



**Transportation Noise  
Assessment**

**989 Somerset Street West**

**Ottawa, Ontario**

REPORT: GME 13-116 - Traffic Noise

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February 4, 2014

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## EXECUTIVE SUMMARY

This document describes a traffic noise assessment performed for a proposed condominium building located in Ottawa, Ontario. The development will rise 43 meters above local grade. Figure 1 illustrates a site plan with surrounding context. The major source of roadway noise affecting the development is traffic along Somerset Street West. Noise impacts from the O-Train have been analysed and considered to be insignificant.

The assessment is based on: (i) theoretical noise prediction methods that conform to the Ministry of the Environment (MOE) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG) and Ministry of the Environment's NPC-300; (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan right of way allowances; and (iv) architectural drawings received from Alcaide Webster Architects Inc.

The results of the current study indicate that noise levels due to roadway traffic over the site will range between 45 and 73 dBA during the daytime period (07:00-23:00) and between 38 and 66 dBA during the nighttime period (23:00-07:00). The highest traffic noise levels will occur along the south side of the development, nearest to Somerset Street West. Minimum building construction in all areas is required to satisfy the Ontario Building Code (2012). In addition, the following Sound Transmission Class (STC) ratings are required for building components where daytime noise levels exceed 65 dBA and nighttime noise levels exceed 60 dBA (see Figures 3 and 4).

- **Bedroom Windows**

- (i) Bedroom windows facing south will require a minimum STC of 36
- (ii) Bedroom windows facing east and west will require a minimum STC of 33
- (iii) All other bedroom windows are to satisfy Ontario Building Code (OBC 2012) requirements

- **Living Room Windows**

- (i) Living room windows facing south will require a minimum STC of 31
- (ii) Living room windows facing east and west will require a minimum STC of 28
- (iii) All other living room windows are to satisfy Ontario Building Code (OBC 2012) requirements

- **Exterior Walls**

- (i) Exterior wall components on the east, south and west façades require a minimum STC of 45 which will be achieved with brick cladding or an acoustical equivalent according to NRC test data<sup>1</sup>

A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing. We have not specified any particular window configurations, as there are several manufacturers and various combinations of window components that will offer the necessary sound attenuation rating. However, it is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors. All specified building components will require review by a qualified acoustical engineer for conformance to the recommendations of this report prior to building permit application.

In addition to upgraded windows, the installation of individual air conditioning units (or similar mechanical system) will be required for all units. The following Warning Clause (Type D<sup>2</sup>) will be required in all Agreements of Lease, Purchase and Sale for all units:

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<sup>1</sup> J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.

<sup>2</sup> City of Ottawa ENCG, Table 1.10

*“Dwelling units in this building have been supplied with central air conditioning which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City of Ottawa’s and the Ministry of the Environment’s noise criteria.”*

Noise levels at the podium terrace are expected to approach 61 dBA during the daytime period. According to ENCG, if this area is to be used as an outdoor living space, noise control measures are required. Investigation into the application of a 1.1 meter noise mitigating guard rail on the southeast side of the terrace proved that noise levels can be reduced to 58 dBA, as illustrated in Figure 5. Although noise levels at the terrace remain elevated, it is not economically feasible to reduce the noise levels to below 55 dBA. In addition, any inclusion of a noise barrier with a height greater than 1.1 meters would negatively impact the aesthetic nature of the space. As mitigated noise levels are above 55 dBA, a Warning Clause (Type B<sup>3</sup>) is required for all units:

*“Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing (road) (Transitway) (rail) (air) traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the City’s and the Ministry of the Environment’s noise criteria.”*

Additionally, the following restrictive covenant shall also be included in all Agreements of Lease, Purchase and Sale:

*“The Transferee covenants with the Transferor that the above clause, verbatim, shall be included in all subsequent Agreements of Purchase and Sale and deeds conveying the lands described herein, which shall run with the said lands and is for the benefit of the subsequent owners of the said lands and the owner of the adjacent road.”*

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<sup>3</sup> City of Ottawa ENCG, Table 1.10  
domicile

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## **1. INTRODUCTION**

Gradient Microclimate Engineering Inc. (GME) was retained by domicile to undertake a transportation noise study of the proposed residential and commercial development at 989 Somerset Street West in Ottawa, Ontario. This report summarizes the methodology, results and recommendations related to a roadway traffic noise assessment. GME's scope of work involved assessing exterior and interior noise levels generated by local roadway and railway traffic. The assessment was performed on the basis of theoretical noise calculation methods conforming to the City of Ottawa's<sup>4</sup> and Ministry of the Environment's<sup>5</sup> guidelines. Calculations were based on architectural drawings received from Alcaide Webster Architects Inc. with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP).

## **2. TERMS OF REFERENCE**

The focus of this environmental assessment is a proposed 13-storey condominium development. The development is located on the southeast corner at the intersection of Spruce Street and City Centre Avenue. The major source of roadway noise is Somerset Street West. The site is surrounded on all sides with mixed-use land, specifically commercial and residential. Figure 1 illustrates a complete site plan with surrounding context.

Upon completion, the development will consist of a 4 storey podium supporting a 9 storey tower. The first and second floors will house commercial space, while the remaining floors occupy residential space only. One outdoor living area (OLA) is located on site, specifically a podium level terrace on the second floor.

## **3. OBJECTIVES**

The main goals of this work are to: (i) calculate the future noise levels on the study building produced by local roadway and LRT traffic, (ii) predict vibration levels on the study building produced by the LRT, and (iii) ensure that interior noise and vibration levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Sections 4.2 and 4.3 of this report.

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<sup>4</sup> City of Ottawa Environmental Noise Control Guidelines, SS Wilson Associates, May 10, 2006

<sup>5</sup> MOE, NPC-300

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## 4. METHODOLOGY

### 4.1 Background

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

### 4.2 Roadway Traffic Noise

#### 4.2.1 Criteria for Roadway Traffic Noise

For vehicle traffic, the equivalent sound energy level,  $L_{EQ}$ , provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the  $L_{EQ}$  is commonly calculated on the basis of a 16-hour ( $L_{EQ16}$ ) daytime (07:00-23:00) / 8-hour ( $L_{EQ8}$ ) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specifies that the recommended indoor noise limit ranges (that are relevant to this study) are 45 dBA for living and dining areas and 40 dBA for sleeping quarters of residences. Based on GME's experience, more comfortable indoor noise levels should be targeted toward 42 dBA and 37 dBA (for living rooms and bedrooms, respectively) to control peak noise and deficiencies in building envelope construction.

Noise levels predicted at the plane of the window (POW) dictate the action required to achieve the recommended sound levels. Different mitigation measures are required when: (i) POW noise levels exceed 65 dBA daytime or 60 dBA nighttime; or (ii) when POW noise levels range between 55 and 65 dBA daytime; or between 50 and 60 dBA nighttime. In the first case (i), a full

building component review is required. As windows are most often the weakest point in sound transmission through a façade, when the values are close to meeting the criteria, windows with adequate Sound Transmission Class (STC) ratings must be selected to provide the required noise attenuation. Additionally in this case, units must be fitted with forced air heating and central air conditioning. For case (ii), units must be fitted with forced air ventilation systems with provisions for the future installation of air conditioning systems. Where a criterion is not met, an associated Warning Clause is required to be registered on title, as indicated in Table 1.10 of the ENCG.

For outdoor living areas (OLA), the predicted exterior noise levels determine the level of mitigation required. Table 1 summarizes the noise control measures and requirements for OLA's.

**TABLE 1: OUTDOOR LIVING AREA NOISE CONTROL REQUIREMENTS<sup>6</sup>**

<b>L<sub>EQ</sub> SOUND LEVEL</b>	<b>OUTDOOR CONTROL MEASURES</b>
L <sub>EQ(16Hr)</sub> ≤ 55 dBA	None required
55 dBA < L <sub>EQ(16Hr)</sub> ≤ 60 dBA	Control measures (barriers) may not be required but should be considered
L <sub>EQ(16Hr)</sub> > 60 dBA	Control measures (barriers) required to reduce the L <sub>EQ</sub> to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible

## 4.2.2 Roadway Traffic Volumes

For future traffic noise predictions, the MOE document NPC-300 requires the use of the Annual Average Daily Traffic (AADT) volumes, projected to exist ten years into the future, with an average annual growth rate of 2% per year. In contrast, the City of Ottawa's Official Plan (OP) requires that the AADT volumes should be based on roadway allowances, which are defined by the Right of Way (ROW) protection values identified in the OP for specific roadways.

To ensure compliance with the reasonable worst case situation, the following steps were taken:

<sup>6</sup> Adopted from Table 1.10 of the ENCG

- Recent counted traffic data were acquired from the City of Ottawa and the Ministry of Transportation, upon which a growth rate of 2% per year was applied and extrapolated to the City’s OP horizon year of 2024
- Traffic volumes based on roadway ROW values were obtained from the City of Ottawa Official Plan<sup>7</sup> (Annex 1 – Road Classification and Rights of Way). For roadways where the ROW information was unavailable, the designation was assumed based on the size of the existing road and available traffic information.

In all cases, the higher of the OP versus projected values were used to calculate future noise levels. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

**TABLE 2: ROADWAY TRAFFIC DATA**

Roadway	Roadway Class	Speed Limit (km/h)	Official Plan AADT	Available Traffic AADT From Count	Year of Traffic AADT	Projected 2023 AADT
Somerset Street West	4-UAU	60 <sup>†</sup>	30,000	N/A	N/A	N/A

† - Assumed speed limit

### 4.2.3 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the Ministry of the Environment (MOE) computerized noise assessment program, STAMSON 5.04, for road and rail analysis. Appendix A includes the STAMSON 5.04 input and output data.

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

- Truck traffic on Somerset Street West was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions
- The day/night split was taken to be 92% / 8% respectively for all streets

<sup>7</sup> [www.ottawa.ca/city\\_hall/ottawa2020/official\\_plan/vol\\_1/07\\_annexes/annex\\_01/index\\_en.html](http://www.ottawa.ca/city_hall/ottawa2020/official_plan/vol_1/07_annexes/annex_01/index_en.html)

- Absorptive and reflective intermediate ground surfaces based on specific source-receiver path ground characteristics
- Topographic features of the site were included in the analysis
- Somerset Street West road gradient was taken as 2.5%

Noise receptors were strategically placed at nine locations around the study area (see Figure 2). The initial calculations revealed that outdoor noise levels would be sufficiently high as to require investigation of indoor noise levels. As such, calculations were performed to verify the STC requirements.

### **4.3 Insignificant Sources**

Test calculations were done to assess the noise levels from the O-Train on the most exposed receptor, POR 9. Future train schedules were obtained from the City of Ottawa, one train arriving at Bayview station every 8 minutes. The O-Train was modelled in Stamson as a 4-car SRT (Scarborough Rapid Transit) vehicle; operating at an assumed speed of 60 km/h. Results showed that the daytime noise impacts from the O-Train were 45 dBA, over 10 dB less than the noise impacts from Somerset Street West. As such, the O-Train has not been included in the noise calculations for the remaining receptors.

### **4.4 Indoor Noise Calculations**

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2006) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneered walls can achieve STC 55. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40 depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

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According to the ENCG, when daytime noise levels at the plane of the living room window exceed 65 dBA or nighttime noise levels at the plane of bedroom window exceed 60 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure<sup>8</sup> considers: (i) window type and total area as a percentage of total room floor area; (ii) exterior wall type and total area as a percentage of the total room floor area; (iii) the acoustic absorption characteristics of the room; (iv) outdoor noise source type and approach geometry; and (v) the indoor sound level criteria, which varies according to the intended use of a space. Based on published research<sup>9</sup>, exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, which was prepared for site plan approval, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels).

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<sup>8</sup> Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

<sup>9</sup> CMHC, Road & Rail Noise: Effects on Housing

## 5. RESULTS AND DISCUSSION

### 5.1 Roadway Noise Levels

Appendix A contains the complete set of input and output data from all STAMSON 5.04 calculations. The results of the roadway noise calculations are summarized in Table 3 below.

**TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC**

RECEPTOR NUMBER	PLANE OF WINDOW RECEPTOR LOCATION	NOISE LEVEL (dBA)	
		DAY	NIGHT
1	POW – 4 <sup>th</sup> Floor – East Side	70	63
2	POW – 4 <sup>th</sup> Floor – South Side	73	66
3	POW – 4 <sup>th</sup> Floor – West Side	70	63
4	POW – 10 <sup>th</sup> Floor – North Side	45	38
5	POW – 10 <sup>th</sup> Floor – East Side	67	60
6	POW – 10 <sup>th</sup> Floor – South Side	71	64
7	POW – 10 <sup>th</sup> Floor – West Side	67	60
8	OLA – Podium Terrace – East Side	56	48
9	OLA – Podium Terrace – West Side	61	54

The results of the current analysis indicate that noise levels will range between 45 and 73 dBA during the daytime period (07:00-23:00) and between 38 and 66 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 73 dBA) occurs on the south side (POR 2), which is closest to Somerset Street West.

### 5.2 STC Requirements

The noise levels predicted due to road traffic exceed the criteria listed in NPC-300 for building components. As discussed in Section 4.4 the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). As per city of Ottawa requirements, detailed STC calculations will be required to be completed prior to building permit application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figures 3 and 4):

- **Bedroom Windows**
  - (i) Bedroom windows facing south will require a minimum STC of 36
  - (ii) Bedroom windows facing east and west will require a minimum STC of 33
  - (iii) All other bedroom windows are to satisfy Ontario Building Code (OBC 2012) requirements
  
- **Living Room Windows**
  - (i) Living room windows facing south will require a minimum STC of 31
  - (ii) Living room windows facing east and west will require a minimum STC of 28
  - (iii) All other living room windows are to satisfy Ontario Building Code (OBC 2012) requirements
  
- **Exterior Walls**
  - (i) Exterior wall components on the east, south and west façades require a minimum STC of 45 which will be achieved with brick cladding or an acoustical equivalent according to NRC test data<sup>10</sup>

Results of the calculations also indicate that all units will require individual air conditioning units, or similar mechanical ventilation, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized in Table 4 below.

**TABLE 4: SITE VENTILATION AND WARNING CLAUSE REQUIREMENTS**

LOCATION	VENTILATION REQUIREMENTS	WARNING CLAUSE
All Units	Central Air Conditioning	Type D

<sup>10</sup> J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.

### 5.3 Noise Barrier Calculation

Noise levels at the podium terrace are expected to approach 61 dBA during the daytime period. According to the ENCG, if this area is to be used as an outdoor living space, noise control measures are required. Investigation into the application of a 1.1 meter noise mitigating guard rail on the east, south and west sides of the terrace proved that noise levels can be reduced to 58 dBA, as illustrated in Figure 5. Although noise levels at the terrace remain elevated, it is not economically feasible to reduce the noise levels to below 55 dBA. In addition, any inclusion of a noise barrier with a height greater than 1.1 meters would negatively impact the space architecturally. As mitigated noise levels are above 55 dBA, a Warning Clauses (Type B<sup>11</sup>) is required. Table 5 summarizes the results of the barrier investigations at the podium terrace.

**TABLE 5: RESULTS OF BARRIER INVESTIGATION**

LOCATION	REFERENCE RECEPTORS	BARRIER HEIGHT (m)	DAYTIME L <sub>EQ</sub> NOISE LEVELS (dBA)	
			WITHOUT BARRIER	WITH BARRIER
2 <sup>nd</sup> Floor Podium Terrace	9	1.1	61	58
		2.3		55

<sup>11</sup> City of Ottawa ENCG, Table 1.10

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## 6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current study indicate that noise levels due to roadway traffic over the site will range between 45 and 73 dBA during the daytime period (07:00-23:00) and between 38 and 66 dBA during the nighttime period (23:00-07:00). The highest traffic noise levels will occur along the south side of the development, nearest to Somerset Street West. Minimum building construction in all areas is required to satisfy the Ontario Building Code (2012). In addition, the following Sound Transmission Class (STC) ratings are required for building components where daytime noise levels exceed 65 dBA and nighttime noise levels exceed 60 dBA (see Figures 3 and 4).

- **Bedroom Windows**

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- (i) Living room windows facing south will require a minimum STC of 31
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- (iii) All other living room windows are to satisfy Ontario Building Code (OBC 2012) requirements

- **Exterior Walls**

- (i) Exterior wall components on the east, south and west façades require a minimum STC of 45 which will be achieved with brick cladding or an acoustical equivalent according to NRC test data<sup>12</sup>

A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing. We have not specified any particular window configurations, as there are several manufacturers

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<sup>12</sup> J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.

and various combinations of window components that will offer the necessary sound attenuation rating. However, it is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors. All specified building components will require review by a qualified acoustical engineer for conformance to the recommendations of this report prior to building permit application.

In addition to upgraded windows, the installation of individual air conditioning units (or similar mechanical system) will be required for all units. The following Warning Clause (Type D<sup>13</sup>) will be required in all Agreements of Lease, Purchase and Sale for all units:

*“Dwelling units in this building have been supplied with central air conditioning which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City of Ottawa’s and the Ministry of the Environment’s noise criteria.”*

Noise levels at the podium terrace are expected to approach 61 dBA during the daytime period. According to the ENCG, if this area is to be used as an outdoor living space, noise control measures are required. Investigation into the application of a 1.1 meter noise mitigating guard rail on the southeast side of the terrace proved that noise levels can be reduced to 58 dBA, as illustrated in Figure 5. Although noise levels at the terrace remain elevated, it is not economically feasible to reduce the noise levels to below 55 dBA. In addition, any inclusion of a noise barrier with a height greater than 1.1 meters would negatively impact the space architecturally. As mitigated noise levels are above 55 dBA, a Warning Clause (Type B<sup>14</sup>) is required for all units:

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<sup>13</sup> City of Ottawa ENCG, Table 1.10

<sup>14</sup> City of Ottawa ENCG, Table 1.10

*“Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing (road) (Transitway) (rail) (air) traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the City’s and the Ministry of the Environment’s noise criteria.”*

Additionally, the following restrictive covenant shall also be included in all Agreements of Lease, Purchase and Sale:

*“The Transferee covenants with the Transferor that the above clause, verbatim, shall be included in all subsequent Agreements of Purchase and Sale and deeds conveying the lands described herein, which shall run with the said lands and is for the benefit of the subsequent owners of the said lands and the owner of the adjacent road.”*

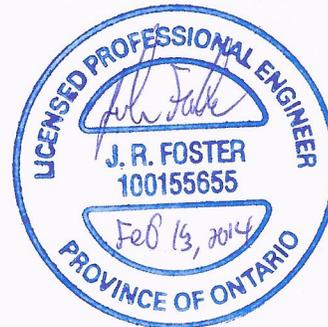
This concludes our assessment and report. If you have any questions or wish to discuss our findings please advise us. In the interim, we thank you for the opportunity to be of service.

Yours truly,

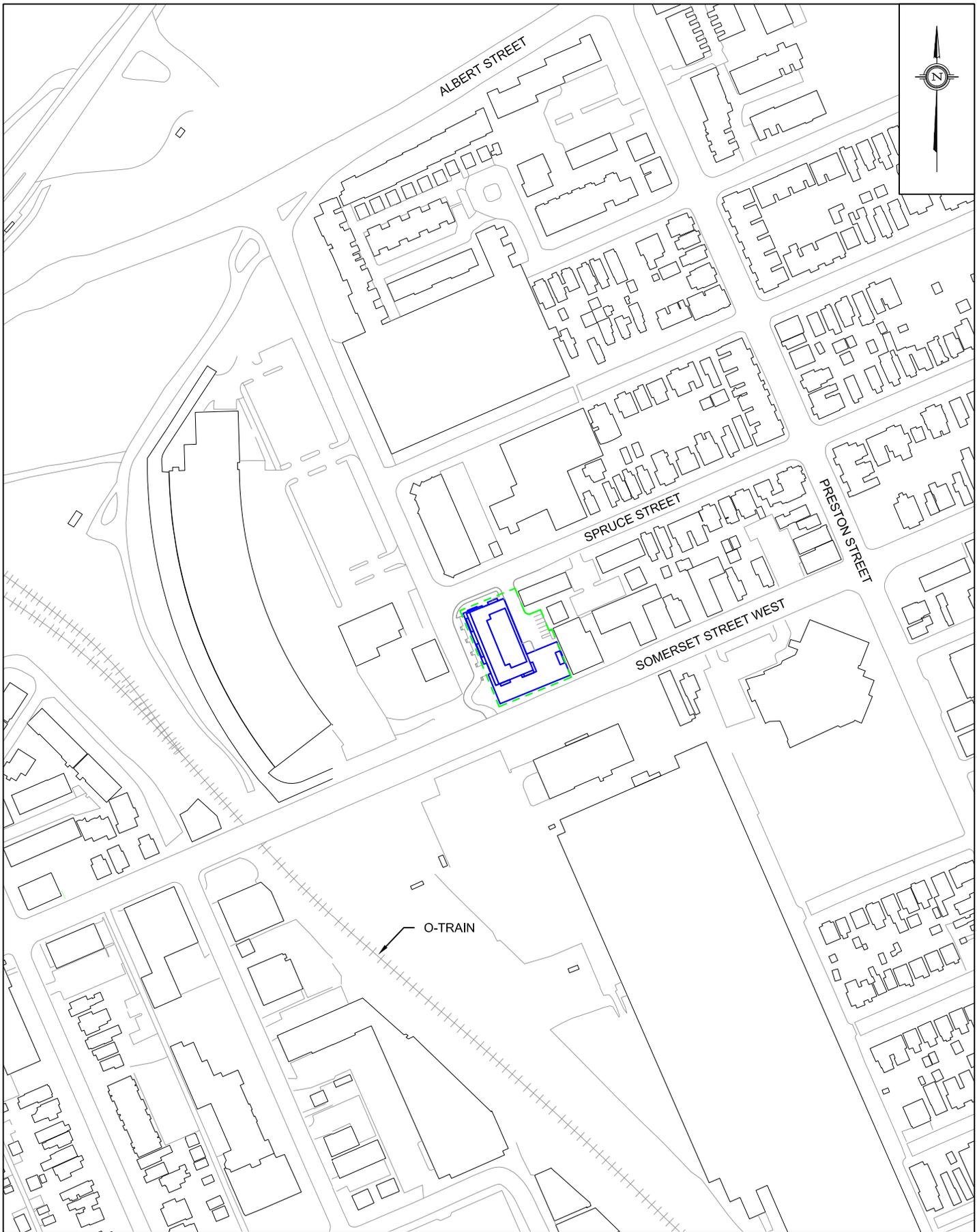
**Gradient Microclimate Engineering Inc.**



Thomas Couper, B.A.Sc  
Project Manager  
GME 13-116-Traffic Noise



Joshua Foster., P.Eng.  
Associate



PROJECT		989 SOMERSET STREET WEST - TRAFFIC NOISE STUDY	
SCALE	1:3000 (APPROX.)	DRAWING NO.	GME13-116-1
DATE	JANUARY 22, 2014	DRAWN BY	T.C

DESCRIPTION	FIGURE 1: SITE PLAN & SURROUNDING CONTEXT
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SPRUCE STREET



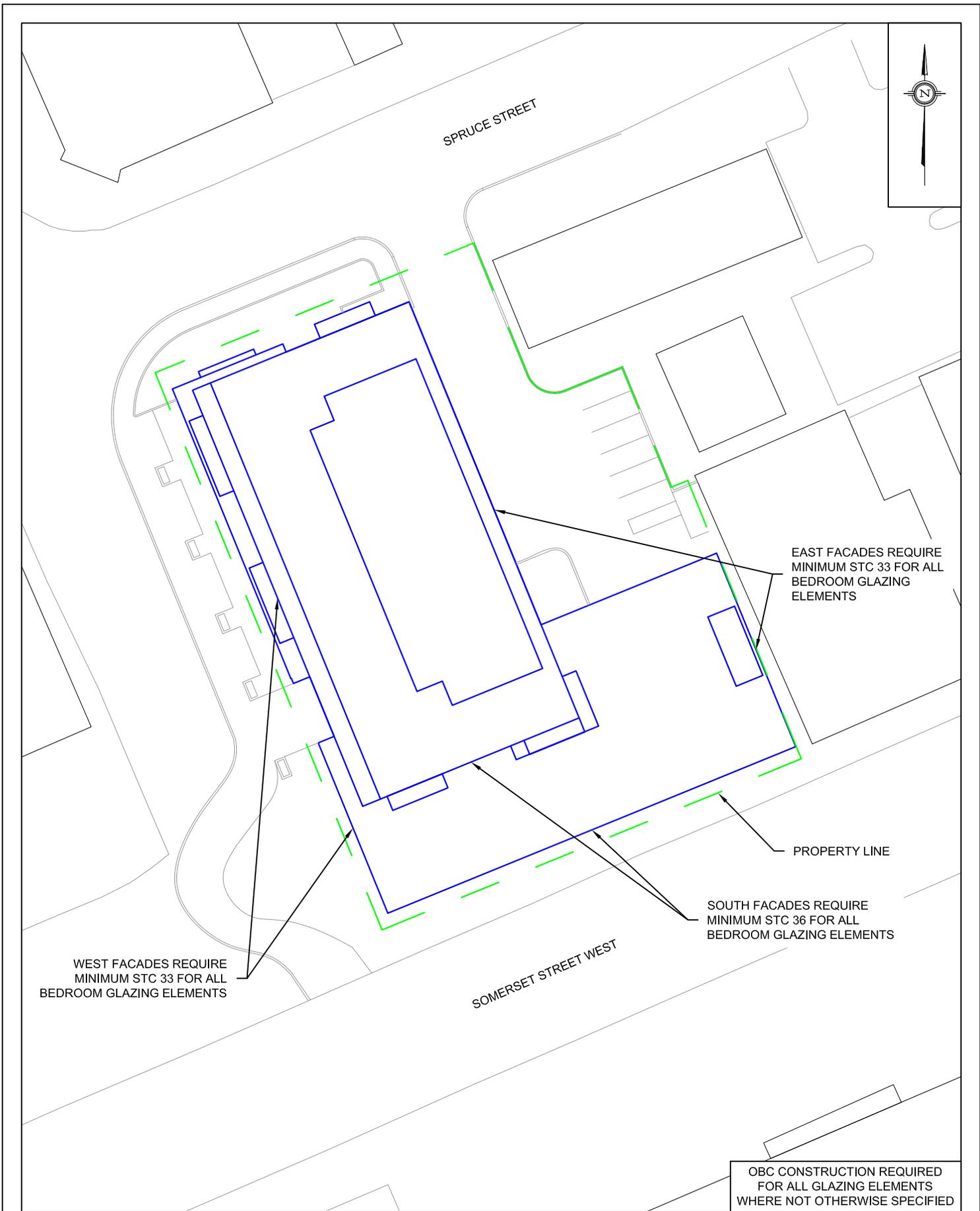
PROPERTY LINE

SOMERSET STREET WEST

- 1 10TH FLOOR RECEPTOR
- 1 4TH FLOOR RECEPTOR
- 1 OLA RECEPTOR

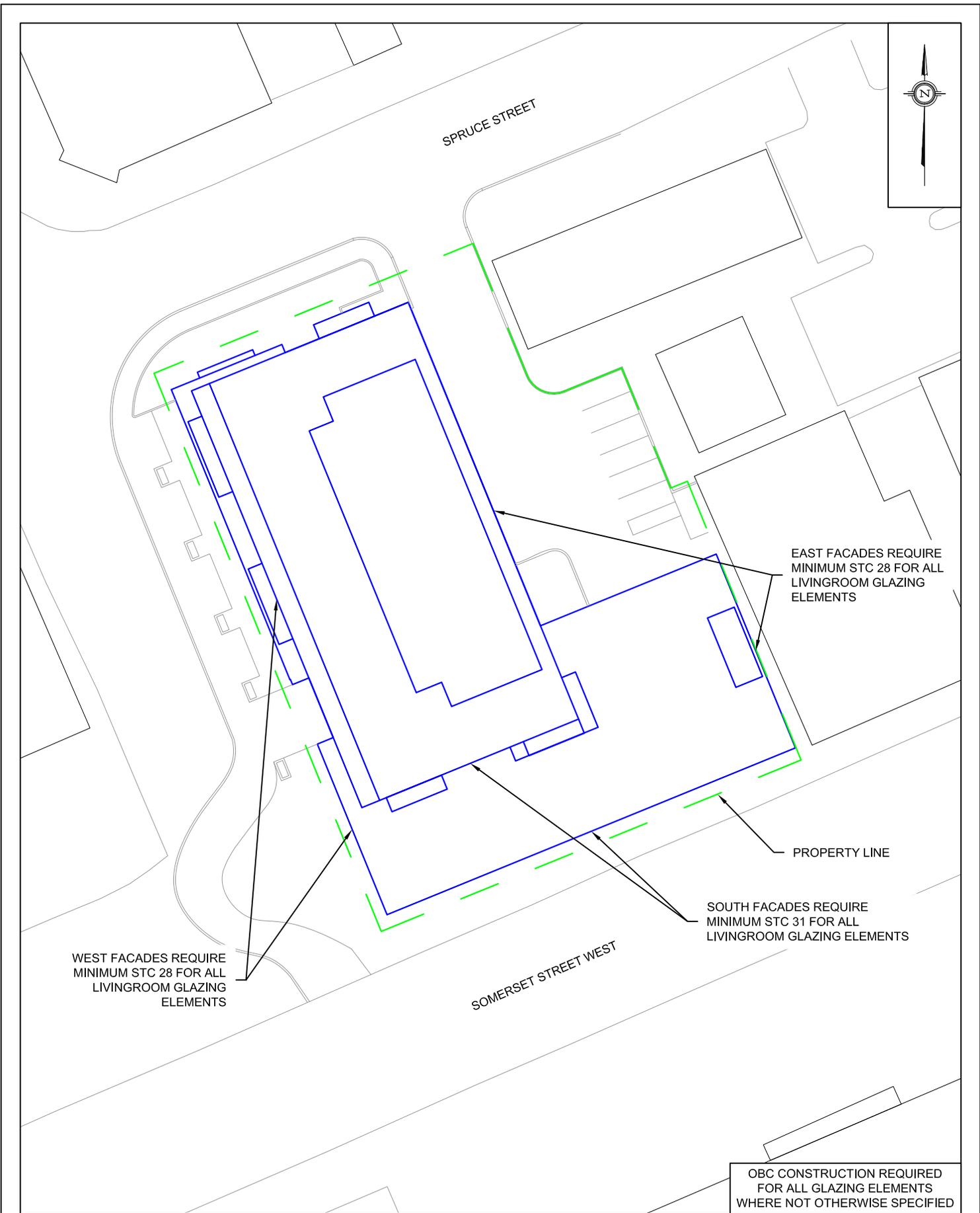
PROJECT	989 SOMERSET STREET WEST - TRAFFIC NOISE STUDY	
SCALE	1:500 (APPROX.)	DRAWING NO. GME13-116-2
DATE	JANUARY 22, 2014	DRAWN BY T.C

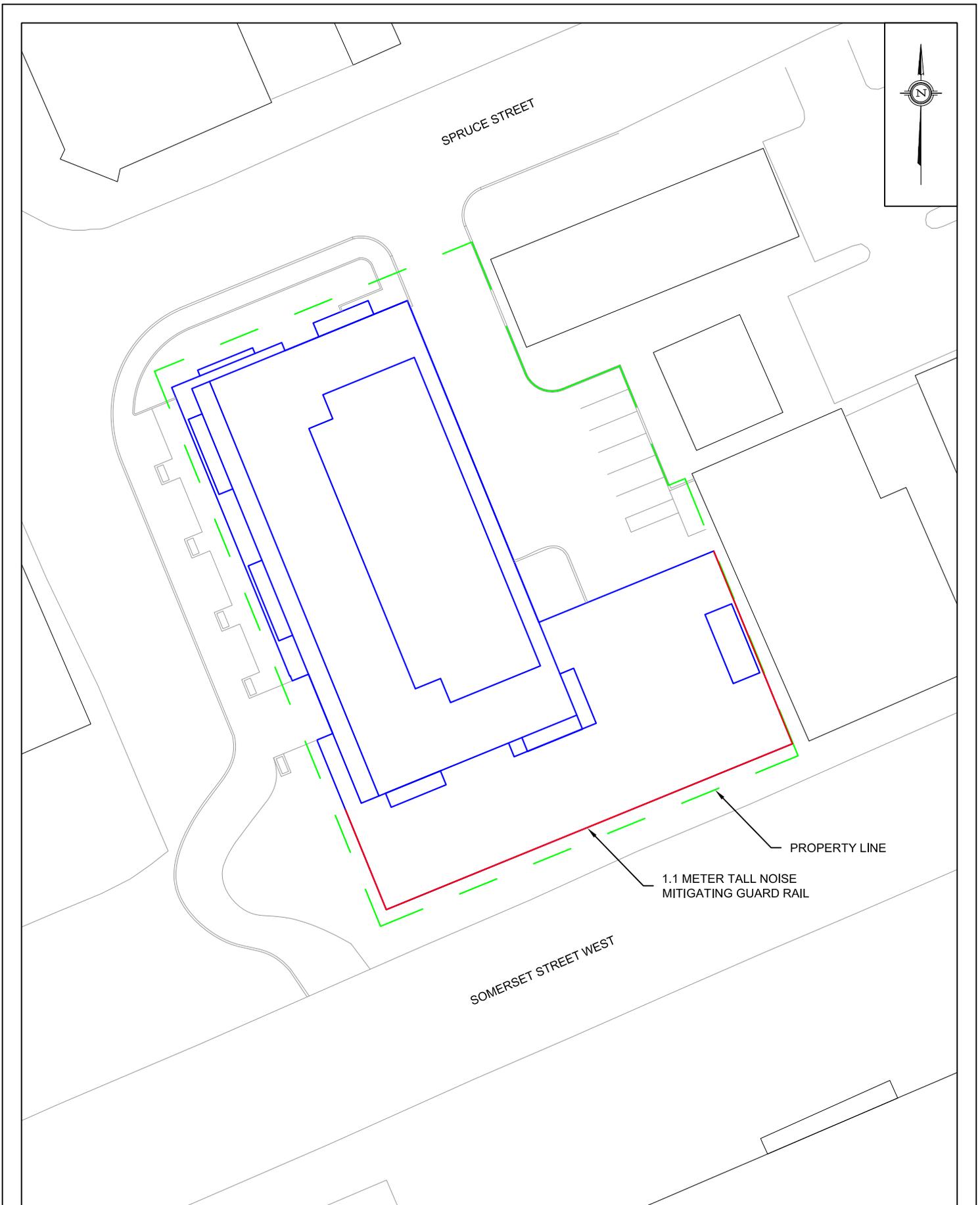
DESCRIPTION
FIGURE 2: RECEPTOR LOCATIONS



OBC CONSTRUCTION REQUIRED FOR ALL GLAZING ELEMENTS WHERE NOT OTHERWISE SPECIFIED

 <p>127 Walgreen Road Ottawa, Ontario K0A 1L0 (613) 836-0934</p>	<b>PROJECT</b> 989 SOMERSET STREET WEST - TRAFFIC NOISE STUDY		<b>DESCRIPTION</b> FIGURE 3: BEDROOM WINDOW STC REQUIREMENTS
	<b>SCALE</b> 1:500 (APPROX.)	<b>DRAWING NO.</b> GME13-116-3	
	<b>DATE</b> JANUARY 22, 2014	<b>DRAWN BY</b> T.C	





**APPENDIX A**

**STAMSON 5.04**

**INPUT AND OUTPUT DATA**



STAMSON 5.0                      NORMAL REPORT                      Date: 22-01-2014 12:56:16  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR1.te                      Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Car traffic volume : 24288/2112 veh/TimePeriod \*  
Medium truck volume : 1932/168 veh/TimePeriod \*  
Heavy truck volume : 1380/120 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): 30000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

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

-----  
Angle1    Angle2                      : -82.00 deg    0.00 deg  
Wood depth                            : 0              (No woods.)  
No of house rows                      : 0 / 0  
Surface                                : 2              (Reflective ground surface)  
Receiver source distance              : 15.00 / 15.00 m  
Receiver height                        : 9.90 / 9.90 m  
Topography                             : 2              (Flat/gentle slope; with barrier)  
Barrier angle1                         : -82.00 deg    Angle2 : 0.00 deg  
Barrier height                         : 4.00 m  
Barrier receiver distance              : 3.70 / 3.70 m  
Source elevation                        : 0.00 m  
Receiver elevation                      : 0.00 m  
Barrier elevation                        : 0.00 m  
Reference angle                        : 0.00



Results segment # 1: Somerset (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	9.90	7.83	7.83

ROAD (0.00 + 70.17 + 0.00) = 70.17 dBA

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

-82	0	0.00	73.59	0.00	0.00	-3.41	0.00	0.00	0.00
70.17*									
-82	0	0.00	73.59	0.00	0.00	-3.41	0.00	0.00	0.00
70.17									

\* Bright Zone !

Segment Leq : 70.17 dBA

Total Leq All Segments: 70.17 dBA



Results segment # 1: Somerset (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	9.90	7.83	7.83

ROAD (0.00 + 62.58 + 0.00) = 62.58 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-82	0	0.00	65.99	0.00	0.00	-3.41	0.00	0.00	0.00

SubLeq
62.58*
62.58

\* Bright Zone !

Segment Leq : 62.58 dBA

Total Leq All Segments: 62.58 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 70.17  
 (NIGHT): 62.58



STAMSON 5.0                      NORMAL REPORT                      Date: 22-01-2014 12:56:26  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR2.te                      Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Car traffic volume : 24288/2112 veh/TimePeriod \*  
Medium truck volume : 1932/168 veh/TimePeriod \*  
Heavy truck volume : 1380/120 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): 30000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

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

-----  
Angle1 Angle2 : -85.00 deg 85.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 15.00 / 15.00 m  
Receiver height : 9.90 / 9.90 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00



Results segment # 1: Somerset (day)

Source height = 1.50 m

ROAD (0.00 + 73.34 + 0.00) = 73.34 dBA

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

SubLeq

-85	85	0.00	73.59	0.00	0.00	-0.25	0.00	0.00	0.00
-----	----	------	-------	------	------	-------	------	------	------

73.34

Segment Leq : 73.34 dBA

Total Leq All Segments: 73.34 dBA

Results segment # 1: Somerset (night)

Source height = 1.50 m

ROAD (0.00 + 65.74 + 0.00) = 65.74 dBA

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

SubLeq

-85	85	0.00	65.99	0.00	0.00	-0.25	0.00	0.00	0.00
-----	----	------	-------	------	------	-------	------	------	------

65.74

Segment Leq : 65.74 dBA

Total Leq All Segments: 65.74 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 73.34  
(NIGHT): 65.74



STAMSON 5.0                      NORMAL REPORT                      Date: 22-01-2014 12:56:39  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR3.te                      Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Car traffic volume : 24288/2112 veh/TimePeriod \*  
Medium truck volume : 1932/168 veh/TimePeriod \*  
Heavy truck volume : 1380/120 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): 30000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

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

-----  
Angle1 Angle2 : 0.00 deg 81.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 15.00 / 15.00 m  
Receiver height : 9.90 / 9.90 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00



Results segment # 1: Somerset (day)

Source height = 1.50 m

ROAD (0.00 + 70.12 + 0.00) = 70.12 dBA

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

SubLeq

0	81	0.00	73.59	0.00	0.00	-3.47	0.00	0.00	0.00
---	----	------	-------	------	------	-------	------	------	------

70.12

Segment Leq : 70.12 dBA

Total Leq All Segments: 70.12 dBA

Results segment # 1: Somerset (night)

Source height = 1.50 m

ROAD (0.00 + 62.52 + 0.00) = 62.52 dBA

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

SubLeq

0	81	0.00	65.99	0.00	0.00	-3.47	0.00	0.00	0.00
---	----	------	-------	------	------	-------	------	------	------

62.52

Segment Leq : 62.52 dBA

Total Leq All Segments: 62.52 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 70.12  
(NIGHT): 62.52



STAMSON 5.0                      NORMAL REPORT                      Date: 22-01-2014 12:56:49  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR4.te                      Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Car traffic volume : 24288/2112 veh/TimePeriod \*  
Medium truck volume : 1932/168 veh/TimePeriod \*  
Heavy truck volume : 1380/120 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): 30000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

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

-----  
Angle1    Angle2                      : -62.00 deg    59.00 deg  
Wood depth                            : 0              (No woods.)  
No of house rows                      : 0 / 0  
Surface                                : 2              (Reflective ground surface)  
Receiver source distance              : 68.00 / 68.00 m  
Receiver height                        : 27.90 / 27.90 m  
Topography                             : 2              (Flat/gentle slope; with barrier)  
Barrier angle1                         : -62.00 deg    Angle2 : 59.00 deg  
Barrier height                         : 43.00 m  
Barrier receiver distance              : 1.00 / 1.00 m  
Source elevation                        : 0.00 m  
Receiver elevation                      : 0.00 m  
Barrier elevation                       : 0.00 m  
Reference angle                        : 0.00



Results segment # 1: Somerset (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	27.90	27.51	27.51

ROAD (0.00 + 45.30 + 0.00) = 45.30 dBA

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

--  
-62 59 0.00 73.59 0.00 -6.56 -1.72 0.00 0.00 -20.00  
45.30

Segment Leq : 45.30 dBA

Total Leq All Segments: 45.30 dBA

Results segment # 1: Somerset (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	27.90	27.51	27.51

ROAD (0.00 + 37.70 + 0.00) = 37.70 dBA

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

--  
-62 59 0.00 65.99 0.00 -6.56 -1.72 0.00 0.00 -20.00  
37.70

Segment Leq : 37.70 dBA

Total Leq All Segments: 37.70 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 45.30  
(NIGHT): 37.70



STAMSON 5.0                      NORMAL REPORT                      Date: 22-01-2014 12:56:59  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR5.te                      Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Car traffic volume : 24288/2112 veh/TimePeriod \*  
Medium truck volume : 1932/168 veh/TimePeriod \*  
Heavy truck volume : 1380/120 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): 30000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

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

-----  
Angle1    Angle2                      : -77.00 deg    0.00 deg  
Wood depth                            : 0                      (No woods.)  
No of house rows                      : 0 / 0  
Surface                                : 2                      (Reflective ground surface)  
Receiver source distance : 27.00 / 27.00 m  
Receiver height                        : 27.90 / 27.90 m  
Topography                            : 2                      (Flat/gentle slope; with barrier)  
Barrier angle1                        : -77.00 deg    Angle2 : 0.00 deg  
Barrier height                         : 11.40 m  
Barrier receiver distance : 15.50 / 15.50 m  
Source elevation                       : 0.00 m  
Receiver elevation                     : 0.00 m  
Barrier elevation                      : 0.00 m  
Reference angle                        : 0.00



Results segment # 1: Somerset (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	27.90	12.74	12.74

ROAD (0.00 + 67.35 + 0.00) = 67.35 dBA

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

SubLeq

--									
-77	0	0.00	73.59	0.00	-2.55	-3.69	0.00	0.00	-2.52
64.82*									
-77	0	0.00	73.59	0.00	-2.55	-3.69	0.00	0.00	0.00
67.35									

\* Bright Zone !

Segment Leq : 67.35 dBA

Total Leq All Segments: 67.35 dBA



Results segment # 1: Somerset (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	27.90	12.74	12.74

ROAD (0.00 + 59.75 + 0.00) = 59.75 dBA

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

--									
-77	0	0.00	65.99	0.00	-2.55	-3.69	0.00	0.00	-2.52
57.23*									
-77	0	0.00	65.99	0.00	-2.55	-3.69	0.00	0.00	0.00
59.75									

\* Bright Zone !

Segment Leq : 59.75 dBA

Total Leq All Segments: 59.75 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.35  
(NIGHT): 59.75



STAMSON 5.0                      NORMAL REPORT                      Date: 22-01-2014 12:57:08  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR6.te                      Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Car traffic volume : 24288/2112 veh/TimePeriod \*  
Medium truck volume : 1932/168 veh/TimePeriod \*  
Heavy truck volume : 1380/120 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): 30000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

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

-----  
Angle1    Angle2                      : -80.00 deg    79.00 deg  
Wood depth                      : 0              (No woods.)  
No of house rows                : 0 / 0  
Surface                            : 2              (Reflective ground surface)  
Receiver source distance        : 22.60 / 22.60 m  
Receiver height                  : 27.90 / 27.90 m  
Topography                        : 2              (Flat/gentle slope; with barrier)  
Barrier angle1                    : -80.00 deg    Angle2 : 79.00 deg  
Barrier height                    : 11.40 m  
Barrier receiver distance        : 10.90 / 10.90 m  
Source elevation                  : 0.00 m  
Receiver elevation                : 0.00 m  
Barrier elevation                 : 0.00 m  
Reference angle                  : 0.00



Results segment # 1: Somerset (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	27.90	15.17	15.17

ROAD (0.00 + 71.27 + 0.00) = 71.27 dBA

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

-80	79	0.00	73.59	0.00	-1.78	-0.54	0.00	0.00	-0.00
71.27*									
-80	79	0.00	73.59	0.00	-1.78	-0.54	0.00	0.00	0.00
71.27									

\* Bright Zone !

Segment Leq : 71.27 dBA

Total Leq All Segments: 71.27 dBA



Results segment # 1: Somerset (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	27.90	15.17	15.17

ROAD (0.00 + 63.67 + 0.00) = 63.67 dBA

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

--									
-80	79	0.00	65.99	0.00	-1.78	-0.54	0.00	0.00	-0.00
63.67*									
-80	79	0.00	65.99	0.00	-1.78	-0.54	0.00	0.00	0.00
63.67									

\* Bright Zone !

Segment Leq : 63.67 dBA

Total Leq All Segments: 63.67 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 71.27  
 (NIGHT): 63.67



STAMSON 5.0                      NORMAL REPORT                      Date: 22-01-2014 12:57:18  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR7.te                      Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Car traffic volume : 24288/2112 veh/TimePeriod \*  
Medium truck volume : 1932/168 veh/TimePeriod \*  
Heavy truck volume : 1380/120 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): 30000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

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

-----  
Angle1 Angle2 : 0.00 deg 75.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 27.70 / 27.70 m  
Receiver height : 27.90 / 27.90 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00



Results segment # 1: Somerset (day)

Source height = 1.50 m

ROAD (0.00 + 67.12 + 0.00) = 67.12 dBA

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

SubLeq

0	75	0.00	73.59	0.00	-2.66	-3.80	0.00	0.00	0.00
---	----	------	-------	------	-------	-------	------	------	------

67.12

Segment Leq : 67.12 dBA

Total Leq All Segments: 67.12 dBA

Results segment # 1: Somerset (night)

Source height = 1.50 m

ROAD (0.00 + 59.52 + 0.00) = 59.52 dBA

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

SubLeq

0	75	0.00	65.99	0.00	-2.66	-3.80	0.00	0.00	0.00
---	----	------	-------	------	-------	-------	------	------	------

59.52

Segment Leq : 59.52 dBA

Total Leq All Segments: 59.52 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.12  
(NIGHT): 59.52



STAMSON 5.0                    NORMAL REPORT                    Date: 22-01-2014 12:57:27  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR8.te                    Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Car traffic volume : 24288/2112 veh/TimePeriod \*  
Medium truck volume : 1932/168 veh/TimePeriod \*  
Heavy truck volume : 1380/120 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): 30000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

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

-----  
Angle1    Angle2                    : -79.00 deg    81.00 deg  
Wood depth                    : 0            (No woods.)  
No of house rows              : 0 / 0  
Surface                        : 2            (Reflective ground surface)  
Receiver source distance : 21.80 / 21.80 m  
Receiver height                : 12.90 / 12.90 m  
Topography                    : 2            (Flat/gentle slope; with barrier)  
Barrier angle1                : -79.00 deg    Angle2 : 81.00 deg  
Barrier height                 : 11.40 m  
Barrier receiver distance : 10.50 / 10.50 m  
Source elevation               : 0.00 m  
Receiver elevation             : 0.00 m  
Barrier elevation              : 0.00 m  
Reference angle                : 0.00



Results segment # 1: Somerset (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	12.90	7.41	7.41

ROAD (0.00 + 56.03 + 0.00) = 56.03 dBA

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

-79	81	0.00	73.59	0.00	-1.62	-0.51	0.00	0.00	-15.42
56.03									

Segment Leq : 56.03 dBA

Total Leq All Segments: 56.03 dBA



Results segment # 1: Somerset (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	12.90	7.41	7.41

ROAD (0.00 + 48.43 + 0.00) = 48.43 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-79	81	0.00	65.99	0.00	-1.62	-0.51	0.00	0.00	-15.42

SubLeq  
48.43

Segment Leq : 48.43 dBA

Total Leq All Segments: 48.43 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.03  
(NIGHT): 48.43



STAMSON 5.0                    NORMAL REPORT                    Date: 22-01-2014 12:57:36  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR9.te                    Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Car traffic volume : 24288/2112 veh/TimePeriod \*  
Medium truck volume : 1932/168 veh/TimePeriod \*  
Heavy truck volume : 1380/120 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): 30000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

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

-----  
Angle1    Angle2                    : -83.00 deg    81.00 deg  
Wood depth                    : 0            (No woods.)  
No of house rows               : 0 / 0  
Surface                        : 2            (Reflective ground surface)  
Receiver source distance       : 17.00 / 17.00 m  
Receiver height                : 12.90 / 12.90 m  
Topography                    : 2            (Flat/gentle slope; with barrier)  
Barrier angle1                 : -83.00 deg    Angle2 : 81.00 deg  
Barrier height                 : 11.40 m  
Barrier receiver distance       : 5.50 / 5.50 m  
Source elevation               : 0.00 m  
Receiver elevation              : 0.00 m  
Barrier elevation               : 0.00 m  
Reference angle                : 0.00



Results segment # 1: Somerset (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	12.90	9.21	9.21

ROAD (0.00 + 61.01 + 0.00) = 61.01 dBA

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

-83	81	0.00	73.59	0.00	-0.54	-0.40	0.00	0.00	-11.63
61.01									

Segment Leq : 61.01 dBA

Total Leq All Segments: 61.01 dBA

Results segment # 1: Somerset (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	12.90	9.21	9.21

ROAD (0.00 + 53.41 + 0.00) = 53.41 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-83	81	0.00	65.99	0.00	-0.54	-0.40	0.00	0.00	-11.63

SubLeq  
53.41

Segment Leq : 53.41 dBA

Total Leq All Segments: 53.41 dBA

RT/Custom data, segment # 1: OTrain 1 (day/night)

1 - 4-car SRT:

Traffic volume : 240/24 veh/TimePeriod  
Speed : 60 km/h

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

Angle1	Angle2	: -50.00 deg	17.00 deg
Wood depth		: 0	(No woods.)
No of house rows		: 0 / 0	
Surface		: 2	(Reflective ground surface)
Receiver source distance		: 165.00 / 165.00 m	
Receiver height		: 12.90 / 12.90 m	
Topography		: 2	(Flat/gentle slope; with barrier)
Barrier angle1		: -50.00 deg	Angle2 : 17.00 deg
Barrier height		: 0.00 m	
Barrier receiver distance		: 10.00 / 10.00 m	
Source elevation		: 54.00 m	
Receiver elevation		: 60.00 m	
Barrier elevation		: 0.00 m	
Reference angle		: 0.00	

RT/Custom data, segment # 2: OTrain 2 (day/night)

-----  
 1 - 4-car SRT:

Traffic volume : 240/24 veh/TimePeriod  
 Speed : 60 km/h

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

-----  
 Angle1 Angle2 : 17.00 deg 55.00 deg  
 Wood depth : 0 (No woods.)  
 No of house rows : 0 / 0  
 Surface : 2 (Reflective ground surface)  
 Receiver source distance : 165.00 / 165.00 m  
 Receiver height : 16.40 / 16.40 m  
 Topography : 2 (Flat/gentle slope; with barrier)  
 Barrier angle1 : 28.00 deg Angle2 : 55.00 deg  
 Barrier height : 9.00 m  
 Barrier receiver distance : 125.00 / 125.00 m  
 Source elevation : 0.00 m  
 Receiver elevation : 0.00 m  
 Barrier elevation : 0.00 m  
 Reference angle : 0.00

Results segment # 1: OTrain 1 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.50	12.90	71.78	71.78

RT/Custom (0.00 + 43.87 + 0.00) = 43.87 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-50	17	0.00	58.58	-10.41	-4.29	0.00	0.00	0.00	43.87*
-50	17	0.00	58.58	-10.41	-4.29	0.00	0.00	0.00	43.87

\* Bright Zone !

Segment Leq : 43.87 dBA

Results segment # 2: OTrain 2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.50	16.40	4.35	4.35

RT/Custom (36.02 + 28.00 + 0.00) = 36.66 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
17	28	0.00	58.58	-10.41	-12.14	0.00	0.00	0.00	36.02
28	55	0.00	58.58	-10.41	-8.24	0.00	0.00	-11.92	28.00

Segment Leq : 36.66 dBA

Total Leq All Segments: 44.63 dBA

Results segment # 1: OTrain 1 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.50	12.90	71.78	71.78

RT/Custom (0.00 + 36.88 + 0.00) = 36.88 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-50	17	0.00	51.59	-10.41	-4.29	0.00	0.00	0.00	36.88*
-50	17	0.00	51.59	-10.41	-4.29	0.00	0.00	0.00	36.88

\* Bright Zone !

Segment Leq : 36.88 dBA

Results segment # 2: OTrain 2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.50	16.40	4.35	4.35

RT/Custom (29.03 + 21.01 + 0.00) = 29.67 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
17	28	0.00	51.59	-10.41	-12.14	0.00	0.00	0.00	29.03
28	55	0.00	51.59	-10.41	-8.24	0.00	0.00	-11.92	21.01

Segment Leq : 29.67 dBA

Total Leq All Segments: 37.64 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.11  
(NIGHT): 53.52



STAMSON 5.0                      NORMAL REPORT                      Date: 22-01-2014 12:57:49  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR9WB.te                      Time Period: Day/Night 16/8 hours  
Description:

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

-----  
Car traffic volume : 24288/2112 veh/TimePeriod \*  
Medium truck volume : 1932/168 veh/TimePeriod \*  
Heavy truck volume : 1380/120 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): 30000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

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

-----  
Angle1    Angle2                      : -83.00 deg    81.00 deg  
Wood depth                            : 0                      (No woods.)  
No of house rows                      : 0 / 0  
Surface                                : 2                      (Reflective ground surface)  
Receiver source distance : 17.00 / 17.00 m  
Receiver height                        : 12.90 / 12.90 m  
Topography                            : 2                      (Flat/gentle slope; with barrier)  
Barrier angle1                        : -83.00 deg    Angle2 : 81.00 deg  
Barrier height                         : 12.50 m  
Barrier receiver distance : 5.50 / 5.50 m  
Source elevation                       : 0.00 m  
Receiver elevation                     : 0.00 m  
Barrier elevation                      : 0.00 m  
Reference angle                        : 0.00



Results segment # 1: Somerset (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	12.90	9.21	9.21

ROAD (0.00 + 57.74 + 0.00) = 57.74 dBA

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

-83	81	0.00	73.59	0.00	-0.54	-0.40	0.00	0.00	-14.90
57.74									

Segment Leq : 57.74 dBA

Total Leq All Segments: 57.74 dBA

Results segment # 1: Somerset (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	12.90	9.21	9.21

ROAD (0.00 + 50.14 + 0.00) = 50.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-83	81	0.00	65.99	0.00	-0.54	-0.40	0.00	0.00	-14.90

SubLeq  
50.14

Segment Leq : 50.14 dBA

Total Leq All Segments: 50.14 dBA

RT/Custom data, segment # 1: OTrain 1 (day/night)

1 - 4-car SRT:

Traffic volume : 240/24 veh/TimePeriod  
Speed : 60 km/h

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

Angle1	Angle2	: -50.00 deg	17.00 deg
Wood depth	:	0	(No woods.)
No of house rows	:	0 / 0	
Surface	:	2	(Reflective ground surface)
Receiver source distance	:	165.00 / 165.00 m	
Receiver height	:	12.90 / 12.90 m	
Topography	:	2	(Flat/gentle slope; with barrier)
Barrier angle1	:	-50.00 deg	Angle2 : 17.00 deg
Barrier height	:	0.00 m	
Barrier receiver distance	:	10.00 / 10.00 m	
Source elevation	:	54.00 m	
Receiver elevation	:	60.00 m	
Barrier elevation	:	0.00 m	
Reference angle	:	0.00	

RT/Custom data, segment # 2: OTrain 2 (day/night)

-----  
 1 - 4-car SRT:

Traffic volume : 240/24 veh/TimePeriod  
 Speed : 60 km/h

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

-----  
 Angle1 Angle2 : 17.00 deg 55.00 deg  
 Wood depth : 0 (No woods.)  
 No of house rows : 0 / 0  
 Surface : 2 (Reflective ground surface)  
 Receiver source distance : 165.00 / 165.00 m  
 Receiver height : 16.40 / 16.40 m  
 Topography : 2 (Flat/gentle slope; with barrier)  
 Barrier angle1 : 28.00 deg Angle2 : 55.00 deg  
 Barrier height : 9.00 m  
 Barrier receiver distance : 125.00 / 125.00 m  
 Source elevation : 0.00 m  
 Receiver elevation : 0.00 m  
 Barrier elevation : 0.00 m  
 Reference angle : 0.00

Results segment # 1: OTrain 1 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.50	12.90	71.78	71.78

RT/Custom (0.00 + 43.87 + 0.00) = 43.87 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-50	17	0.00	58.58	-10.41	-4.29	0.00	0.00	0.00	43.87*
-50	17	0.00	58.58	-10.41	-4.29	0.00	0.00	0.00	43.87

\* Bright Zone !

Segment Leq : 43.87 dBA

Results segment # 2: OTrain 2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.50	16.40	4.35	4.35

RT/Custom (36.02 + 28.00 + 0.00) = 36.66 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
17	28	0.00	58.58	-10.41	-12.14	0.00	0.00	0.00	36.02
28	55	0.00	58.58	-10.41	-8.24	0.00	0.00	-11.92	28.00

Segment Leq : 36.66 dBA

Total Leq All Segments: 44.63 dBA

Results segment # 1: OTrain 1 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.50	12.90	71.78	71.78

RT/Custom (0.00 + 36.88 + 0.00) = 36.88 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-50	17	0.00	51.59	-10.41	-4.29	0.00	0.00	0.00	36.88*
-50	17	0.00	51.59	-10.41	-4.29	0.00	0.00	0.00	36.88

\* Bright Zone !

Segment Leq : 36.88 dBA

Results segment # 2: OTrain 2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.50	16.40	4.35	4.35

RT/Custom (29.03 + 21.01 + 0.00) = 29.67 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
17	28	0.00	51.59	-10.41	-12.14	0.00	0.00	0.00	29.03
28	55	0.00	51.59	-10.41	-8.24	0.00	0.00	-11.92	21.01

Segment Leq : 29.67 dBA

Total Leq All Segments: 37.64 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.95  
(NIGHT): 50.38