Environmental Noise Assessment
Fifth Wheel Development
Grimsby, Ontario

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1.0 INTRODUCTION

Novus Environmental Inc. (Novus) was retained by Losani Homes (1998) Ltd. to conduct an Environmental Noise Study for the proposed Fifth Wheel residential development located in Grimsby, Ontario. This report assesses the potential impacts of the environment on the proposed development, including Transportation and Stationary noise sources.

1.1 Nature of the Subject Lands

The location of the proposed development is on the north side of North Service Road, east of Casablanca Boulevard, in Grimsby Ontario. Novus recognizes that the Fifth Wheel Truck stop has been demolished, and the Truck Wash has seized operation since December 2017.

The proposed development consists of six (6) condominium buildings (Buildings A to F), one (1) back-to-back townhouse block (Building G), and seven (7) single-row townhouse blocks (Buildings H to N). A shared podium connects Buildings A and B. The development also includes two (2) levels of underground parking.

Amenity space for the development is included on the 6th floor podium rooftop between Buildings A and B, and on the 7th floor of Buildings C, D, E and F. Publicly accessible spaces are located at grade to the east of the Building A/Building B, and central to the development site to the east of Buildings C and D.

A copy of the current site plan is included in **Appendix A**.

1.2 Nature of the Surroundings

The development site is primarily surrounded by other residential lands and commercial properties, with a single residential home is located on the land adjacent to the proposed development site. Industrial facilities are located to the east and south on the opposite side of the QEW.

A context plan is shown in **Figure 1**.

PART 1: IMPACTS OF THE ENVIRONMENT ON THE DEVELOPMENT

In assessing potential impacts of the environment on the proposed development, the focus of this report is to assess the potential for:

1) Roadway noise impacts on the development;
2) Railway noise impacts on the development; and
3) Stationary noise impacts from the surrounding industries on the development.

The railway is located approximately 420 m from the development, and is outside the minimum recommended distance requiring a noise and vibration study. Therefore, this source was not assessed.

2.0 TRANSPORTATION NOISE IMPACTS

2.1 Transportation Noise Sources

Transportation sources of interest with the potential to produce noise at the proposed development are:

- The QEW south of the proposed development; and
- North Service Road south of the proposed development;
- Casablanca Boulevard west of the proposed development.

The level of noise from these sources has been predicted, and this information has been used to identify façade, ventilation, and warning clause requirements.

2.2 Surface Transportation Noise Criteria

2.2.1 Ministry of the Environment Publication NPC-300

Noise Sensitive Developments

Ministry of the Environment and Climate Change (MOECC) Publication NPC-300 provides sound level criteria for noise sensitive developments. The applicable portions of NPC-300 are Part C – Land Use Planning and the associated definitions outlined in Part A – Background. **Table 1** to **Table 3** below summarize applicable surface transportation criteria limits.

Location Specific Criteria

Table 1 summarizes criteria in terms of energy equivalent sound exposure (L_{eq}) levels for specific noise-sensitive locations. Both outdoor and indoor locations are identified, with the focus of outdoor areas being amenity spaces. Indoor criteria vary with sensitivity of the space. As a result, sleep areas have more stringent criteria than Living / Dining room space.

Table 1: NPC-300 Sound Level Criteria for Road and Rail Noise

Type of Space	Time Period	Energy Equivalent Sound Exposure Level L_{eq} [5] (dBA)		Assessment Location
		Road	Rail [1]	
Outdoor Amenity Area	Daytime (0700-2300h)	55	55	Outdoors [2]
Living / Dining Room [3]	Daytime (0700-2300h)	45	40	Indoors [4]
	Nighttime (2300-0700h)	45	40	Indoors [4]
Sleeping Quarters	Daytime (0700-2300h)	45	40	Indoors [4]
	Nighttime (2300-0700h)	40	35	Indoors [4]

Notes: [1] Whistle noise is excluded for OLA noise assessments, and included for Living / Dining Room and Sleeping Quarter assessments.
[2] Road and Rail noise impacts are to be combined for assessment of OLA impacts.
[3] Residence area Dens, Hospitals, Nursing Homes, Schools, Daycares are also included. During the nighttime period, Schools and Daycares are excluded.
[4] An assessment of indoor noise levels is required only if the criteria in **Table 3** are exceeded.
[5] L_{eq} – the energy equivalent sound exposure level, integrated over the time period shown.

Table 2: MOECC Publication NPC-300 Outdoor Living Area Mitigation Requirements

Time Period	Equivalent Sound Level in Outdoor Living Area (dBA)	Mitigation Requirements and Warning Clauses
Daytime (0700-2300h)	≤ 55	• None
	55 to 60 incl.	• Noise barrier **OR** • Warning Clause A
	> 60	• Noise barrier to reduce noise to 55 dBA **OR** • Noise barrier to reduce noise to 60 dBA and Warning Clause B

Ventilation and Warning Clauses

The requirements for ventilation, where windows potentially would have to remain closed as a means of noise control, apply where the sound exposure levels are summarized in **Table 3** exceed the guideline limits in **Table 1** for indoors spaces. Despite the implementation of ventilation measures where required, some occupants may choose not to use the ventilation means provided, and as such, warning clauses advising future occupants of the potential excess over the guideline limits are required.

Warning clauses also apply to the OLA where an excess of up to 5 dBA over the 55 dBA OLA limit is often acceptable to many, particularly in the context of an urban environment. Warning clauses are discussed further, below in **Table 3.**

Building Shell Requirements

Table 4 provides L_{eq} thresholds which if exceeded, require the building shell and components (i.e., wall, windows) to be designed and selected accordingly to ensure that the **Table 3** and **Table 4** indoor sound criteria are met.

Table 3: NPC-300 Ventilation and Warning Clause Requirements

Assessment Location	Time Period	Energy Equivalent Sound Exposure Level - L_{eq} (dBA)		Ventilation and Warning Clause Requirements [2]
		Road	Rail [1]	
Outdoor Amenity Area	Daytime (0700-2300h)	56 to 60 incl.		Type A Warning Clause
Plane of Window	Daytime (0700-2300h)	≤ 55		None
		56 to 65 incl.		Forced Air Heating with provision to add air conditioning + Type C Warning Clause
		> 65		Central Air Conditioning + Type D Warning Clause
	Nighttime (2300-0700h)	51 to 60 incl.		Forced Air Heating with provision to add air conditioning + Type C Warning Clause
		> 60		Central Air Conditioning + Type D Warning Clause

Notes: [1] Whistle noise is excluded.
[2] Road and Rail noise is combined for determining Ventilation and Warning Clause requirements.

Table 4: NPC-300 Building Component Requirements

Assessment Location	Time Period	Energy Equivalent Sound Exposure Level - L_{eq} (dBA)		Component Requirements
		Road	Rail [1]	
Plane of Window	Daytime (0700-2300h)	> 65	> 60	Designed/ Selected to Meet Indoor Requirements [2]
	Nighttime (2300-0700h)	> 60	> 55	

Notes: [1] Including whistle noise.
[2] Building component requirements are assessed separately for Road and Railway, and combined for a resultant sound isolation parameter.

In summary, roadway noise impacts are to be predicted at the plane-of-window for the proposed development. Providing the plane-of-window sound levels exceed the daytime and nighttime sound levels indicated in **Table 3**, the determination of the building façade components is required for meeting the indoor sound level criteria outlined in **Table 1**.

In addition, the ventilation requirements and warning clauses are determined, as outlined in **Table 3**, based on the plane-of-window noise levels.

2.3 Traffic Data and Future Projections

2.3.1 Roadway Traffic Data

Road traffic data was obtained from the Ministry of Transportation Traffic Volumes document (2016) for QEW. Traffic data for was grown to a 2028 traffic volume based on a 1.8% annual growth rate, indicated by City of Hamilton for this area. North Service road and Casablanca Boulevard traffic volumes were obtained from data provided by project traffic consultants (Paradigm Transportation Solutions Inc.) for the 2026 future year. The traffic data was grown further to 2028, using the above 1.8% growth rate for the area.

Table 5 summarizes road traffic volumes used in the analysis. Copies of the traffic data used are included in **Appendix B**.

Table 5: Summary of Road Traffic Data

Roadway Link	2028 Volume (AADT)	Day / Night Volume Split [1]		Commercial Traffic Breakdown [2]		Vehicle Speed (km/h)
		Daytime	Nighttime	% Med	% Heavy	
QEW (1 Direction)	66,333	85	15	3%	9%	100
North Service Road	12,933	85	15	2%	2%	60
Casablanca Boulevard	25,297	85	15	2%	2%	60

Notes: [1] Based on historical data on file at Novus. Non-Industrial Arterial Roadways were applied for North Service Road and Casablanca Boulevard, and Provincial Highways applied to QEW
[2] Truck Percnetages was calculated from Turning Movement Count data for Casablanca and North Service Road.
QEW Truck Percentages were obtained from MTO iCorridor website..

2.4 Projected Sound Levels

Future road traffic sound levels at the proposed development were predicted using Cadna/A, a commercially available noise propagation modelling software. Roadways were modelled as line sources of sound, with sound emission rates calculated using the ORNAMENT algorithms, the road traffic noise model of the MOECC. These predictions were validated and are equivalent to those made using the MOECC's ORNAMENT or STAMSON v5.04 road traffic noise models.

Sound levels were predicted along the facades of the proposed development using the "building evaluation" feature of Cadna/A. This feature allows for noise levels to be predicted across the entire façade of a structure.

As the ground separating the development from the roadways is primarily asphalt, reflective ground was applied to the noise modelling.

2.4.1 Façade Sound Levels

Predicted sound levels at each building of the proposed development are shown in **Figure 2A** and **Figure 2B** for the daytime and night-time periods, respectively.

As shown in **Figure 2A**, daytime noise impacts are above 65 dBA for buildings A through G and J. The night-time noise impacts are above 60 dBA for buildings A through G and J also, as shown in **Figure 2B**. Therefore, an assessment of indoor noise levels is required for these buildings.

Table 6 tabulates the worst-case impacts for every building of the proposed development.

Table 6: Summary of Worst-case Roadway Transportation Sound Levels

Building	Period	Roadway Sound Level (dBA)	Building Component Criteria (dBA)	In-Room Assessment Required? (Yes/No)
A	Day	71	65	Yes
	Night	67	60	Yes
B	Day	73	65	Yes
	Night	69	60	Yes
Podium (A & B)	Day	73	65	Yes
	Night	68	60	Yes
C	Day	75	65	Yes
	Night	71	60	Yes
D	Day	77	65	Yes
	Night	72	60	Yes
E	Day	77	65	Yes
	Night	72	60	Yes
F	Day	77	65	Yes
	Night	72	60	Yes
G	Day	66	65	Yes
	Night	61	60	Yes
H	Day	57	65	No
	Night	52	60	No
I	Day	52	65	No
	Night	47	60	No
J	Day	66	65	Yes
	Night	61	60	Yes
K	Day	64	65	No
	Night	60	60	No
L	Day	65	65	No
	Night	60	60	No
M	Day	63	65	No
	Night	58	60	No
N	Day	56	65	No
	Night	51	60	No

2.4.2 Outdoor Living Areas

Noise impacts were assessed for the rooftop terrace spaces at the outdoor 6th floor amenity space building between buildings A and B (OLA_AB), and the 7th floor terraces for buildings C, to F (OLA_C to OLA_F). The assessment location is shown in **Figure 2A**.

The roadway impacts on the development OLAs are shown in **Table 7**.

Table 7: Summary of Transportation OLA Sound Levels - Unmitigated

OLA ID	Transportation Impacts L_{eq} Day (dBA)	Applicable Guideline Limit L_{eq} Day (dBA)	Exceeds Criteria? (Yes/No)
OLA_AB	69	60	Yes
OLA_C	71	60	Yes
OLA_D	70	60	Yes
OLA_E	70	60	Yes
OLA_F	70	60	Yes

As noise impacts exceed 60 dBA, an assessment of noise mitigation measures is required for each OLA.

The MOECC requires OLAs which are 4 meters in depth or greater, to be assessed for roadway noise impacts. Based on discussions with Losani Homes, the private balconies are less than the MOECC minimum depth threshold of 4 meters for inclusion. Therefore, the private terraces are not considered to be OLAs for the purposes of the guidelines, and have not been assessed.

In addition, the landscaped area located at grade near Building A and B, and central to the development (near Building C and D) are considered to be a publicly accessible spaces, and were not assessed as outdoor amenity areas. As these areas are generally shielded from the QEW, sound levels are not expected to be significant.

2.5 Façade Recommendations

2.5.1 Glazing Requirements

An assessment of building components is required for façades of the condominium buildings and townhouses, as show in **Section 2.4.1**.

Indoor sound levels and required façade Sound Transmission Classes (STCs) were estimated using the procedures outlined in National Research Council Building Practice Note BPN-56. Façade calculations are provided in **Appendix C**.

As detailed floor plans were not available at the time of the analysis, living room/bedroom receptor locations for buildings A to F were assumed to have a glazing-to-façade area ratio of 55%. A 35% glazing-to-façade area was assumed for each façade of the townhouse block.

The following is a summary of the glazing requirements for each building of the development:

Table 8: Summary of Window STC Requirements

Building	Façade [1]	Window STC Requirements [2]	
		Living Room	Bedroom
Building A	North	OBC	OBC
	East	OBC	OBC
	South	OBC	**30**
	West	OBC	**31**
Building B	North	OBC	OBC
	East	OBC	OBC
	South	OBC	**32**
	West	**30**	**33**
Building AB Podium	North	OBC	OBC
	East	OBC	OBC
	South	OBC	**32**
	West	**30**	**33**
Building C	North	OBC	**30**
	East	OBC	OBC
	South	**31**	**34**
	West	**32**	**35**
Building D	North	OBC	OBC
	East	**30**	**33**
	South	**34**	**37**
	West	**31**	**34**
Building E	North	OBC	OBC
	East	**30**	**33**
	South	**34**	**37**
	West	**31**	**34**
Building F	North	OBC	OBC
	East	**31**	**34**
	South	**34**	**37**
	West	**30**	**33**
Building G	North	OBC	OBC
	East	OBC	OBC
	South	OBC	OBC
	West	OBC	OBC
Building J	North	OBC	OBC
	East	OBC	OBC
	South	OBC	OBC
	West	OBC	OBC

Notes: [1] Façade locations are shown in **Figure 2A** and **Figure 2B**.
[2] OBC: Any configuration meeting the minimum structural and safety requirements of the Ontario Building Code, which generally produces a minimum STC for glazed elements of STC 29.

The buildings and facades not mentioned above do not require upgraded glazing. Ontario Building Code (OBC) glazing (STC-29) for townhouses will be sufficient to meet indoor sound level criteria.

It should be noted that if a room (living/dining or bedroom) is located on a corner and has two (2) exposed sides, an increase in 3 STC points may be necessary for the glazing.

The glazing requirements above are approximated, based on the generic room, façade and glazing dimensions. Once detailed floor plans and façade plans become available, the glazing requirements should be re-assessed and reviewed by an Acoustical Consultant.

2.5.2 Ventilation and Warning Clause Requirements

Where required, the Warning Clauses must be included in agreements registered on Title for the residential units, included in agreements of purchase and sale or lease, and all rental agreements.

Based on the predicted façade noise levels, forced air heating with provision to add central air conditioning and a **Type C** Warning clause will be required for Townhouse Buildings H to N.

Type C Warning Clause

> "This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment and Climate Change"

Based on the predicted façade noise levels, mandatory air conditioning and a **Type D** Warning Clause will be required for the following buildings:

- Condominium Buildings A, (including podium) through F; and
- Townhouse Buildings G.

Type D Warning Clause

> "This dwelling unit has been or will be fitted with a central air conditioning system which will enable occupants to keep windows closed if road and or air traffic noise interferes with the indoor activities."

As per the Town of Grimsby Official Plan document, the following warning clause must be included in agreements registered on Title for the residential units, in agreements of purchase and sale or lease, and all rental agreements. The warning clause is designed to notify

purchasers and tenants of the mitigation measures implemented for the development and/or exceedance of the Ministry of the Environment Noise level guidelines as follows:

Town of Grimsby Official Plan Warning Clause

> "Due to existing and/or possible future highway operations, the effects of noise may interfere with the activities or the living environment of the occupants of this property."

2.6 Outdoor Living Area Requirements

2.6.1 Barrier Requirements

The roadway impacts for each of the rooftop OLAs exceed the 60 dBA criteria, as shown in **Table 7** and graphically in **Figure 2A**. Therefore, an assessment of mitigation measures was completed. **Table 9** summarizes the barrier requirement for meeting the applicable guideline limits. The barrier locations are shown in **Figure 3**.

Table 9: Barrier Specifications

Description	Length (m)	Height (m)	Notes:
OLA_AB	30	3.5	
OLA_C	45	4.25	L-shaped, west and south sides of OLA req'd as barriers
OLA_D	45	4.5	L-shaped, west and south sides of OLA req'd as barriers
OLA_E	55	4.25	L-shaped, east and south sides of OLA req'd as barriers
OLA_F	55	4.0	L-shaped, east and south sides of OLA req'd as barriers

The OLA roadway impacts with the barriers implemented are summarized in **Table 10** and shown in **Figure 3**.

Table 10: Summary of Transportation OLA Sound Levels – Mitigated

OLA ID	Transportation Impacts L_{eq} Day (dBA)	Applicable Guideline Limit L_{eq} Day (dBA)	Meets Criteria? (Yes/No)
OLA_AB	60	60	Yes
OLA_C	60	60	Yes
OLA_D	60	60	Yes
OLA_E	60	60	Yes
OLA_F	60	60	Yes

The barrier height requirements are in excess of 3 m for each of the rooftop terraces. This is not considered reasonable.

During the site plan stage, a combination of perimeter barriers and localized acoustical screening should be included in the landscape design. Given the range of impacts (69 dBA to 71 dBA), meeting the guideline requirements are anticipated to be possible.

The perimeter barriers and localized screening can be composed of solid walls and glass/ plexiglass panels. The panels should be selected so that they have sufficient mass to adequately attenuate the noise (generally a minimum of 20 kg/m^2 face density). The panels and frames should be free of gaps and cracks on the sides and bottom. The system should also be designed to withstand any wind loading.

2.6.2 Ventilation and Warning Clause Requirements

Roadway noise levels are predicted to be above 60 dBA in all amenity spaces. Therefore, a **Type B** noise warning clause is required to be included no additional noise mitigation measures or warning clauses are required. The **Type B** Warning Clause is below:

Type B Warning Clause

> "Purchasers are advised that despite the inclusion of noise control features in this development area, sound levels due to increasing road and rail traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the Municipality's and the Ministry of the Environment and Climate Change's noise criteria."

3.0 STATIONARY NOISE IMPACTS

A site visit was completed on August 30, 2017 by Novus personnel to review the surrounding stationary noise sources. The Grimsby Wastewater Treatment Plant is located to the east, and is separated from the development site by a single residential home. To the south-east, on the opposite side of the QEW are several industries including Lake Foundry, Williams Printing Services, Grimsby Power Inc,

The surrounding area is dominated by roadway noise from the QEW, with no significant stationary noise audible at the proposed development site. In addition, as the industries located to the south-east are expected to be in compliance with the MOECC NPC-300 guideline limits at the closer intervening buildings, noise impacts are not anticipated and have not been assessed.

PART 2: IMPACTS OF THE DEVELOPMENT ON THE SURROUNDING AREA

4.0 IMPACTS OF THE DEVELOPMENT MECHANICAL SYSTEMS ON SURROUNDING PROPERTIES

In terms of the noise environment of the area, it is expected that the project will have a negligible effect on the neighbouring properties. The traffic related to the proposed development will be small in relation to the traffic volumes within the area, and is not of concern with respect to noise impact.

Other possible sources of noise associated with the development with potentially adverse impacts on the surrounding neighbourhood are emergency generators and mechanical roof-top equipment of Buildings A to F. This equipment is required to meet MOECC Publication NPC-300 requirements at the closest off-site noise sensitive receptors.

Given the high ambient sound levels in the area and the fact that the systems will be designed to ensure that the applicable noise guideline are met at on-site receptors, off-site impacts are not anticipated.

Regardless, potential impacts should be assessed as part of the final building design. The criteria can be met at all surrounding and on-site receptors by the appropriate selection of mechanical equipment, by locating equipment with sufficient setback from noise sensitive locations, and by incorporating control measures (e.g., silencers) into the design.

It is recommended the mechanical systems be reviewed by an Acoustical Consultant prior to final selection of equipment.

PART 3: IMPACTS OF THE DEVELOPMENT ON ITSELF

5.0 OUTDOOR NOISE IMPACTS FROM DEVELOPMENT MECHANICAL SYSTEMS

The building mechanical systems for Buildings A to F have not been designed at this time. Although no adverse impacts are expected, such equipment has the potential to result in noise impacts on residential spaces within the development. This equipment is required to meet MOECC Publication NPC-300 requirements at the facades of the noise sensitive spaces within the development. Therefore, the potential impacts should be assessed as part of the final building design.

The criteria is expected to be met at all on-site receptors with the appropriate selection of mechanical equipment, by locating equipment to minimize noise impacts within the development, and by incorporating control measures (e.g., silencers) into the design.

It is recommended the mechanical systems be reviewed by an Acoustical Consultant prior to final selection of equipment.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The potential for noise impacts on the proposed development have been assessed. Based on the results of the study, the following conclusions have been reached:

6.1 Transportation Noise

- An assessment of transportation noise impacts from the Queen Elizabeth Way, North Service Road and Casablanca Boulevard has been completed.

- Based on transportation façade sound levels, upgraded glazing is required to meet the MOECC Publication NPC-300 Indoor Sound Level Criteria (refer **Section 2.5.1)**.

- Provisions for air conditioning are recommended as outlined in **Section 2.5.2**.

- The following Warning Clauses must be registered on Title for the residential units, included in agreements of purchase and sale or lease, and all rental agreements, as outlined in **Section 2.5 and 2.6,** as follows:

  Type B Warning Clause – Buildings A to F

  > "Purchasers are advised that despite the inclusion of noise control features in this development area, sound levels due to increasing road and rail traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the Municipality's and the Ministry of the Environment and Climate Change's noise criteria."

  Type C Warning Clause – Building H, J, K to N

  > "This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment and Climate Change.

  Type D Warning Clause – Buildings A to G

  > "This dwelling unit has been or will be fitted with a central air conditioning system which will enable occupants to keep windows closed if road and or air traffic noise interferes with the indoor activities."

Town of Grimsby Official Plan Warning Clause – All

> "Due to existing and/or possible future highway operations, the effects of noise may interfere with the activities or the living environment of the occupants of this property."

- Noise impacts modelled for the rooftop OLAs on Buildings A to F, and are predicted to exceed the applicable guidelines. Acoustic barriers are required to meet the guideline limits within this area, as outlined in **Section 2.6.1**. Alternatively, a combination of perimeter barriers and localized screening for seating areas is anticipated to be sufficient to meet the guideline limits.

- The glazing requirements were determined based on the generic room, façade and glazing dimensions. Once detailed floor plans and façade plans become available, the glazing requirements should be re-assessed and reviewed by an Acoustical Consultant.

6.2 Stationary Noise

No significant noise sources were identified to be audible at the proposed development site during the site visit by Novus personnel. The industries located south-east of the development are separated from the proposed development by noise sensitive lands and the QEW. As the industries are expected to be in compliance with the NPC-300 guideline limits at the closer intervening residential home, noise impacts are not anticipated to be a concern.

6.3 Overall Assessment

- Impacts of the environment on the proposed development can be adequately controlled with upgrades to the building construction, additional mitigation measures, and the ventilation and warning clause requirements detailed in **Part 1** of this report.

- Impacts of the proposed development are expected to meet the applicable guideline limits, and can be adequately controlled by following the design guidance outlined **Part 2** of this report.

- Impacts of the proposed development on itself can be adequately controlled by following the design guidance outlined in **Part 3** of this report.

- Given the early stage of design and the conservative analysis that has been completed, it is recommended that the acoustical requirements above should be refined by an Acoustical Consultant as the design progresses.

- As the mechanical systems for the proposed development have not been designed at the time of this assessment, the acoustical requirements above should be confirmed by an Acoustical Consultant as part of the final building design.

7.0 REFERENCES

National Research Council, Building Practice Note 56: *Controlling Sound Transmission into Buildings*, Canada 1985.

Ontario Ministry of the Environment and Climate Change, 1989, Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT).

Ontario Ministry of the Environment and Climate Change, Publication NPC-300: *Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning*, 2013.

Ontario Ministry of the Environment (MOECC), 1996, STAMSON v5.03: Road, Rail and Rapid Transit Noise Prediction Model.

Figures

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Figure No. **1**

Context Plan

Fifth Wheel Development
Grimsby, ON

True North

Scale: 1: 10,000
Date: 18/01/17
File No.: 17-0186
Drawn By: JAK

novus ENVIRONMENTAL

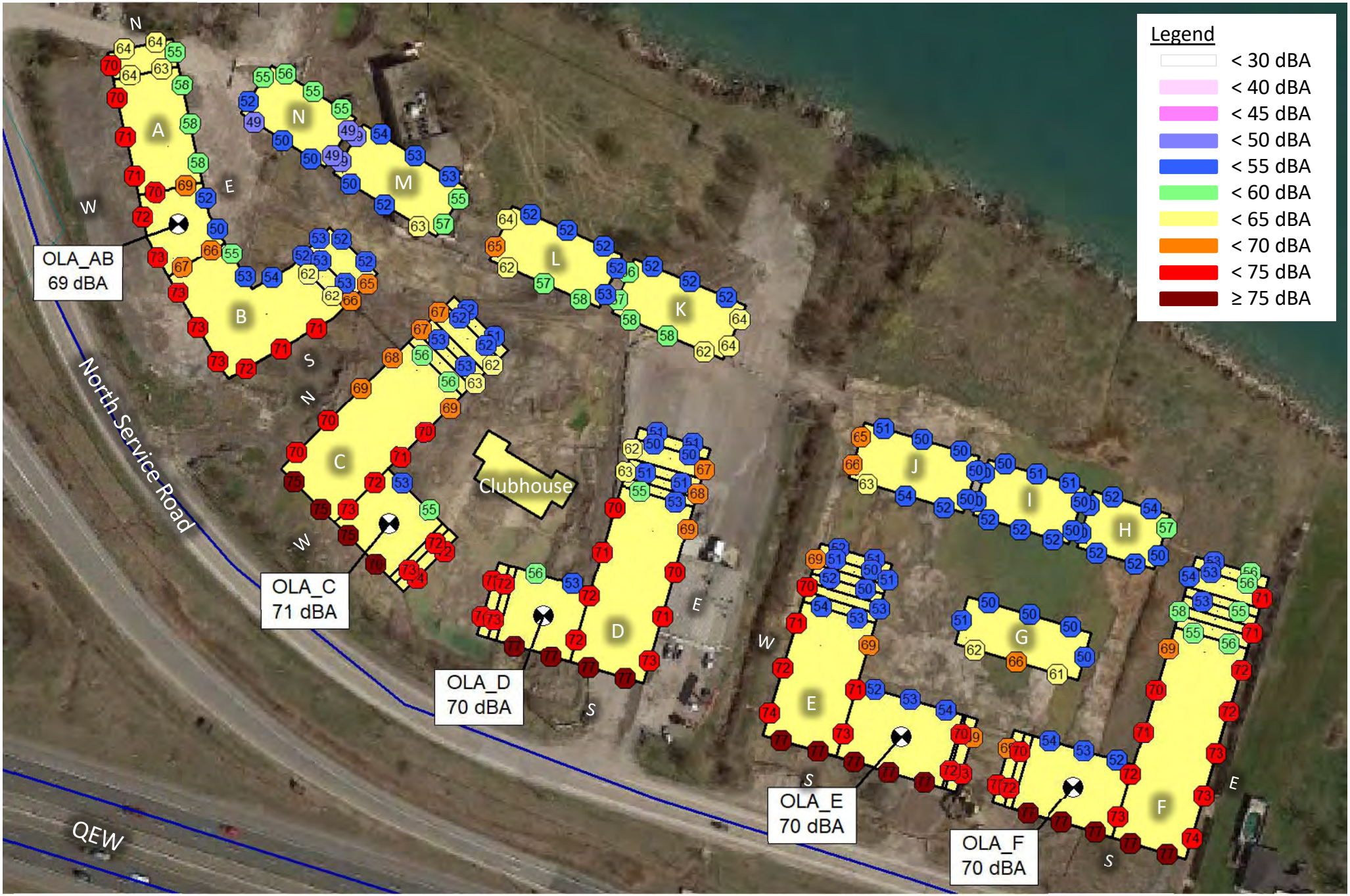

Figure No. **2A**

Modelled Road Noise Impacts – Daytime

Fifth Wheel Development
Grimsby, ON

True North

Scale: 1: 1,500
Date: 18/05/17
File No.: 17-0186
Drawn By: MTL

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Figure No. **2B**

Modelled Road Noise Impacts – Night-time

Fifth Wheel Development
Grimsby, ON

True North

Scale: 1: 1,500
Date: 18/05/17
File No.: 17-0186
Drawn By: MTL

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Legend

Acoustic Barrier

Figure No. **3**

Modelled Road Noise Impacts-
Outdoor Living Area (Mitigated)

Fifth Wheel Development
Grimsby, ON

True North

Scale:	1: 1,500
Date:	18/05/17
File No.:	17-0186
Drawn By:	MTL

novus ENVIRONMENTAL

Appendix A

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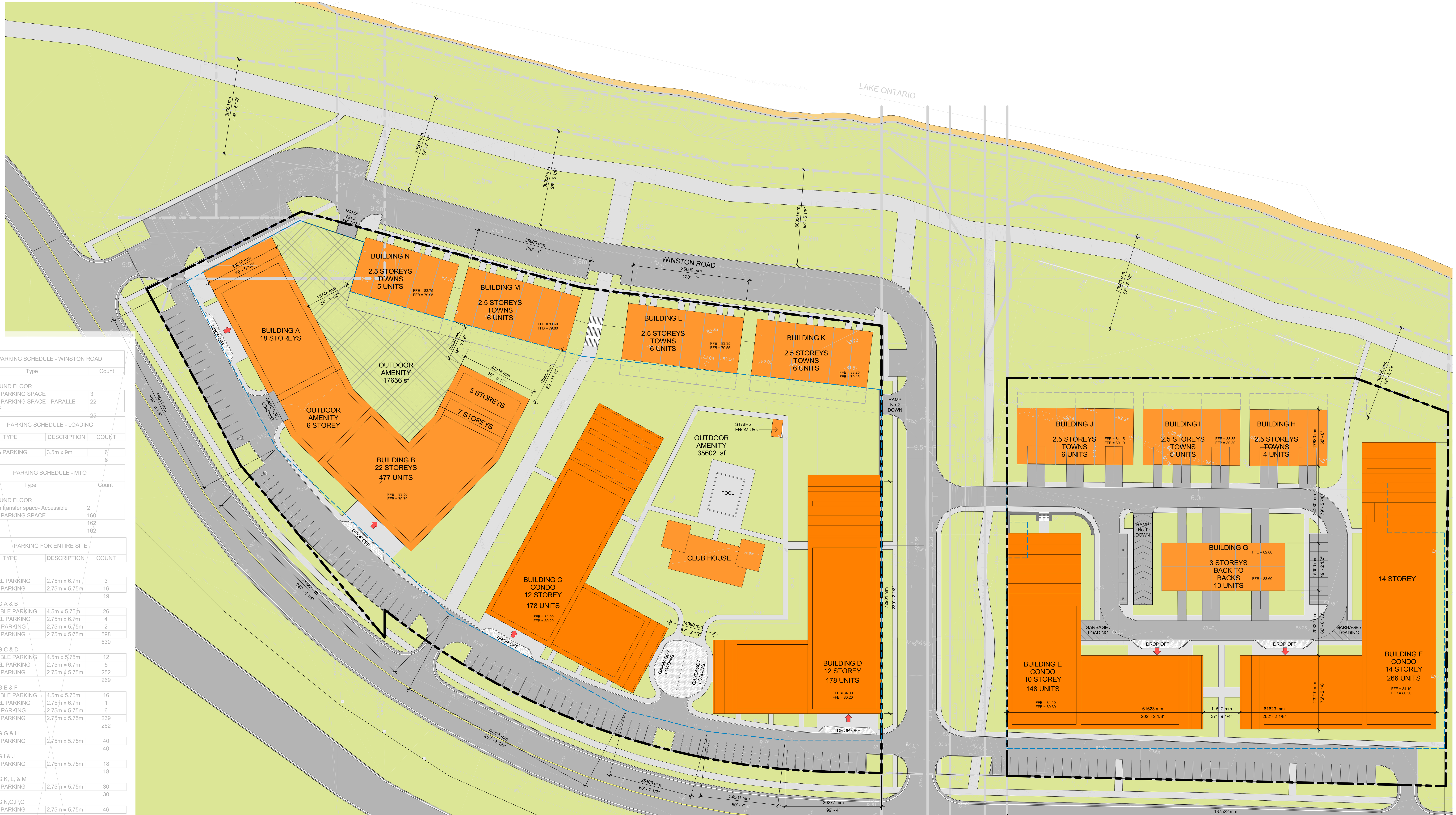

PARKING SCHEDULE - WINSTON ROAD	
Type	Count
T/O GROUND FLOOR	
TYPICAL PARKING SPACE	3
TYPICAL PARKING SPACE - PARALLE PARKING	22
	25

PARKING SCHEDULE - LOADING		
TYPE	DESCRIPTION	COUNT
LOADING PARKING	3.5m x 9m	6
		6

PARKING SCHEDULE - MTO	
Type	Count
T/O GROUND FLOOR	
4.5 m with transfer space- Accessible	2
TYPICAL PARKING SPACE	160
	162
	162

PARKING FOR ENTIRE SITE		
TYPE	DESCRIPTION	COUNT
PARALLEL PARKING	2.75m x 6.7m	3
TYPICAL PARKING	2.75m x 5.75m	16
		19
BUILDING A & B		
ACCESSIBLE PARKING	4.5m x 5.75m	26
PARALLEL PARKING	2.75m x 6.7m	4
TANDEM PARKING	2.75m x 5.75m	2
TYPICAL PARKING	2.75m x 5.75m	598
		630
BUILDING C & D		
ACCESSIBLE PARKING	4.5m x 5.75m	12
PARALLEL PARKING	2.75m x 6.7m	5
TYPICAL PARKING	2.75m x 5.75m	252
		269
BUILDING E & F		
ACCESSIBLE PARKING	4.5m x 5.75m	16
PARALLEL PARKING	2.75m x 6.7m	1
TANDEM PARKING	2.75m x 5.75m	6
TYPICAL PARKING	2.75m x 5.75m	239
		262
BUILDING G & H		
TYPICAL PARKING	2.75m x 5.75m	40
		40
BUILDING I & J		
TYPICAL PARKING	2.75m x 5.75m	18
		18
BUILDING K, L, & M		
TYPICAL PARKING	2.75m x 5.75m	30
		30
BUILDING N,O,P,Q		
TYPICAL PARKING	2.75m x 5.75m	46
		46
		1314

PARKING STATISTICS

PARKING SCHEDULE - BUILDING A & B	
Type	Count
U/G P1	
4.5 m with transfer space- Accessible	13
TYPICAL PARKING SPACE	209
TYPICAL PARKING SPACE - TANDEM	1
	223
U/G P2	
4.5 m with transfer space- Accessible	13
TYPICAL PARKING SPACE	389
TYPICAL PARKING SPACE - PARALLE PARKING	4
TYPICAL PARKING SPACE - TANDEM	1
	407
	630

BUILDING A & B
429 UNITS (18 STOREYS) = 429

PARKING REQUIREMENTS
1.25 SPACES FOR DWELLING UNIT

429 x 1.25 = 536.25
=
536 PARKING SPACES REQUIRED IN TOTAL

ONE ACCESSIBLE PARKING SPACE SHALL BE PROVIDED PER 20 PARKING SPACES

536 / 20 = 26.8 (27) ACCESSIBLE PARKING

RESTAURANT = 1 SPACE FOR EACH 4.5 SQUARE METERS OF PUBLIC GROSS FLOOR AREA WITH A MINIMUM OF 10 SPACES

RESTAURANT = (5277sf) 490 sm / 4.5 = 108.8

536 + 109 = 645 SPOTS NEEDED

PARKING SCHEDULE - BUILDING C & D	
Type	Count
U/G P1	
4.5 m with transfer space- Accessible	12
TYPICAL PARKING SPACE	234
TYPICAL PARKING SPACE - PARALLE PARKING	5
	251
U/G P2	
TYPICAL PARKING SPACE	18
	18
	269

186 UNITS (10 STOREYS) x 2 = 372
BUILDING C & D

PARKING REQUIREMENTS
1.25 SPACES FOR DWELLING UNIT

372 x 1.25 = 465
=
465 PARKING SPACES REQUIRED IN TOTAL

ONE ACCESSIBLE PARKING SPACE SHALL BE PROVIDED PER 20 PARKING SPACES

465 / 20 =23.25 (23) ACCESSIBLE PARKING

COMMERCIAL = 1 SPACE FOR EACH 28 SQUARE METERS

COMMERCIAL = (7300sf x 2 = 14,600sf) 1356 sm / 28 = 48 PARKING SPOTS

465 + 48 = 513 SPOTS NEEDED

PARKING LEVEL
UNITS = 429 + 372 = 801 x 1.25 = 1001 PARKING SPACES NEEDED (2 + LEVELS OF PARKING REQUIRED)
RESTAURANT + COMMERCIAL = 109 + 513 = 622 SPOTS NEEDED

PARKING SCHEDULE - BUILDING E & F	
Type	Count
U/G P1	
4.5 m with transfer space- Accessible	16
TYPICAL PARKING SPACE	239
TYPICAL PARKING SPACE - PARALLE PARKING	1
TYPICAL PARKING SPACE - TANDEM	6
	262
	262

BUILDING E & F
197 UNITS (10 STOREYS) x 2 = 394

PARKING REQUIREMENTS
1.25 SPACES FOR DWELLING UNIT

394 x 1.25 = 492.5
=
493 PARKING SPACES REQUIRED IN TOTAL

ONE ACCESSIBLE PARKING SPACE SHALL BE PROVIDED PER 20 PARKING SPACES

493 / 20 =24.65 (25) ACCESSIBLE PARKING

COMMERCIAL= 1 SPACE FOR EACH 28 SQUARE METERS

COMMERCIAL = (11,432 sf x 2 = 22,864sf) 2,124 sm / 28 = 76

394 + 76 = 470 SPOTS NEEDED

PARKING LEVEL
UNITS = 493 PARKING SPACES NEEDED (2 LEVELS OF PARKING REQUIRED)
COMMERICAL = 76

PARKING SCHEDULE - BUILDING G	
Type	Count
U/G P1	
TYPICAL PARKING SPACE	40
	40
	40

BUILDING G
10 UNITS = 10

PARKING REQUIREMENTS
2 SPACES FOR DWELLING UNIT

10 x 2 = 20
=
20 PARKING SPACES

BUILDING AREA FOR BUILDING G

PER UNIT = 1639 sf
FLOOR 1 = 385 sf
FLOOR 2 = 627 sf
FLOOR 3 = 627 sf

PARKING SCHEDULE - BUILDING H, I, & J	
Type	Count
T/O GROUND FLOOR	
TYPICAL PARKING SPACE	8
	8
U/G P1	
TYPICAL PARKING SPACE	10
	10
	18

BUILDING H, I & J
18 UNITS = 18

PARKING REQUIREMENTS
2 SPACES FOR DWELLING UNIT

18 x 2 = 36
=
36 PARKING SPACES

BUILDING AREA FOR BUILDINGS H, I, & J

PER UNIT = 3111 sf
FLOOR 1 = 789 sf
FLOOR 2 = 1161 sf
FLOOR 3 = 1161 sf

H(A)

PER UNIT = 4178 sf
FLOOR 1 = 1160 sf
FLOOR 2 = 1509 sf
FLOOR 3 = 1509 sf

PARKING SCHEDULE - BUILDING K, L, M & N	
Type	Count
T/O GROUND FLOOR	
TYPICAL PARKING SPACE	30
	30
	30

BUILDING K, L, M & N
23 UNITS = 23

PARKING REQUIREMENTS
2 SPACES FOR DWELLING UNIT

23 x 2 = 46
=
46 PARKING SPACES

BUILDING AREA FOR BUILDINGS K, L, M, & N

PER UNIT = 2982 sf
FLOOR 1 = 660 sf
FLOOR 2 = 1161 sf
FLOOR 3 = 1161 sf

TOTAL UNIT COUNT

A & B = 429
C & D = 372
E & F = 394
G = 10
H, I , J = 18
K, L, M, N = 23

TOTAL UNITS = 1246

SITE STATISTICS

SITE STATISTICS - BLOCK 1			
DESCRIPTION	AREA (SM)	AREA (SF)	PERCENTAGE
BUILDING FOOTPRINT			
BUILDING FOOTPRINT	8129.41 m²	87504 ft²	33.0%
	8129.41 m²	87504 ft²	33.0%
HARD LANDSCAPE			
ASPHALT	3358.34 m²	36149 ft²	13.6%
SIDEWALK	1942.02 m²	20904 ft²	7.9%
	5300.35 m²	57053 ft²	21.5%
SOFT LANDSCAPE			
GRASS	10715.02 m²	115335 ft²	43.5%
PAVERS	465.97 m²	5016 ft²	1.9%
	11180.99 m²	120351 ft²	45.4%
	24610.75 m²	264908 ft²	100.0%
SITE TOTAL	27070.74 m²	291387 ft²	100.0%

SITE STATISTICS - BLOCK 2			
DESCRIPTION	AREA (SM)	AREA (SF)	PERCENTAGE
BUILDING FOOTPRINT			
BUILDING FOOTPRINT	4635.68 m²	49898 ft²	38.0%
	4635.68 m²	49898 ft²	38.0%
HARD LANDSCAPE			
ASPHALT	4020.16 m²	43273 ft²	33.0%
CURB	159.67 m²	1719 ft²	1.3%
SIDEWALK	1037.19 m²	11164 ft²	8.5%
	5217.01 m²	56155 ft²	42.8%
SOFT LANDSCAPE			
GRASS	2253.37 m²	24255 ft²	18.5%
PAVERS	81.12 m²	873 ft²	0.7%
	2334.49 m²	25128 ft²	19.2%
	12187.18 m²	131182 ft²	100.0%
SITE TOTAL	17365.96 m²	186926 ft²	100.0%

Chamberlain
Architects Constructors Managers

Chamberlain Architect Services Limited

4671 Palladium Way (Unit 1)
Burlington, Ontario. L7M 0W9
CANADA

Phone: 905.631.7777

www.chamberlainIPD.com

NO.	ISSUED	DATE
	CLIENT REVIEW	FEB, 21 2018
	CLIENT REVIEW	MARCH 13 2018
	CLIENT REVIEW	MARCH 21 2018
	CLIENT MEETING	MARCH 26 2018
	CLIENT REVIEW	MAY 4TH 2018

CLIENT
Owner

SEAL

CONSTRUCTION NORTH
TRUE NORTH

PROJECT
LOSANI HOMES

GRIMBSY, ONTARIO

SHEET NAME
SITE PLAN

START DATE	Issue Date
DRAWN BY	CMC / ME
CHECKED BY	JM
SCALE	1 : 500
PROJECT NO.	118004

DRAWING
A001

C:\Users\ccosta\Documents\118004 - Losani Homes - 2018-04-05-Newest File with Freds Changes - Current_ccosta.rvt
5/4/2018 11:05:01 AM

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Appendix B

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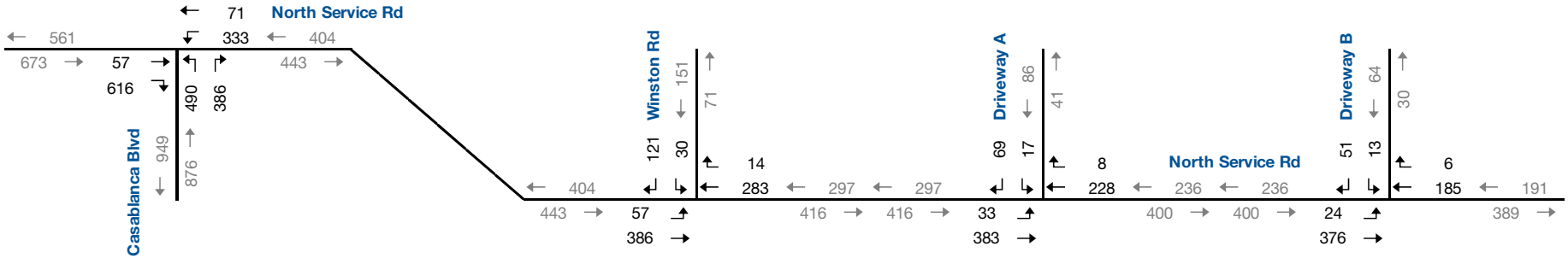
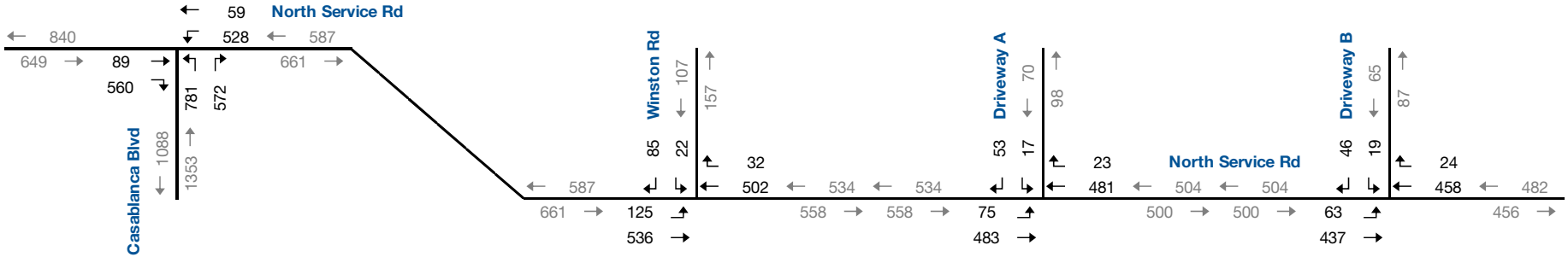
Highway	Location Description From	Location Description To	Dist. (KM)	2016 AADT
QEW	FORT ERIE-GODERICH ST-PEACE BRIDGE PLAZA	CENTRAL AV IC	0.2	14,600
QEW	CENTRAL AV IC	CONCESSION RD IC-1	0.9	18,700
QEW	CONCESSION RD IC-1	THOMPSON RD IC-2	1.0	15,500
QEW	THOMPSON RD IC-2	GILMORE RD IC-5	2.4	17,700
QEW	GILMORE RD IC-5	BOWEN RD IC-7	2.0	24,200
QEW	BOWEN RD IC-7	NETHERBY RD IC-12 NIAGARA FALLS LTS	5.5	25,700
QEW	NETHERBY RD IC-12 NIAGARA FALLS LTS	SODOM RD IC-16	3.2	22,000
QEW	SODOM RD IC-16	LYONS CREEK RD IC-21	6.6	29,000
QEW	LYONS CREEK RD IC-21	MCLEOD RD IC-27	4.4	36,700
QEW	MCLEOD RD IC-27	HWY 420 IC-30	2.9	45,100
QEW	HWY 420 IC-30	THOROLD STONE RD IC-32	2.0	70,400
QEW	THOROLD STONE RD IC-32	MOUNTAIN RD IC-34	2.5	67,400
QEW	MOUNTAIN RD IC-34	HWY 405(WBL)IC-37	2.4	71,000
QEW	HWY 405(WBL)IC-37	GLENDALE AV IC-38	1.3	88,100
QEW	GLENDALE AV IC-38	NIAGARA ST SERVICE RDS	4.8	90,500
QEW	NIAGARA ST SERVICE RDS	NIAGARA ST IC-44	1.2	78,600
QEW	NIAGARA ST IC-44	LAKE ST IC-46	1.6	81,900
QEW	LAKE ST IC-46	ONTARIO ST IC-47	1.3	117,000
QEW	ONTARIO ST IC-47	MARTINDALE RD IC-48	0.7	97,400
QEW	MARTINDALE RD IC-48	HWY 406 IC-49	0.7	74,400
QEW	HWY 406 IC-49	SEVENTH ST IC-51	1.9	97,100
QEW	SEVENTH ST IC-51	JORDAN RD IC-55	4.3	98,100
QEW	JORDAN RD IC-55	VICTORIA AV IC-57	2.8	104,300
QEW	VICTORIA AV IC-57	ONTARIO ST IC-64	6.7	105,100
QEW	ONTARIO ST IC-64	BARTLETT AV IC-68	3.8	99,800
QEW	BARTLETT AV IC-68	MAPLE AV IC-71	2.5	99,300
QEW	MAPLE AV IC-71	CASABLANCA BV IC-74	3.6	107,100
QEW	CASABLANCA BV IC-74	FIFTY RD IC-78	3.5	112,300
QEW	FIFTY RD IC-78	FRUITLAND RD IC-83	5.1	120,300
QEW	FRUITLAND RD IC-83	HAMILTON 20 IC 88-CENTENNIAL PKWY	5.2	119,000
QEW	HAMILTON 20 IC 88-CENTENNIAL PKWY	BURLINGTON ST IC-89	1.6	130,000
QEW	BURLINGTON ST IC-89	EASTPORT RD IC-93 (7189)	4.0	135,000
QEW	EASTPORT RD IC-93 (7189)	HAMILTON HARBOUR ENTRANCE	0.9	149,400
QEW	HAMILTON HARBOUR ENTRANCE	NORTH SHORE BLVD IC 97	2.3	271,300
QEW	NORTH SHORE BLVD IC 97	FAIRVIEW ST IC-99	2.3	161,300
QEW	FAIRVIEW ST IC-99	HWY 403/407 IC-100	1.0	172,900
QEW	HWY 403/407 IC-100	BRANT ST IC 101	0.8	164,300
QEW	BRANT ST IC 101	GUELPH LINE IC-102	1.8	162,100
QEW	GUELPH LINE IC-102	WALKERS LINE IC-105	2.0	195,000
QEW	WALKERS LINE IC-105	APPLEBY LINE IC-107	2.0	190,000
QEW	APPLEBY LINE IC-107	BURLOAK DR IC-109	1.9	195,000
QEW	BURLOAK DR IC-109	BRONTE SERVICE RD IC-110	1.5	204,000
QEW	BRONTE SERVICE RD IC-110	REG. RD 25(N) BRONTE RD(S) IC-111	0.4	202,200
QEW	REG. RD 25(N) BRONTE RD(S) IC-111	THIRD LINE RD IC 113	2.0	191,300

AM Peak Hour



PM Peak Hour



NTS

Year 2026 Total Traffic Forecast

Fifth Wheel Lands TIS
170205

Figure 2

Casablanca Blvd @ North Service Rd

Total Count Diagram

Municipality: Grimsby
Site #: 0000000002
Intersection: North Service Rd & Casablanca Blv
TFR File #: 3
Count date: 17-Sep-2014

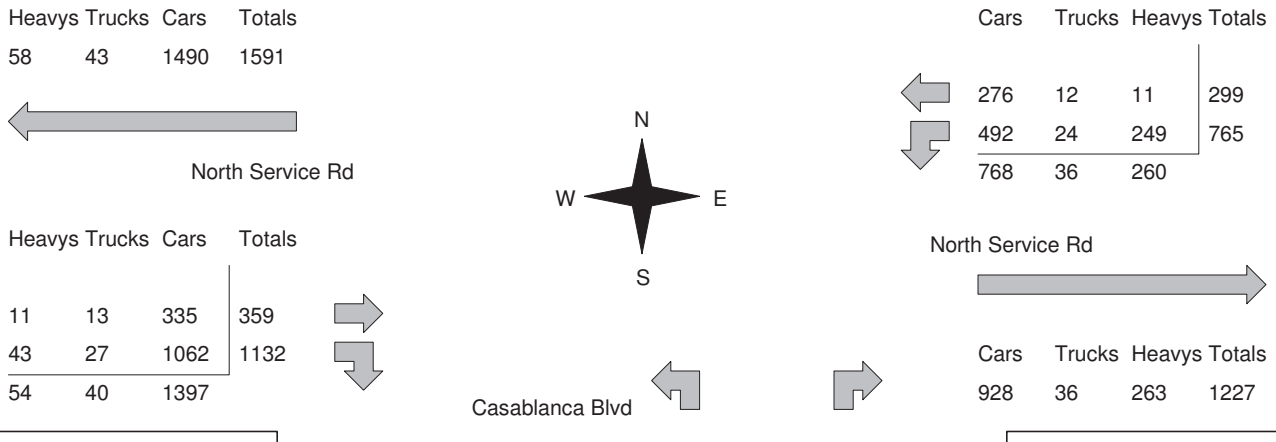
Weather conditions:
Sunny/Dry

Person(s) who counted:
Ken

**** Non-Signalized Intersection ****

Major Road: North Service Rd runs W/E

East Leg Total: 2291
East Entering: 1064
East Peds: 1
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 0
West Entering: 1491
West Leg Total: 3082

Cars 1554
Trucks 51
Heavys 292
Totals 1897

Cars 1214 593 1807
Trucks 31 23 54
Heavys 47 252 299
Totals 1292 868

Peds Cross: ⋈
South Peds: 0
South Entering: 2160
South Leg Total: 4057

Comments

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O R N A M E N T - Sound Power Emissions & Source Heights

Ontario Road Noise Analysis Method for Environment and Transportation

Road Segment ID	Roadway Name	Link Description	Speed (kph)	Period (h)	Auto	Med	Heavy	Road Gradient (%)	Cadna/A Ground Absorption G	PWL (dBA)	Source Height, s (m)
QEW_avg_D	QEW (1 direction)	Transportation Day Impacts	100	16	49897	1648	4944	0	0.00	**96.4**	**1.7**
QEW_avg_N	QEW (1 direction)	Transportation Night Impacts	100	8	8697	287	862	0	0.00	**91.8**	**1.7**
								0	0.00	**#DIV/0!**	**#DIV/0!**
NService_avg_D	N Service Road	Transportation Day Impacts	60	16	10548	249	217	0	0.00	**81.3**	**1.2**
NService_avg_N	N Service Road	Transportation Night Impacts	60	8	1838	43	38	0	0.00	**76.7**	**1.2**
								0	0.00	**#DIV/0!**	**#DIV/0!**
Casablanca_avg_D	Casablanca Blvd	Ambient Day Impacts	60	16	20631	488	424	0	0.00	**84.2**	**1.2**
Casablanca_avg_N	Casablanca Blvd	Ambient Evening Impacts	60	8	3596	85	74	0	0.00	**79.6**	**1.2**
								0	0.00	**#DIV/0!**	**#DIV/0!**
								0	0.00	**#DIV/0!**	**#DIV/0!**
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Appendix C

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BPN 56 Calculation Procedure - Required Glazing STC Rating (Fixed Veneer)

ROADWAY

Fifth Wheel, Grimsby - Project 17-0186

DAYTIME

		Sound Levels				Room / Façade Inputs										Source Inputs			Veneer - Component 1						Glazing - Component 2					
Receptor ID	Receptor Description	Façade Sound Level: (dBA)	Free - field Correction: (dBA)	Required Indoor Sound Level: (dBA)	Required Noise Reduction: (dBA)	Glazing as % of Wall Area	Exposed Wall Height (m)	Exposed Wall Length (m)	Room Depth (m)	Total Floor Area (m^2)	Veneer Wall Area (m^2)	Glazing Wall Area (m^2)	Veneer as % of Floor Area: (%)	Glazing as % of Floor Area: (%)	Room Absorption:	Incident Sound Angle: (deg)	Angle Correction Factor:	Spectrum type:	Assumed Veneer STC (STC)	Component Category:	Room Correction	Frequency Correction	Sound Energy Correction	% Total Transmitted Energy (%)	Component Category:	Room Correction	Frequency Correction	% Total Transmitted Energy (%)	Sound Energy Correction	Require Glazing STC (STC)
BldgA_W_LvgRm	Building A, West Façade, Living Room	71	3	45	29	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	24	5	C. sealed thin window, or openable thick window	-5	4	95	0	**28**
BldgA_S_LvgRm	Building A, South Façade, Living Room	70	3	45	28	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	25	5	C. sealed thin window, or openable thick window	-5	4	95	0	**27**
BldgA_W_Bdrm	Building A, West Façade, Bedroom	71	3	45	29	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	21	5	C. sealed thin window, or openable thick window	-2	4	95	0	**31**
BldgA_S_Bdrm	Building A, South Façade, Bedroom	70	3	45	28	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	22	5	C. sealed thin window, or openable thick window	-2	4	95	0	**30**
BldgB_N_LvgRm	Building B, North Façade Living Room	67	3	45	25	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	28	5	C. sealed thin window, or openable thick window	-5	4	95	0	**24**
BldgB_S_LvgRm	Building B, South Façade Living Room	72	3	45	30	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	23	5	C. sealed thin window, or openable thick window	-5	4	95	0	**29**
BldgB_W_LvgRm	Building B, West Façade Living Room	73	3	45	31	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	22	5	C. sealed thin window, or openable thick window	-5	4	95	0	**30**
BldgB_N_Bdrm	Building B, North Façade Bedroom	67	3	45	25	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	25	5	C. sealed thin window, or openable thick window	-2	4	95	0	**27**
BldgB_S_Bdrm	Building B, South Façade Bedroom	72	3	45	30	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	20	5	C. sealed thin window, or openable thick window	-2	4	95	0	**32**
BldgB_W_Bdrm	Building B, West Façade Bedroom	73	3	45	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgABPodBPod_W_LvgRm	Buidling A+B Podium, West Façade, Living Room	73	3	45	31	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	22	5	C. sealed thin window, or openable thick window	-5	4	95	0	**30**
BldgABPod_W_Bdrm	Buidling A+B Podium, West Façade, Bedroom	73	3	45	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgC_N_LvgRm	Building C, North Façade Living Room	70	3	45	28	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	25	5	C. sealed thin window, or openable thick window	-5	4	95	0	**27**
BldgC_W_LvgRm	Building C, West Façade Living Room	75	3	45	33	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	20	5	C. sealed thin window, or openable thick window	-5	4	95	0	**32**
BldgC_S_LvgRmUpper	Building C, South Façade Living Room, Floors 7+	73	3	45	31	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	22	5	C. sealed thin window, or openable thick window	-5	4	95	0	**30**
BldgC_S_LvgRmLower	Building C, South Façade Living Room, Floors 1 to 6	74	3	45	32	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	21	5	C. sealed thin window, or openable thick window	-5	4	95	0	**31**
BldgC_N_Bdrm	Building C, North Façade Bedroom	70	3	45	28	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	22	5	C. sealed thin window, or openable thick window	-2	4	95	0	**30**
BldgC_W_Bdrm	Building C, West Façade Bedroom	75	3	45	33	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	17	5	C. sealed thin window, or openable thick window	-2	4	95	0	**35**
BldgC_S_BdrmUpper	Building C, South Façade Bedroom, Floors 7+	73	3	45	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgC_S_BdrmLower	Building C, South Façade Bedroom, Floors 1 to 6	74	3	45	32	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	18	5	C. sealed thin window, or openable thick window	-2	4	95	0	**34**
BldgD_E_LvgRm	Building D, East Façade Living Room	73	3	45	31	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	22	5	C. sealed thin window, or openable thick window	-5	4	95	0	**30**
BldgD_S_LvgRm	Building D, South Façade Living Room	77	3	45	35	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	18	5	C. sealed thin window, or openable thick window	-5	4	95	0	**34**
BldgD_W_LvgRmUpper	Building D, West Façade Living Room, Floors 7+	72	3	45	30	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	23	5	C. sealed thin window, or openable thick window	-5	4	95	0	**29**
BldgD_W_LvgRmLower	Building D, West Façade Living Room, Floors 1 to 6	74	3	45	32	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	21	5	C. sealed thin window, or openable thick window	-5	4	95	0	**31**
BldgD_E_Bdrm	Building D, East Façade Bedroom	73	3	45	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgD_S_Bdrm	Building D, South Façade Bedroom	77	3	45	35	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	15	5	C. sealed thin window, or openable thick window	-2	4	95	0	**37**
BldgD_W_BdrmUpper	Building D, West Façade Bedroom, Floors 7+	72	3	45	30	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	20	5	C. sealed thin window, or openable thick window	-2	4	95	0	**32**
BldgD_W_BdrmLower	Building D, West Façade Bedroom, Floors 1 to 6	74	3	45	32	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	18	5	C. sealed thin window, or openable thick window	-2	4	95	0	**34**
BldgE_E_LvgRmUpper	Building E, East Façade Living Room, Floors 7+	73	3	45	31	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	22	5	C. sealed thin window, or openable thick window	-5	4	95	0	**30**
BldgE_E_LvgRmLower	Building E, East Façade Living Room, Floors 1 to 6	73	3	45	31	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	22	5	C. sealed thin window, or openable thick window	-5	4	95	0	**30**
BldgE_S_LvgRm	Building E, South Façade Living Room	77	3	45	35	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	18	5	C. sealed thin window, or openable thick window	-5	4	95	0	**34**
BldgE_W_LvgRm	Building E, West Façade Living Room	74	3	45	32	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	21	5	C. sealed thin window, or openable thick window	-5	4	95	0	**31**
BldgE_E_BdrmUpper	Building E, East Façade Bedroom, Floors 7+	73	3	45	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgE_E_Bdrm, Lower	Building E, East Façade Bedroom, Floors 1 to 6	73	3	45	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgE_S_Bdrm	Building E, South Façade Bedroom	77	3	45	35	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	15	5	C. sealed thin window, or openable thick window	-2	4	95	0	**37**
BldgE_W_Bdrm	Building E, West Façade Bedroom	74	3	45	32	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	18	5	C. sealed thin window, or openable thick window	-2	4	95	0	**34**
BldgF_E_LvgRm	Building F, East Façade Living Room	74	3	45	32	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	21	5	C. sealed thin window, or openable thick window	-5	4	95	0	**31**
BldgF_S_LvgRm	Building F, South Façade Living Room	77	3	45	35	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	18	5	C. sealed thin window, or openable thick window	-5	4	95	0	**34**
BldgF_W_LvgRmUpper	Building F, West Façade Living Room, Floors 7+	73	3	45	31	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	22	5	C. sealed thin window, or openable thick window	-5	4	95	0	**30**
BldgF_W_LvgRmLower	Building F, West Façade Living Room, Floors 1 to 6	73	3	45	31	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	22	5	C. sealed thin window, or openable thick window	-5	4	95	0	**30**
BldgF_E_Bdrm	Building F, East Façade Bedroom	74	3	45	32	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	18	5	C. sealed thin window, or openable thick window	-2	4	95	0	**34**
BldgF_S_Bdrm	Building F, South Façade Bedroom	77	3	45	35	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	15	5	C. sealed thin window, or openable thick window	-2	4	95	0	**37**
BldgF_W_BdrmUpper	Building F, West Façade Bedroom, Floors 7+	73	3	45	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgF_W_BdrmLower	Building F, West Façade Bedroom, Floors 1 to 6	73	3	45	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**

NIGHT-TIME

Receptor ID	Receptor Description	Façade Sound Level: (dBA)	Free - field Correction: (dBA)	Required Indoor Sound Level: (dBA)	Required Noise Reduction: (dBA)	Glazing as % of Wall Area	Exposed Wall Height (m)	Exposed Wall Length (m)	Room Depth (m)	Total Floor Area (m^2)	Veneer Wall Area (m^2)	Glazing Wall Area (m^2)	Veneer as % of Floor Area: (%)	Glazing as % of Floor Area: (%)	Room Absorption:	Incident Sound Angle: (deg)	Angle Correction Factor:	Spectrum type:	Assumed Veneer STC (STC)	Component Category:	Room Correction	Frequency Correction	Sound Energy Correction	% Total Transmitted Energy (%)	Component Category:	Room Correction	Frequency Correction	% Total Transmitted Energy (%)	Sound Energy Correction	Require Glazing STC (STC)
BldgA_W_LvgRm	Building A, West Façade, Living Room	66	3	45	24	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	29	5	C. sealed thin window, or openable thick window	-5	4	95	0	**23**
BldgA_S_LvgRm	Building A, South Façade, Living Room	65	3	45	23	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	30	5	C. sealed thin window, or openable thick window	-5	4	95	0	**22**
BldgA_W_Bdrm	Building A, West Façade, Bedroom	66	3	40	29	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	21	5	C. sealed thin window, or openable thick window	-2	4	95	0	**31**
BldgA_S_Bdrm	Building A, South Façade, Bedroom	65	3	40	28	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	22	5	C. sealed thin window, or openable thick window	-2	4	95	0	**30**
BldgB_N_LvgRm	Building B, North Façade Living Room	62	3	45	20	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	33	5	C. sealed thin window, or openable thick window	-5	4	95	0	**19**
BldgB_S_LvgRm	Building B, South Façade Living Room	67	3	45	25	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	28	5	C. sealed thin window, or openable thick window	-5	4	95	0	**24**
BldgB_W_LvgRm	Building B, West Façade Living Room	69	3	45	27	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	26	5	C. sealed thin window, or openable thick window	-5	4	95	0	**26**
BldgB_N_Bdrm	Building B, North Façade Bedroom	62	3	40	25	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	25	5	C. sealed thin window, or openable thick window	-2	4	95	0	**27**
BldgB_S_Bdrm	Building B, South Façade Bedroom	67	3	40	30	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	20	5	C. sealed thin window, or openable thick window	-2	4	95	0	**32**
BldgB_W_Bdrm	Building B, West Façade Bedroom	69	3	40	32	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	18	5	C. sealed thin window, or openable thick window	-2	4	95	0	**34**
BldgABPodBPod_W_LvgRm	Buidling A+B Podium, West Façade, Living Room	68	3	45	26	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	27	5	C. sealed thin window, or openable thick window	-5	4	95	0	**25**
BldgABPod_W_Bdrm	Buidling A+B Podium, West Façade, Bedroom	68	3	40	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgC_N_LvgRm	Building C, North Façade Living Room	66	3	45	24	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	29	5	C. sealed thin window, or openable thick window	-5	4	95	0	**23**
BldgC_W_LvgRm	Building C, West Façade Living Room	71	3	45	29	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	55	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	25	5	C. sealed thin window, or openable thick window	-5	4	95	0	**28**
BldgC_S_LvgRmUpper	Building C, South Façade Living Room, Floors 7+	68	3	45	26	55%	2.95	6.0	3.0	18.0	8.0	9.7	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	24	5	C. sealed thin window, or openable thick window	-2	4	95	0	**28**
BldgC_S_LvgRmLower	Building C, South Façade Living Room, Floors 1 to 6	69	3	45	27	55%	2.95	6.0	3.0	18.0	8.0	9.7	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	23	5	C. sealed thin window, or openable thick window	-2	4	95	0	**29**
BldgC_N_Bdrm	Building C, North Façade Bedroom	66	3	40	29	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	21	5	C. sealed thin window, or openable thick window	-2	4	95	0	**31**
BldgC_W_Bdrm	Building C, West Façade Bedroom	71	3	40	34	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	16	5	C. sealed thin window, or openable thick window	-2	4	95	0	**36**
BldgC_S_BdrmUpper	Building C, South Façade Bedroom, Floors 7+	68	3	40	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgC_S_BdrmLower	Building C, South Façade Bedroom, Floors 1 to 6	69	3	40	32	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	18	5	C. sealed thin window, or openable thick window	-2	4	95	0	**34**
BldgD_E_LvgRm	Building D, East Façade Living Room	68	3	45	26	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	27	5	C. sealed thin window, or openable thick window	-5	4	95	0	**25**
BldgD_S_LvgRm	Building D, South Façade Living Room	72	3	45	30	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	23	5	C. sealed thin window, or openable thick window	-5	4	95	0	**29**
BldgD_W_LvgRmUpper	Building D, West Façade Living Room, Floors 7+	68	3	45	26	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	27	5	C. sealed thin window, or openable thick window	-5	4	95	0	**25**
BldgD_W_LvgRmLower	Building D, West Façade Living Room, Floors 1 to 6	69	3	45	27	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	26	5	C. sealed thin window, or openable thick window	-5	4	95	0	**26**
BldgD_E_Bdrm	Building D, East Façade Bedroom	68	3	40	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgD_S_Bdrm	Building D, South Façade Bedroom	72	3	40	35	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	15	5	C. sealed thin window, or openable thick window	-2	4	95	0	**37**
BldgD_W_BdrmUpper	Building D, West Façade Bedroom, Floors 7+	68	3	40	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgD_W_BdrmLower	Building D, West Façade Bedroom, Floors 1 to 6	69	3	40	32	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	18	5	C. sealed thin window, or openable thick window	-2	4	95	0	**34**
BldgE_E_LvgRmUpper	Building E, East Façade Living Room, Floors 7+	68	3	45	26	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	27	5	C. sealed thin window, or openable thick window	-5	4	95	0	**25**
BldgE_E_LvgRmLower	Building E, East Façade Living Room, Floors 1 to 6	68	3	45	26	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	27	5	C. sealed thin window, or openable thick window	-5	4	95	0	**25**
BldgE_S_LvgRm	Building E, South Façade Living Room	72	3	45	30	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	23	5	C. sealed thin window, or openable thick window	-5	4	95	0	**29**
BldgE_W_LvgRm	Building E, West Façade Living Room	69	3	45	27	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	26	5	C. sealed thin window, or openable thick window	-5	4	95	0	**26**
BldgE_E_BdrmUpper	Building E, East Façade Bedroom, Floors 7+	68	3	40	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgE_E_Bdrm, Lower	Building E, East Façade Bedroom, Floors 1 to 6	68	3	40	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgE_S_Bdrm	Building E, South Façade Bedroom	72	3	40	35	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	15	5	C. sealed thin window, or openable thick window	-2	4	95	0	**37**
BldgE_W_Bdrm	Building E, West Façade Bedroom	69	3	40	32	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	18	5	C. sealed thin window, or openable thick window	-2	4	95	0	**34**
BldgF_E_LvgRm	Building F, East Façade Living Room	69	3	45	27	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	26	5	C. sealed thin window, or openable thick window	-5	4	95	0	**26**
BldgF_S_LvgRm	Building F, South Façade Living Room	72	3	45	30	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	23	5	C. sealed thin window, or openable thick window	-5	4	95	0	**29**
BldgF_W_LvgRmUpper	Building F, West Façade Living Room, Floors 7+	68	3	45	26	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	27	5	C. sealed thin window, or openable thick window	-5	4	95	0	**25**
BldgF_W_LvgRmLower	Building F, West Façade Living Room, Floors 1 to 6	68	3	45	26	55%	2.95	3.0	6.0	18.0	4.0	4.9	22	27	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-6	7	27	5	C. sealed thin window, or openable thick window	-5	4	95	0	**25**

Receptor ID	Receptor Description	Sound Levels				Room / Façade Inputs									Source Inputs			Veneer - Component 1						Glazing - Component 2					
		Façade Sound Level: (dBA)	Free - field Correction: (dBA)	Required Indoor Sound Level: (dBA)	Required Noise Reduction: (dBA)	Glazing as % of Wall Area	Exposed Wall Height (m)	Exposed Wall Length (m)	Room Depth (m)	Total Floor Area (m^2)	Veneer Wall Area (m^2)	Glazing Wall Area (m^2)	Veneer as % of Floor Area: (%)	Glazing as % of Floor Area: (%)	Room Absorption:	Incident Sound Angle: (deg)	Angle Correction Factor:	Spectrum type:	Assumed Veneer STC (STC)	Component Category:	Room Correction	Frequency Correction	Sound Energy Correction	% Total Transmitted Energy (%)	Component Category:	Room Correction	Frequency Correction	% Total Transmitted Energy (%)	Sound Energy Correction	Require Glazing STC (STC)
BldgF_E_Bdrm	Building F, East Façade Bedroom	69	3	40	32	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	18	5	C. sealed thin window, or openable thick window	-2	4	95	0	**34**
BldgF_S_Bdrm	Building F, South Façade Bedroom	72	3	40	35	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	15	5	C. sealed thin window, or openable thick window	-2	4	95	0	**37**
BldgF_W_BdrmUpper	Building F, West Façade Bedroom, Floors 7+	68	3	40	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**
BldgF_W_BdrmLower	Building F, West Façade Bedroom, Floors 1 to 6	68	3	40	31	55%	2.95	3.0	3.0	9.0	4.0	4.9	44	54	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-3	7	19	5	C. sealed thin window, or openable thick window	-2	4	95	0	**33**

BPN 56 Calculation Procedure - Required Glazing STC Rating (Fixed Veneer)

ROADWAY

Fifth Wheel, Grimsby - Project 17-0186

Receptor ID	Receptor Description	Sound Levels				Room / Façade Inputs										Source Inputs			Veneer - Component 1						Glazing - Component 2						
		Façade Sound Level: (dBA)	Free - field Correction: (dBA)	Required Indoor Sound Level: (dBA)	Required Noise Reduction: (dBA)	Glazing as % of Wall Area	Exposed Wall Height (m)	Exposed Wall Length (m)	Room Depth (m)	Total Floor Area (m^2)	Veneer Wall Area (m^2)	Glazing Wall Area (m^2)	Veneer as % of Floor Area: (%)	Glazing as % of Floor Area: (%)	Room Absorption:	Incident Sound Angle: (deg)	Angle Correction Factor:	Spectrum type:	Assumed Veneer STC (STC)	Component Category:	Room Correction	Frequency Correction	Sound Energy Correction	% Total Transmitted Energy (%)	Component Category:	Room Correction	Frequency Correction	% Total Transmitted Energy (%)	Sound Energy Correction	Require Glazing STC (STC)
DAYTIME																														
Bldng_G_LvgRm_S_midpspan	Building G Livingroom North Façade - Midspan	66	3	45	24	35%	2.95	6.0	15.0	90.0	11.5	6.2	13	7	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-8	7	31	5	C. sealed thin window, or openable thick window	-11	4	95	0	**17**
Bldng_G_BdRm_S_midpspan	Building G Bedroom North Façade - Midspan	66	3	45	24	35%	2.95	3.0	3.0	9.0	5.8	3.1	64	34	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-1	7	24	5	C. sealed thin window, or openable thick window	-4	4	95	0	**24**
Bldng_J_LvgRm_S_Corner_Day	Building J Livingroom South Façade - Corner	63	3	42	24	35%	2.95	6.0	15.0	90.0	11.5	6.2	13	7	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-8	7	31	5	C. sealed thin window, or openable thick window	-11	4	95	0	**17**
Bldng_J_LvgRm_W_Corner_Day	Building J Livingroom West Façade - Corner	66	3	42	27	35%	2.95	15.0	6.0	90.0	28.8	15.5	32	17	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-4	7	24	5	C. sealed thin window, or openable thick window	-7	4	95	0	**24**
Bldng_J_BdRm_W_Corner_Day	Building J Bedroom West Façade - Corner	66	3	45	24	35%	2.95	3.0	3.0	9.0	5.8	3.1	64	34	Intermediate	0 - 90	0	D. mixed road traffic, distant aircraft	54	D. sealed thick window, or exterior wall, or roof/ceiling	-1	7	24	5	C. sealed thin window, or openable thick window	-4	4	95	0	**24**

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