	!Cont !weld
* 1. Freight	! 3.5/0.0	! 88.0	! 2.0	! 59.0	!Diesel!	! Yes
* 2. Passenger	! 14.8/3.0	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes
* 3. Commuter	! 7.6/2.6	! 113.0	! 1.0	! 5.0	!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	! 3.2/0.0	! 3.24	! 3.00
2. Passenger	! 12.0/2.4	! 7.18	! 3.00
3. Commuter	! 7.1/2.4	! 2.50	! 3.00

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

Angle1 Angle2 : -90.00 deg -45.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 64.00 / 64.00 m
 Receiver height : 1.50 / 4.50 m
 Topography : 3 (Elevated; no barrier)
 No Whistle
 Elevation : 5.65 m

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

Train Type	! Trains !	! Speed ! (km/h)	!# loc !/Train!	!# Cars !/Train!	! Eng type !	!Cont !weld
* 1. Freight	! 3.5/0.0	! 88.0	! 2.0	! 59.0	!Diesel!	! Yes
* 2. Passenger	! 14.8/3.0	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes
* 3. Commuter	! 7.6/2.6	! 113.0	! 1.0	! 5.0	!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	! 3.2/0.0	! 3.24	! 3.00
2. Passenger	! 12.0/2.4	! 7.18	! 3.00
3. Commuter	! 7.1/2.4	! 2.50	! 3.00

Data for Segment # 2: GEXR (day/night)

```

-----
Angle1  Angle2      : -45.00 deg   90.00 deg
Wood depth      :      0      (No woods.)
No of house rows :      1 / 0
Surface         :      1      (Absorptive ground surface)
Receiver source distance : 64.00 / 64.00 m
Receiver height  :      1.50 / 4.50 m
Topography      :      3      (Elevated; no barrier)
No Whistle
Elevation       :      5.65 m
  
```

Results segment # 1: GEXR (day)

LOCOMOTIVE (0.00 + 52.79 + 0.00) = 52.79 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-45	0.42	69.75	-8.92	-8.04	0.00	0.00	0.00	52.79

WHEEL (0.00 + 43.48 + 0.00) = 43.48 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-45	0.52	61.54	-9.58	-8.49	0.00	0.00	0.00	43.48

Segment Leq : 53.27 dBA

Results segment # 2: GEXR (day)

LOCOMOTIVE (0.00 + 49.51 + 0.00) = 49.51 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.42	69.75	-8.92	-1.97	0.00	-9.35	0.00	49.51

WHEEL (0.00 + 40.50 + 0.00) = 40.50 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.52	61.54	-9.58	-2.11	0.00	-9.35	0.00	40.50

Segment Leq : 50.02 dBA

Total Leq All Segments: 54.95 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.95
 (NIGHT): 56.12

Filename: loc4f.te Time Period: Day/Night 16/8 hours
 Description: Location 4 - East Facade

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

Train Type	! Trains ! ! (Left)	! Trains ! ! (Right)	! Speed ! ! (km/h)	! # loc ! ! /Train!	! # Cars ! ! /Train!	! Eng ! ! type	! Cont ! ! weld
* 1. Freight	! 1.8/0.0	! 1.8/0.0	! 88.0	! 2.0	! 59.0	! Diesel	! Yes
* 2. Passenger	! 7.4/1.5	! 7.4/1.5	! 113.0	! 1.0	! 5.0	! Diesel	! Yes
* 3. Commuter	! 3.8/1.3	! 3.8/1.3	! 113.0	! 1.0	! 5.0	! Diesel	! Yes

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

Train No	Train Name	! Unadj. Trains ! ! Left ! Right	! Annual % ! ! Increase !	! Years of ! ! Growth !
1.	Freight	! 1.6/0.0	! 1.6/0.0	! 3.24
2.	Passenger	! 6.0/1.2	! 6.0/1.2	! 7.18
3.	Commuter	! 3.5/1.2	! 3.5/1.2	! 2.50

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

Angle1 Angle2 : -90.00 deg -5.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 79.00 / 79.00 m
 Receiver height : 1.50 / 7.50 m
 Topography : 3 (Elevated; no barrier)
 Whistle Angle : 74 deg Track 1
 Elevation : 6.50 m

Results segment # 1: GEXR (day)

LOCOMOTIVE (0.00 + 55.48 + 0.00) = 55.48 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-5	0.39	69.79	-10.03	-4.28	0.00	0.00	0.00	55.48

WHEEL (0.00 + 46.32 + 0.00) = 46.32 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-5	0.50	61.61	-10.79	-4.50	0.00	0.00	0.00	46.32

LEFT WHISTLE (0.00 + 56.72 + 0.00) = 56.72 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-58	-5	0.00	72.44	0.00	-5.68	0.00	0.00	0.00	56.72

Segment Leq : 59.37 dBA

Total Leq All Segments: 59.37 dBA

Results segment # 1: GEXR (night)

LOCOMOTIVE (0.00 + 52.33 + 0.00) = 52.33 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-5	0.21	64.92	-8.73	-3.86	0.00	0.00	0.00	52.33

WHEEL (0.00 + 41.77 + 0.00) = 41.77 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-5	0.31	55.37	-9.49	-4.11	0.00	0.00	0.00	41.77

LEFT WHISTLE (0.00 + 54.35 + 0.00) = 54.35 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-58	-5	0.00	68.61	0.00	-5.53	0.00	0.00	0.00	54.35

Segment Leq : 56.61 dBA

Total Leq All Segments: 56.61 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.37
(NIGHT): 56.61

Filename: loc5f.te Time Period: Day/Night 16/8 hours
 Description: Location 5 - Southeast Facade

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

Train Type	! Trains ! ! (Left)	! Trains ! ! (Right)	! Speed ! !(km/h)	!# loc ! !/Train!	!# Cars! !/Train!	Eng type	!Cont ! !weld
* 1. Freight	! 1.8/0.0	! 1.8/0.0	! 88.0	! 2.0	! 59.0	!Diesel!	! Yes
* 2. Passenger	! 7.4/1.5	! 7.4/1.5	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes
* 3. Commuter	! 3.8/1.3	! 3.8/1.3	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes

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

Train type: No Name	! Unadj. Trains ! ! Left ! Right	! Annual % ! ! Increase !	! Years of ! ! Growth !
1. Freight	! 1.6/0.0	! 1.6/0.0	! 3.24 ! 3.00 !
2. Passenger	! 6.0/1.2	! 6.0/1.2	! 7.18 ! 3.00 !
3. Commuter	! 3.5/1.2	! 3.5/1.2	! 2.50 ! 3.00 !

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

 Angle1 Angle2 : -90.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 125.00 / 125.00 m
 Receiver height : 1.50 / 7.50 m
 Topography : 3 (Elevated; no barrier)
 Whistle Angle : 74 deg Track 1
 Elevation : 6.50 m

Results segment # 1: GEXR (day)

LOCOMOTIVE (0.00 + 53.02 + 0.00) = 53.02 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.39	69.79	-12.80	-3.97	0.00	0.00	0.00	53.02

WHEEL (0.00 + 43.66 + 0.00) = 43.66 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.50	61.61	-13.77	-4.18	0.00	0.00	0.00	43.66

LEFT WHISTLE (0.00 + 54.35 + 0.00) = 0.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
16	0	0.00	72.44	0.00	-5.53	0.00	0.00	0.00	54.35

Segment Leq : 53.50 dBA

Total Leq All Segments: 53.50 dBA

Results segment # 1: GEXR (night)

LOCOMOTIVE (0.00 + 50.20 + 0.00) = 50.20 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.21	64.92	-11.14	-3.57	0.00	0.00	0.00	50.20

WHEEL (0.00 + 39.45 + 0.00) = 39.45 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.31	55.37	-12.11	-3.81	0.00	0.00	0.00	39.45

LEFT WHISTLE (0.00 + 54.35 + 0.00) = 0.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
16	0	0.00	68.61	0.00	-5.53	0.00	0.00	0.00	54.35

Segment Leq : 50.55 dBA

Total Leq All Segments: 50.55 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.50
(NIGHT): 50.55

Filename: loc6f.te Time Period: Day/Night 16/8 hours
 Description: Location 6 - North Façade

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

Train Type	! Trains !	! Speed ! (km/h)	!# loc ! /Train!	!# Cars ! /Train!	! Eng type !	!Cont !weld
* 1. Freight	! 3.5/0.0	! 88.0	! 2.0	! 59.0	!Diesel!	! Yes
* 2. Passenger	! 14.8/3.0	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes
* 3. Commuter	! 7.6/2.6	! 113.0	! 1.0	! 5.0	!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	! 3.2/0.0	! 3.24	! 3.00
2. Passenger	! 12.0/2.4	! 7.18	! 3.00
3. Commuter	! 7.1/2.4	! 2.50	! 3.00

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

Angle1 Angle2 : -21.00 deg 7.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 167.00 / 167.00 m
 Receiver height : 1.50 / 7.50 m
 Topography : 3 (Elevated; no barrier)
 No Whistle
 Elevation : 6.50 m

Results segment # 1: GEXR (day)

LOCOMOTIVE (0.00 + 47.09 + 0.00) = 47.09 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-21	7	0.39	69.75	-14.55	-8.11	0.00	0.00	0.00	47.09

WHEEL (0.00 + 37.78 + 0.00) = 37.78 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-21	7	0.50	61.54	-15.65	-8.12	0.00	0.00	0.00	37.78

Segment Leq : 47.57 dBA

Total Leq All Segments: 47.57 dBA

Results segment # 1: GEXR (night)

LOCOMOTIVE (0.00 + 44.16 + 0.00) = 44.16 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-21	7	0.21	64.92	-12.66	-8.10	0.00	0.00	0.00	44.16

WHEEL (0.00 + 33.50 + 0.00) = 33.50 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-21	7	0.31	55.37	-13.76	-8.11	0.00	0.00	0.00	33.50

Segment Leq : 44.52 dBA

Total Leq All Segments: 44.52 dBA

Road data, segment # 1: Highway 7 (day/night)

Car traffic volume : 13431/2370 veh/TimePeriod *

Medium truck volume : 373/66 veh/TimePeriod *

Heavy truck volume : 560/99 veh/TimePeriod *

Posted speed limit : 80 km/h

Road gradient : 0 %

Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 16900

Percentage of Annual Growth : 0.00

Number of Years of Growth : 10.00

Medium Truck % of Total Volume : 2.60

Heavy Truck % of Total Volume : 3.90

Day (16 hrs) % of Total Volume : 85.00

Data for Segment # 1: Highway 7 (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 : 45.00 / 45.00 m

Receiver height : 1.50 / 7.50 m

Topography : 3 (Elevated; no barrier)

Elevation : 3.00 m

Results segment # 1: Highway 7 (day)

Source height = 1.41 m

ROAD (0.00 + 62.61 + 0.00) = 62.61 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	71.42	0.00	-7.50	-1.31	0.00	0.00	0.00	62.61

Segment Leq : 62.61 dBA

Total Leq All Segments: 62.61 dBA

Results segment # 1: Highway 7 (night)

Source height = 1.41 m

ROAD (0.00 + 59.29 + 0.00) = 59.29 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.39	66.90	0.00	-6.65	-0.97	0.00	0.00	0.00	59.29

Segment Leq : 59.29 dBA

Total Leq All Segments: 59.29 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.74
(NIGHT): 59.43

Filename: loc7f.te Time Period: Day/Night 16/8 hours
 Description: Location 7 - North Facade

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

Train Type	! Trains !	! Speed ! (km/h)	! # loc ! /Train!	! # Cars ! /Train!	! Eng type !	! Cont !weld
* 1. Freight	! 3.5/0.0 !	! 88.0 !	! 2.0 !	! 59.0 !	! Diesel !	! Yes
* 2. Passenger	! 14.8/3.0 !	! 113.0 !	! 1.0 !	! 5.0 !	! Diesel !	! Yes
* 3. Commuter	! 7.6/2.6 !	! 113.0 !	! 1.0 !	! 5.0 !	! Diesel !	! Yes

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

Train No	! Name !	! Unadj. ! Trains	! Annual % ! Increase	! Years of ! Growth
1.	Freight	! 3.2/0.0 !	! 3.24 !	! 3.00 !
2.	Passenger	! 12.0/2.4 !	! 7.18 !	! 3.00 !
3.	Commuter	! 7.1/2.4 !	! 2.50 !	! 3.00 !

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

Angle1 Angle2 : -21.00 deg 7.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 3 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 164.00 / 164.00 m
 Receiver height : 1.50 / 7.50 m
 Topography : 3 (Elevated; no barrier)
 No Whistle
 Elevation : 6.50 m

Results segment # 1: GEXR (day)

LOCOMOTIVE (0.00 + 37.94 + 0.00) = 37.94 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-21	7	0.39	69.75	-14.44	-8.11	0.00	-9.25	0.00	37.94

WHEEL (0.00 + 28.64 + 0.00) = 28.64 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-21	7	0.50	61.54	-15.53	-8.12	0.00	-9.25	0.00	28.64

Segment Leq : 38.42 dBA

Total Leq All Segments: 38.42 dBA

Results segment # 1: GEXR (night)

LOCOMOTIVE (0.00 + 44.25 + 0.00) = 44.25 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-21	7	0.21	64.92	-12.57	-8.10	0.00	0.00	0.00	44.25

WHEEL (0.00 + 33.60 + 0.00) = 33.60 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-21	7	0.31	55.37	-13.66	-8.11	0.00	0.00	0.00	33.60

Segment Leq : 44.61 dBA

Total Leq All Segments: 44.61 dBA

Road data, segment # 1: Highway 7 (day/night)

Car traffic volume : 13431/2370 veh/TimePeriod *

Medium truck volume : 373/66 veh/TimePeriod *

Heavy truck volume : 560/99 veh/TimePeriod *

Posted speed limit : 80 km/h

Road gradient : 0 %

Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 16900

Percentage of Annual Growth : 0.00

Number of Years of Growth : 10.00

Medium Truck % of Total Volume : 2.60

Heavy Truck % of Total Volume : 3.90

Day (16 hrs) % of Total Volume : 85.00

Data for Segment # 1: Highway 7 (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 : 1.50 / 7.50 m

Topography : 3 (Elevated; no barrier)

Elevation : 3.00 m

Results segment # 1: Highway 7 (day)

Source height = 1.41 m

ROAD (0.00 + 62.03 + 0.00) = 62.03 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	71.42	0.00	-8.09	-1.31	0.00	0.00	0.00	62.03

Segment Leq : 62.03 dBA

Total Leq All Segments: 62.03 dBA

Results segment # 1: Highway 7 (night)

Source height = 1.41 m

ROAD (0.00 + 58.78 + 0.00) = 58.78 dBA

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

-90 90 0.39 66.90 0.00 -7.16 -0.97 0.00 0.00 0.00 58.78

Segment Leq : 58.78 dBA

Total Leq All Segments: 58.78 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.05
(NIGHT): 58.94

Filename: loc9.te Time Period: Day/Night 16/8 hours
 Description: Location 9 - Rear yard - With Barrier

Rail data, segment # 1: GEXR (Row E) (day/night)

Train Type	! Trains !	! Speed ! (km/h)	!# loc !/Train!	!# Cars !/Train!	! Eng ! type	!Cont !weld
* 1. Freight	! 3.5/0.0	! 88.0	! 2.0	! 59.0	!Diesel!	! Yes
* 2. Passenger	! 14.8/3.0	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes
* 3. Commuter	! 7.6/2.6	! 113.0	! 1.0	! 5.0	!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	! 3.2/0.0	! 3.24	! 3.00
2. Passenger	! 12.0/2.4	! 7.18	! 3.00
3. Commuter	! 7.1/2.4	! 2.50	! 3.00

Data for Segment # 1: GEXR (Row E) (day/night)

Angle1 Angle2 : -90.00 deg -20.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 1 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 67.00 / 67.00 m
 Receiver height : 1.50 / 4.50 m
 Topography : 3 (Elevated; no barrier)
 No Whistle
 Elevation : 5.65 m

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

Train Type	! Trains !	! Speed ! (km/h)	!# loc !/Train!	!# Cars !/Train!	! Eng ! type	!Cont !weld
* 1. Freight	! 3.5/0.0	! 88.0	! 2.0	! 59.0	!Diesel!	! Yes
* 2. Passenger	! 14.8/3.0	! 113.0	! 1.0	! 5.0	!Diesel!	! Yes
* 3. Commuter	! 7.6/2.6	! 113.0	! 1.0	! 5.0	!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	! 3.2/0.0	! 3.24	! 3.00
2. Passenger	! 12.0/2.4	! 7.18	! 3.00
3. Commuter	! 7.1/2.4	! 2.50	! 3.00

Data for Segment # 2: GEXR (day/night)

```

-----
Angle1  Angle2      : -20.00 deg   46.00 deg
Wood depth      :          0   (No woods.)
No of house rows :          0 / 0
Surface         :          1   (Absorptive ground surface)
Receiver source distance : 67.00 / 67.00 m
Receiver height  :    1.50 / 4.50 m
Topography      :          4   (Elevated; with barrier)
No Whistle
Barrier angle1   : -20.00 deg   Angle2 : 46.00 deg
Barrier height   :    2.60 m
Elevation        :    5.65 m
Barrier receiver distance : 9.00 / 9.00 m
Source elevation :   277.50 m
Receiver elevation :   272.00 m
Barrier elevation :   272.00 m
    
```

Rail data, segment # 3: GEXR (Row W) (day/night)

```

-----
Train          ! Trains      ! Speed !# loc !# Cars! Eng !Cont
Type           !              ! (km/h) !/Train! /Train! type !weld
-----+-----+-----+-----+-----+-----
* 1. Freight   ! 3.5/0.0    ! 88.0 ! 2.0 ! 59.0 !Diesel! Yes
* 2. Passenger ! 14.8/3.0   ! 113.0 ! 1.0 ! 5.0 !Diesel! Yes
* 3. Commuter  ! 7.6/2.6    ! 113.0 ! 1.0 ! 5.0 !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      ! 3.2/0.0 ! 3.24 ! 3.00 !
2. Passenger    ! 12.0/2.4 ! 7.18 ! 3.00 !
3. Commuter     ! 7.1/2.4 ! 2.50 ! 3.00 !
    
```

Data for Segment # 3: GEXR (Row W) (day/night)

```

-----
Angle1  Angle2      : 46.00 deg   90.00 deg
Wood depth      :          0   (No woods.)
No of house rows :          1 / 0
Surface         :          1   (Absorptive ground surface)
Receiver source distance : 67.00 / 67.00 m
Receiver height  :    1.50 / 4.50 m
Topography      :          3   (Elevated; no barrier)
No Whistle
Elevation        :    5.65 m
    
```

Results segment # 1: GEXR (Row E) (day)

```

-----
LOCOMOTIVE (0.00 + 45.80 + 0.00) = 45.80 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----
-90    -20    0.42  69.75  -9.20  -5.44   0.00  -9.31   0.00  45.80
-----
    
```

```

-----
WHEEL (0.00 + 36.64 + 0.00) = 36.64 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----
-90    -20    0.52  61.54  -9.88  -5.72   0.00  -9.31   0.00  36.64
-----
    
```

Segment Leq : 46.30 dBA

Results segment # 2: GEXR (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	2.57	274.57
0.50	1.50	2.10	274.10

LOCOMOTIVE (0.00 + 52.11 + 0.00) = 52.11 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-20	46	0.26	69.75	-8.19	-4.45	0.00	0.00	-5.00	52.11

WHEEL (0.00 + 42.47 + 0.00) = 42.47 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-20	46	0.36	61.54	-8.87	-4.49	0.00	0.00	-5.72	42.47

Segment Leq : 52.56 dBA

Results segment # 3: GEXR (Row W) (day)

LOCOMOTIVE (0.00 + 43.06 + 0.00) = 43.06 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
46	90	0.42	69.75	-9.20	-8.18	0.00	-9.31	0.00	43.06

WHEEL (0.00 + 33.72 + 0.00) = 33.72 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
46	90	0.52	61.54	-9.88	-8.63	0.00	-9.31	0.00	33.72

Segment Leq : 43.54 dBA

Total Leq All Segments: 53.90 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.90

APPENDIX C: WARNING CLAUSES

WARNING CLAUSE "A"

"Purchasers are advised that despite the inclusion of noise control features in this development area and within the building units, sound levels from increasing road and/or rail traffic will continue to be of concern, occasionally interfering with some activities of the dwelling occupants as the sound level exceeds the municipality's and the Ministry of the Environment's noise criteria. Air-conditioning has been installed to achieve adequate interior sound levels."

"This dwelling unit was fitted with a central air-conditioning unit. (Note: locate air-cooled condenser unit in a noise-insensitive area.)"

Note: The Ministry of the Environment requires that the central air-conditioning devices must have a sound rating not exceeding 7.6 bels for those manufactured after January 1, 1992.

WARNING CLAUSE "B"

"Purchasers are advised that despite the inclusion of noise control features in this development area and within the building units, sound levels from increasing road and/or rail traffic may continue to be of concern, occasionally interfering with some activities of the dwelling occupants as the sound level exceeds the municipality's and the Ministry of the Environment's noise criteria."

"This dwelling unit was fitted with a forced air heating system with provision for future air-conditioning (Note: locate air-cooled condenser unit in a noise-insensitive area.)"

Note: The Ministry of the Environment requires that the central air-conditioning devices must have a sound rating not exceeding 7.6 bels for those manufactured after January 1, 1992.

WARNING CLAUSE "C"

This is applicable to all units and should be inserted in all development agreements, offers to purchase, and *Agreements of Purchase and Sale* of each dwelling unit within 300 m of the railway right-of-way:

"Warning: GEXR or its assigns or successors in interest has or have a right-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the railway facilities of such right-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). GEXR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way."

APPENDIX D: NOISE CRITERIA

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

Ministry of the Environment Noise Criteria (*NPC-300*)

Bedroom areas (2300 - 0700 hours) = 40 dB L_{eq}
Roadway noise only

Bedroom areas (2300 - 0700 hours) = 35 dB L_{eq}
(including 5 dB adjustment for railway noise only)

Living/dining room areas (0700 - 2300 hours) = 45 dB L_{eq}
Roadway noise only

Living/dining room areas (0700 - 2300 hours) = 40 dB L_{eq}
(including 5 dB adjustment for railway noise only)

Outdoor areas (0700 - 2300 hours) = 55 dB L_{eq}

Railways Noise Criteria (Reference 3)

Bedroom areas (2300 - 0700 hours) = 35 dB L_{eq}

Bedroom areas (0700 - 2300 hours) = 35 dB L_{eq}

Living/dining room areas (0700 - 2300 hours) = 40 dB L_{eq}

Living/dining room areas (2300 - 0700 hours) = 40 dB L_{eq}

Outdoor areas (0700 - 2300 hours) = 55 dB L_{eq}

All road and railway traffic sound level calculations were based on the Site Plan by Glenn Schnarr & Associates, dated May 26, 2015.

L_{eq} (Definition)

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

APPENDIX E: REFERENCES AND CORRESPONDENCE

1. "Policy On The Environmental Protection of New Residential Development Adjacent to Railways: Recommended by CN and CP Rail," May 1983.
2. Ministry of the Environment's *STAMSON* Computer Programme (*Version 5.03*) for the IBM PC.
3. Ministry of the Environment, *ORNAMENT*, "Ontario Road Noise Analysis Method for Environment and Transportation," November 1988.
4. Ministry of the Environment, "Publication NPC-300, Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning", August 2013.
5. Qirt, D.J., "Controlling Sound Transmission into Buildings," National Research Council, *Building Practice Note 56*.