100 Stone Road West, Suite 201
Guelph, Ontario, N1G 5L3
226.706.8080 | www.slrconsulting.com

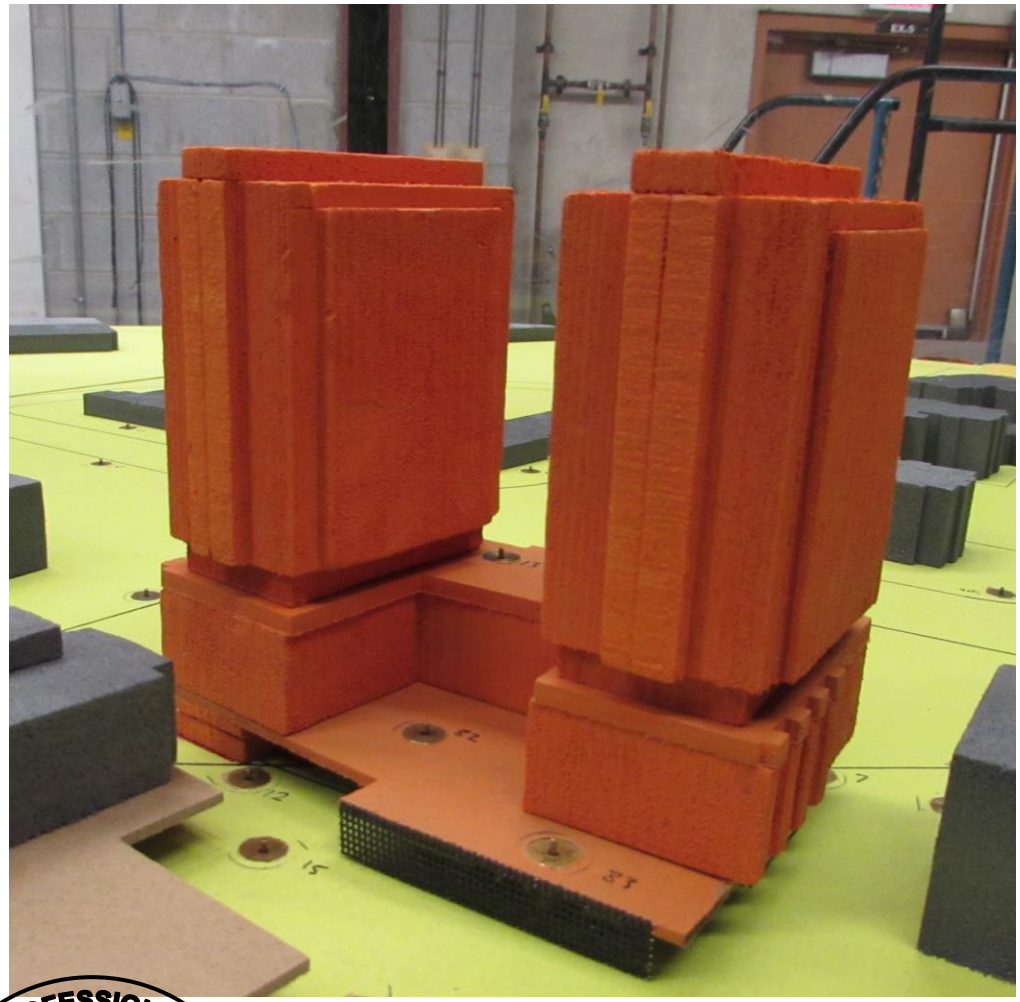
Date: May 31, 2022

To: Latch Developments Ltd.
2 Bloor Street West, Suite 700
Toronto, ON M4W 3E2

Re: **Pedestrian Wind Study**
1989 Appleby Line
Burlington, ON
SLR Project #241.30533.00000

Team: Nishat Nourin, M.Eng., P.Eng.
Microclimate Engineer

Tahrana Lovlin, MAES, P.Eng.
Principal – Microclimate



LICENSED PROFESSIONAL ENGINEER
N. NOURIN
100179358
31/05/2022
PROVINCE OF ONTARIO

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1.0 INTRODUCTION

SLR Consulting (Canada) Ltd. (SLR) was retained by Latch Developments Ltd. to conduct a pedestrian wind study for the proposed development at 1989 Appleby Line in Burlington, Ontario. This report is in support of the combined Official Plan Amendment (OPA) and Zoning Bylaw Amendment (ZBA) application for the development.

1.1 Existing Site

The proposed development is located at east corner of the intersection of Upper Middle Road and Appleby Line in Burlington, Ontario. The site is currently occupied by a gas station. Figure 1 provides an aerial view of the immediate study area. A virtual site visit was conducted by SLR using Google Earth images dated January 2022; some of these images are included in Figures 2a through 2d.

Immediately surrounding the site are mid and high-rise residential buildings to the northeast, east and southeast, and low-rise commercial developments in all other directions. Beyond the immediate surroundings are low-rise residential and commercial buildings in all directions.

Typically, developments with Site Plan Control approval and/or those currently under construction within a 500 radius are included as existing surroundings. For this assessment, the proposed development at 1900 Appleby Line was included.



Figure 1: Aerial view of existing site & surroundings
Credit: Google Earth Pro, dated June 2021

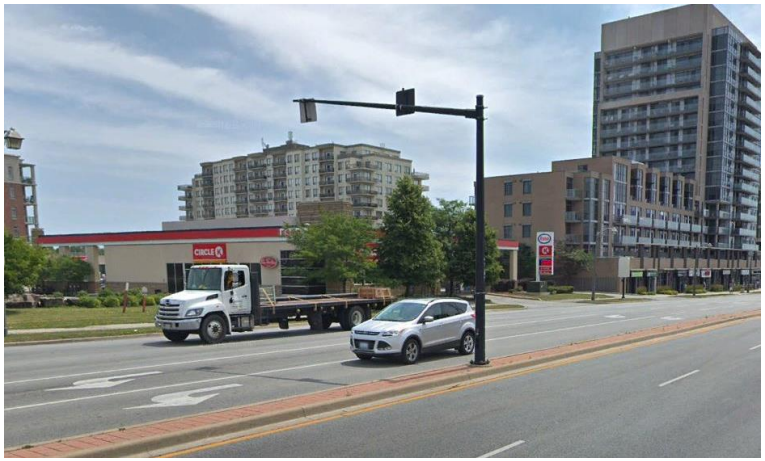


Figure 2a: Looking northeast at the site



Figure 2b: Looking northwest along Appleby Line (Site to the right)



Figure 2c: Looking southwest along Upper Middle Road

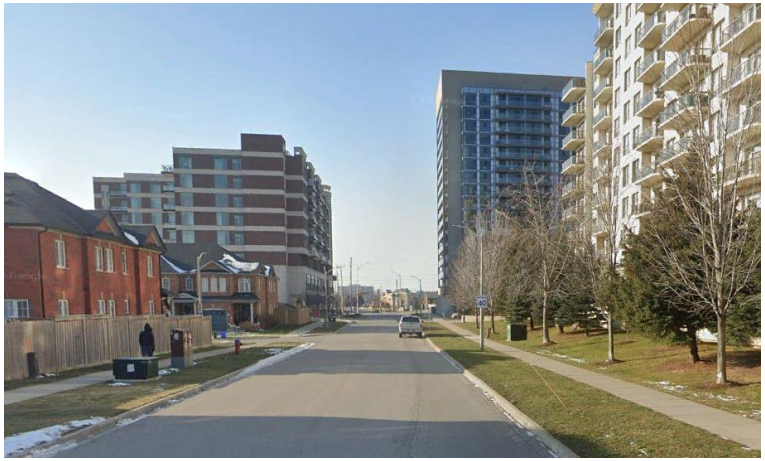


Figure 2d: Looking southwest along Ironstone Drive

1.2 Proposed Development

The proposed development includes two 20-storey towers connected by a six-storey podium with a one storey element along the south facade. A rendering of the proposed development is provided in Figure 3.

1.3 Areas of Interest

Areas of interest for pedestrian wind conditions include those areas which pedestrians are expected to use on a frequent basis. Typically, these include sidewalks, main entrances, transit stops, plazas and parks. There are several transit stops along Appleby Line and Upper Middle Road within the project's vicinity.

The main entrance to the proposed development is located on the west side, along Appleby Line. Retail entrance are located along the north and west sides and secondary entrances are on the east side of the development. On-site areas of interest are shown in Figure 4. In addition, outdoor amenity terraces of the proposed development are located on the second floor and 7th floor.

Note, Project North is approximately 46° clockwise from True North. When referring to the building, Project North is used; when referring to wind directions, True North is used.



Figure 3: Rendering of proposed development

Credit: RAW



Figure 4: Areas of interest – Main floor plan

2.0 APPROACH

The objective of the wind tunnel study is to assist the design team and City Planning officials in making informed decisions about the building form considered and its influence on pedestrian comfort. This quantitative analysis involves the construction of a physical model of the development and surrounding features that influence wind flow. The physical model is instrumented with probes and tested in a wind tunnel. Afterwards, the wind tunnel data are combined with regional meteorological data; this analysis is then compared to the relevant wind criteria and standards in order to determine how appropriate the wind conditions are for the intended pedestrian usage.

2.1 Scale Model Construction

A 1:400 scale model of the proposed 1989 Appleby Line Development was constructed based on up-to-date drawing information received by SLR on May 13, 2022, 2014;

The proximity model of the surrounding area was built in block form for a radius of approximately 480 m from the site centre. As existing buildings surrounding the site will influence wind characteristics, existing buildings, those under construction and those buildings with Site Plan Approval (SPA) were included in the model for both the Existing and Proposed Configurations. Information regarding which approved developments to include within the existing surrounds was determined using the City of Burlington website, as well as discussion with the design team. A list of the approved surrounding development applications was provided to the City Planner for review and comment. Grade differences within the limits of the model were found to be minor, thus the site was modeled as flat.

SLR tested two configurations in the wind tunnel. The descriptions are below:

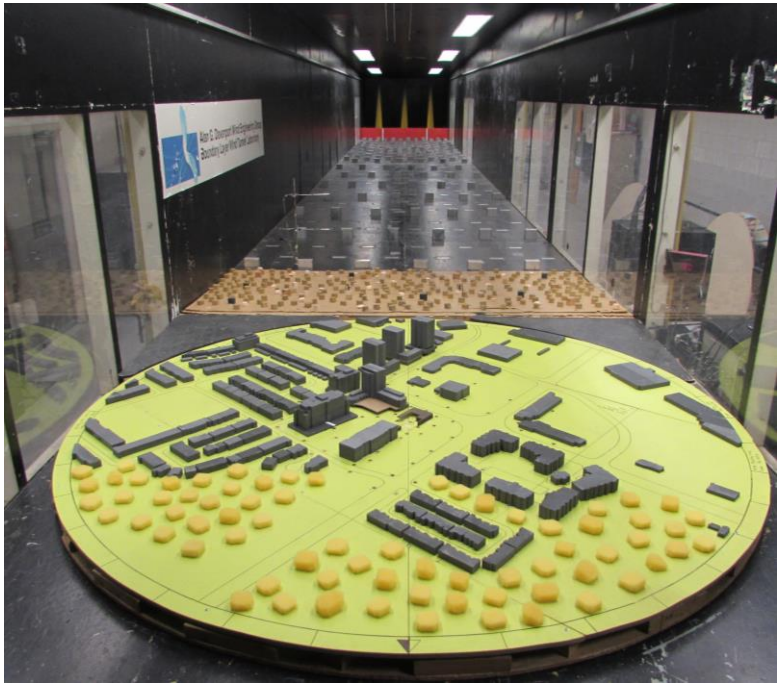
- **Existing Configuration:** Existing site and existing and approved surroundings.
- **Proposed Configuration:** Proposed development with existing and approved surroundings.

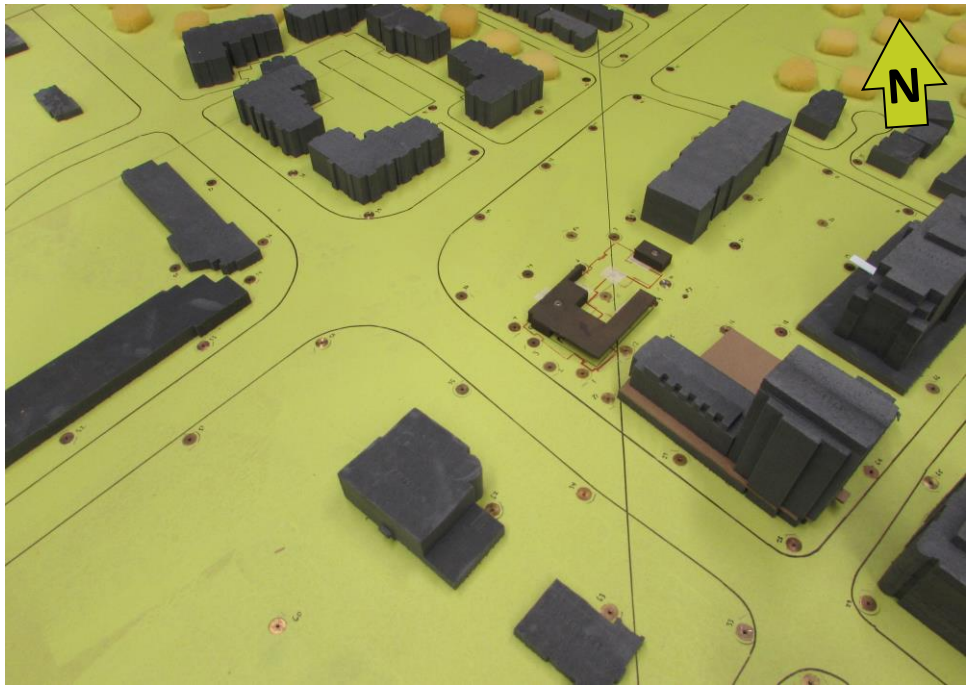
Photographs of the wind tunnel model showing both the Existing and Proposed Configurations are included in **Figures 5a** and **5b**.

2.2 Wind Tunnel

Wind tunnel tests were conducted in the Alan G. Davenport Wind Engineering Group Boundary-Layer Wind Tunnel Laboratory at the University of Western Ontario. The upstream test section of the wind tunnel included generic roughness blocks and turbulence-generating spires to modify the wind flow approaching the model. These features develop characteristics of the wind flow that are similar to the actual site. The test model is rotated on a turn-table to simulate different wind directions with the upstream terrain being changed as appropriate to reflect the various upwind conditions encountered around the site.

The test model was equipped with 82 omni-directional probes to record wind speed at the pedestrian-level (approximately 1.5 m above grade). The orientation of the model was rotated in 10° intervals on the turn-table to permit measurement of wind speed at each probe location for 36 wind directions. The wind tunnel data were then combined with the wind climate model for this region to predict the occurrence of wind speeds in the pedestrian realm and compare against wind criteria for comfort and safety.





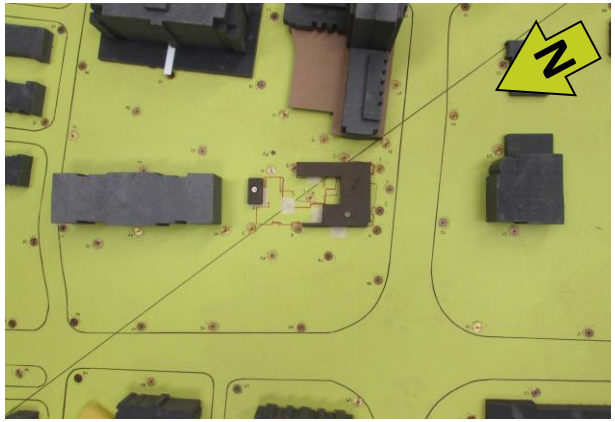
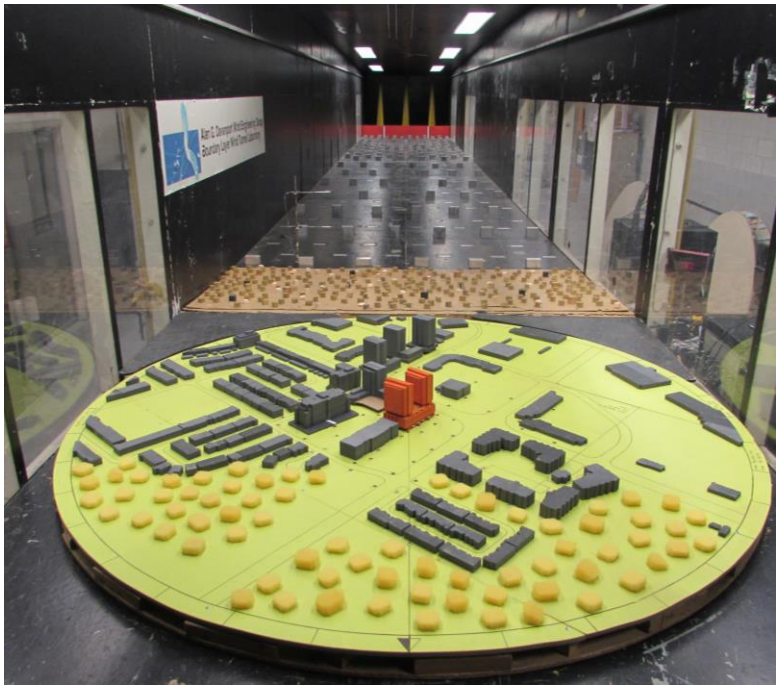
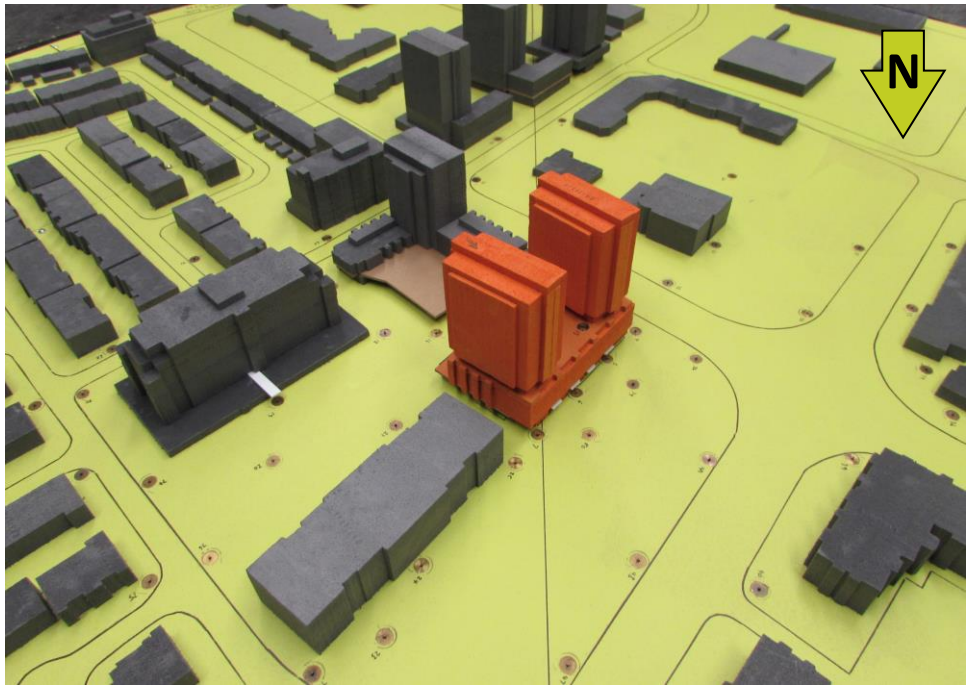


Figure 5a: Existing Configuration





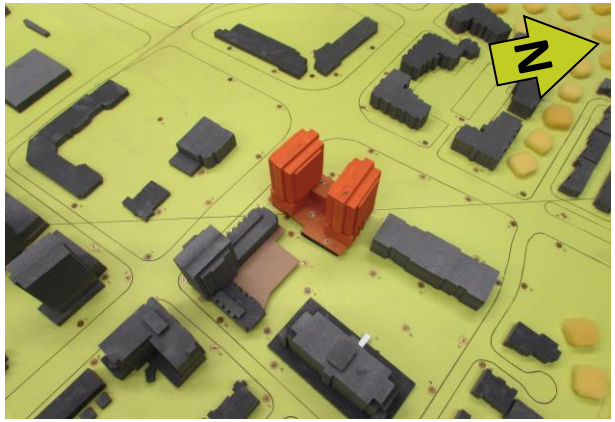


Figure 5b: Proposed Configuration

2.3 Wind Climate

Wind data recorded at John C. Munro International Airport in Hamilton for the period of 1993 to 2019 were obtained and analysed to create a wind climate model for the region. Annual and seasonal wind distribution diagrams ("wind roses") are shown in Figure 6. These diagrams illustrate the percentage of time wind blows from the 16 main compass directions. Of main interest are the longest peaks that identify the most frequently occurring wind directions. The annual wind rose indicates that wind approaching from the southwest and northeast quadrants are most prevalent. The seasonal wind roses readily show how the prevalent winds shift throughout the year. The seasonal wind roses show daytime winds, from 6:00 – 23:00, while the annual wind rose shows all hours.

The directions from which stronger winds (e.g., > 30 km/h) approach are also of interest as they have the highest potential of creating problematic wind conditions, depending upon site exposure and the building configurations. The wind roses in Figure 6 also identify the directional frequency of these stronger winds, as indicated in the figure's legend colour key. On an annual basis, strong winds occur from the southwest and northeast quadrants. All wind speeds and directions were included in the wind climate model.

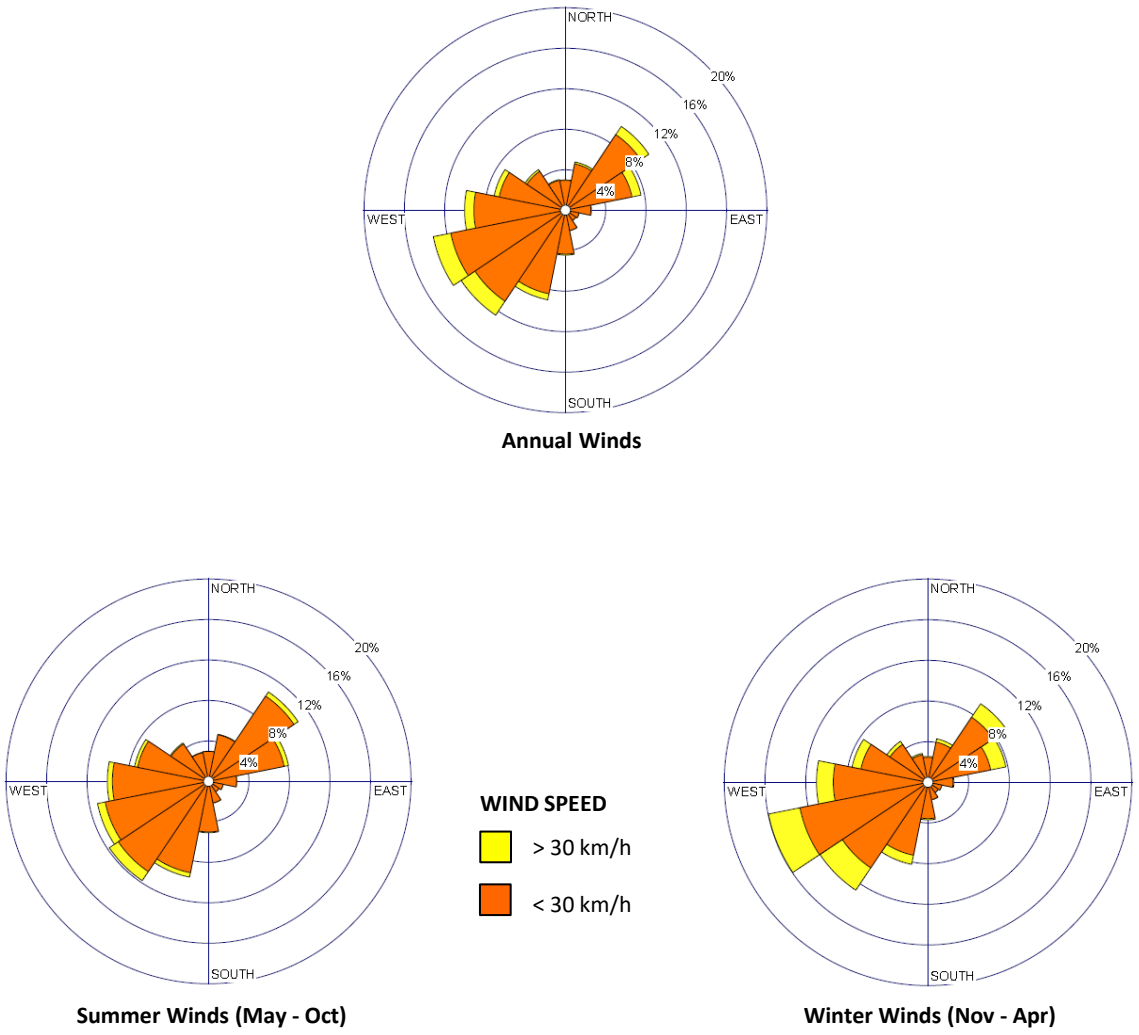


Figure 6: Wind Roses for John C. Munro International Airport (1993-2019, 6am–11pm)

3.0 PEDESTRIAN WIND CRITERIA

Wind comfort conditions are discussed in terms of being acceptable for certain pedestrian activities and are based on predicted wind force and the expected frequency of occurrence. Wind chill, clothing, humidity and exposure to direct sun, for example, all affect a person's thermal comfort; however, these influences are not considered in the wind comfort criteria.

The criteria utilized for this analysis is provided by the City of Burlington, in the document *Pedestrian Level Wind Study Guidelines and Terms of Reference (June 2020).* The comfort criteria, which is based on certain predicted hourly gust-equivalent mean (GEM) wind speeds being exceeded 20% of the time, are summarized in Table 1. By allowing for a 20% exceedance, it assumes wind speeds will be comfortable for the corresponding activity at least four out of five days. The comfort criteria consider only daytime hours, between 6:00am and 11:00pm. GEM is defined as the maximum mean wind speed or the gust wind speed divided by 1.85.

The criterion for wind safety in the table is based on hourly gust wind speeds that are exceeded nine hours per year (approximately 0.1% of the time). When more than one event is predicted annually, wind mitigation measures are then advised. The wind safety criterion is shown in Table 2.

Table 1: Wind Comfort Criteria

Activity	Comfort Ranges for GEM Wind Speed Exceeded 20% of the Time		Description of Wind Comfort
Sitting	0 to 10 km/h	0 to 2.8 m/s	Calm or light breezes desired for outdoor restaurants and seating areas where one can read a paper comfortably.
Standing	0 to 14 km/h	0 to 3.9 m/s	Gentle breezes suitable for main building entrances and transit stops.
Leisurely Walking	0 to 17 km/h	0 to 4.7 m/s	Moderate breezes suitable for walking along pedestrian thorough fares.
Fast Walking	0 to 20 km/h	0 to 5.6 m/s	Strong breezes that can be tolerated if one's objective is to walk, run or cycle without lingering.
Uncomfortable	> 20 km/h	> 5.6 m/s	Strong winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended.

Table 2: Wind Safety Criterion

Activity	Safety Criterion Gust Wind Speed Exceeded Once Per Year (0.1%)		Description of Wind Effects
Any	90 km/h	25 m/s	Excessive gust speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is typically required.

4.0 RESULTS

Figures 7a through 11b present graphical images of the wind comfort and safety conditions for the summer and winter months around the proposed development. These represent the seasonal extremes of best and worst case. The "comfort zones" shown are based on an integration of wind speed and frequency for all 36 wind directions tested with the seasonal wind climate model. The presence of mature trees can lead to wind comfort levels that are marginally more comfortable than shown, during seasons when foliage is present. Full detailed results for the summer, winter and annual safety conditions can be found in Appendix A.

There are generally accepted wind comfort levels that are desired for various pedestrian uses. However, it some climates these may be difficult to achieve in the winter due to the overall climate. For sidewalks, walkways and pathways, wind comfort suitable for leisurely walking are desirable year-round but may not be feasible in the winter. The presence of benches on a sidewalk, which are an optional use, does not change the overall wind comfort requirement for sidewalk. Wind conditions of fast walking are satisfactory for loading areas, laneways, and a limited portion of a sidewalk, considering exposure is brief for pedestrians. For main entrances, transit stops, and public amenity spaces such as parks and playgrounds, wind conditions conducive to standing are preferred throughout the year. For on-site amenity areas, wind conditions suitable for sitting or standing are desirable during the summer, with stronger wind flows, conducive to leisurely walking, tolerated in the winter. The most stringent category of sitting is desirable during the summer for dedicated seating areas, such as patios, where calmer wind is expected for the comfort of patrons.

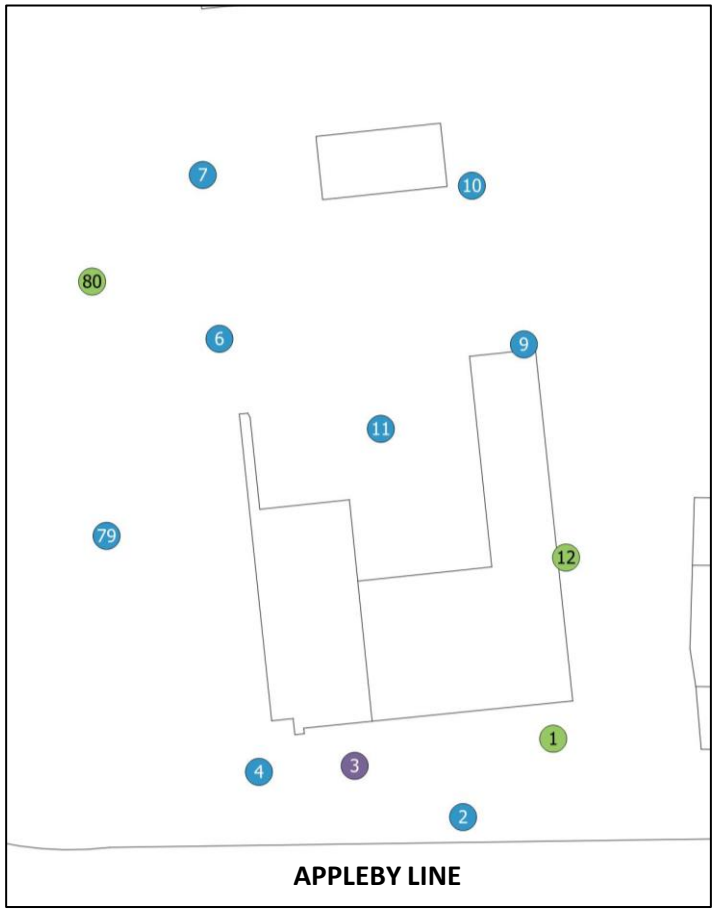
4.1 Building Entrances & Walkways (Locations 1-12 and 79-80)

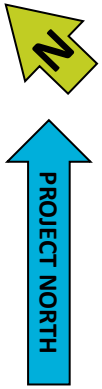
Existing wind conditions on-site are comfortable for leisurely walking or better in the summer. During the winter, wind conditions on-site are comfortable for fast walking or better (Figures 7a and 7b).

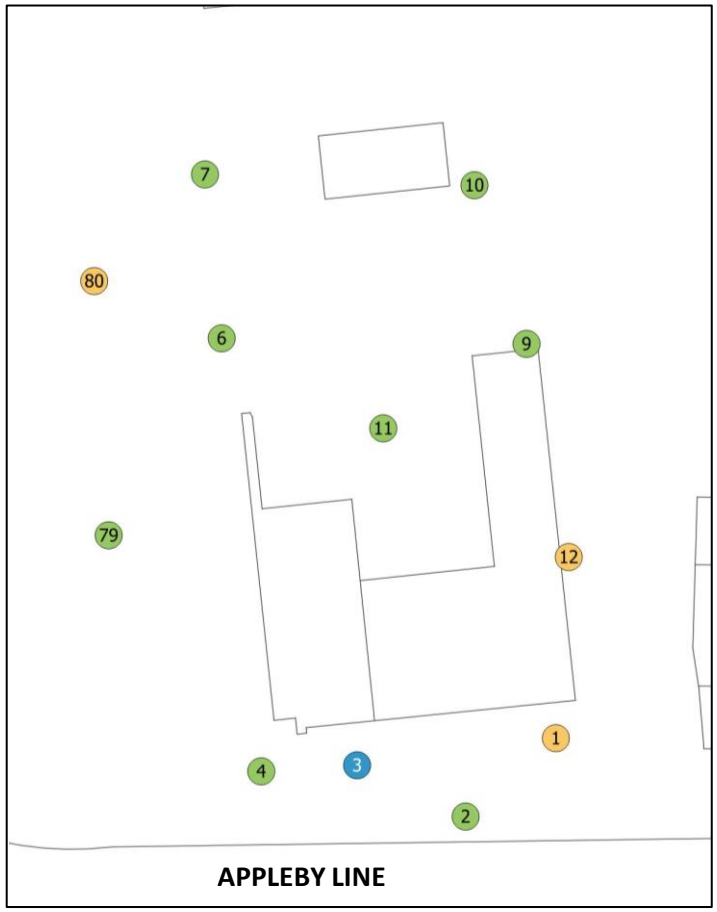
In the Proposed Configuration, wind conditions on-site are generally comfortable for leisurely walking or better in the summer. The exceptions are near the northwest corner (Location 7) and in the parking lot to the west of the building (Locations 79 and 80), where wind conditions are conducive to fast walking in the summer (Figure 8a). During the winter, wind conditions are generally comfortable for fast walking or better on the site, with uncomfortable wind conditions near the northwest corner and in the parking lot to the west of the proposed development (Locations 7, 79 and 80 in Figure 8b).

Wind conditions at the main entrance to the proposed development (Location 1) are comfortable for leisurely walking in the summer (Figure 8a) and uncomfortable during the winter months (Figure 8b). This is due to the prevailing southwesterly winds downwashing off the west tower and accelerating around the corner. At the retail entrances (Locations 3, 5 and 6), wind conditions are comfortable for sitting or standing in the summer. During the winter, wind conditions at these entrances are comfortable for sitting (Location 3), fast walking (Location 5) or leisurely walking (Location 6). At the secondary entrances, (Locations 8 and 10) are comfortable for leisurely walking or better throughout the year.

Wind control measures are discussed for identified windy areas in Section 5.







Predicted Comfort Classes

(#) Sitting (#) Leisurely Walking (#) Uncomfortable

(#) Standing (#) Fast Walking

Notes:

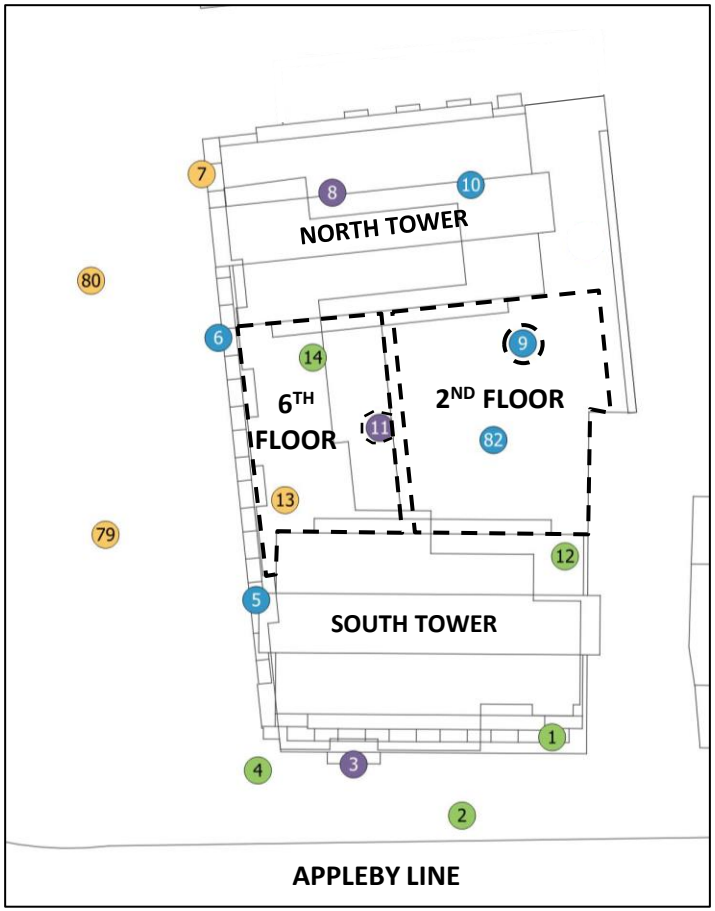
1) Not to scale.

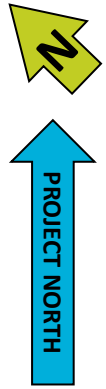
2) Pedestrian level wind sensor location (#)

3) Diagram may be divided by levels (e.g., Grade, Amenity Floors, etc.).

Figure 7a: Existing Configuration – Pedestrian Wind Conditions – On-site Summer

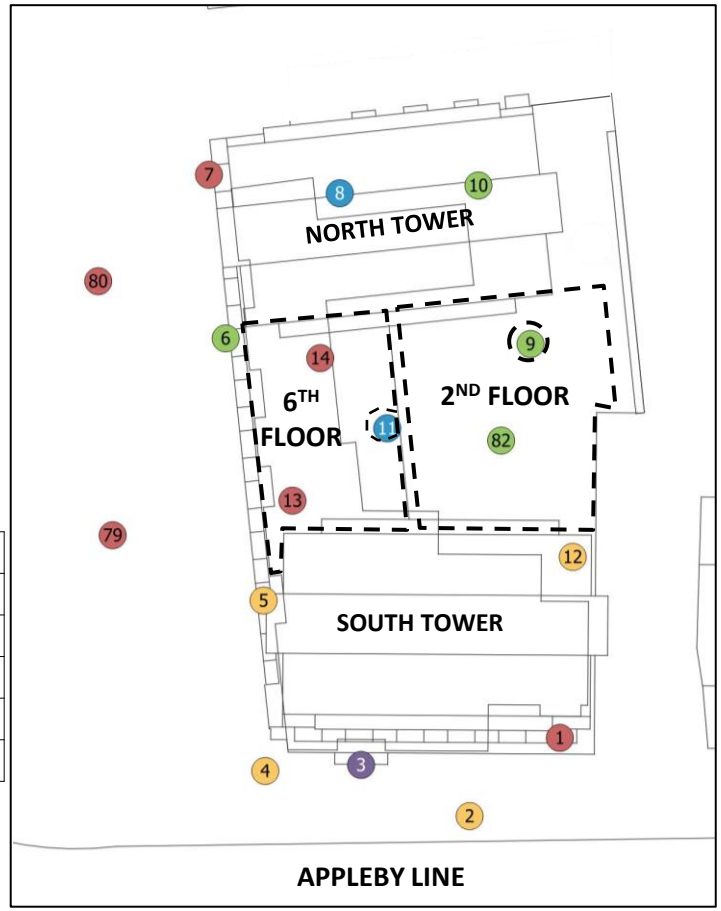
Figure 7b: Existing Configuration – Pedestrian Wind Conditions – On-site Winter





Sensor Location Description

Main Entrance	1
Retail Entrance	3, 5, 6
Exit	8, 10, 11
Walkways	2, 4, 7
Parking Lot	9, 12, 79, 80
Terraces	13, 14, 82



Predicted Comfort Classes

(#) Sitting (#) Leisurely Walking (#) Uncomfortable

(#) Standing (#) Fast Walking

Notes:

1) Not to scale.

2) Pedestrian level wind sensor location (#)

3) Diagram may be divided by levels (e.g., Grade, Amenity Floors, etc.).

Figure 8a: Proposed Configuration – Pedestrian Wind Conditions – On-site Summer

Figure 8b: Proposed Configuration – Pedestrian Wind Conditions – On-site Winter

4.2 Amenity Terraces (Locations 13-14 and 82-83)

On the 2nd floor amenity space (Locations 82 and 83), wind conditions are comfortable for leisurely walking or better in the summer (**Figure 8a**). During the winter, wind conditions are similar to the summer wind conditions, with the exception of the north side of the terrace (Location 83), where wind conditions are uncomfortable (**Figure 8b**).

On the 6th floor amenity terrace (Locations 13 and 14), wind conditions are comfortable for fast walking or better in the summer (**Figure 8a**). In the winter months, wind conditions are uncomfortable on this terrace (**Figure 8b**).

Wind control measures for the terraces are discussed in **Section 5**.

4.3 Surrounding Sidewalks (Locations 15-78)

Existing wind conditions along the sidewalks of Appleby Line, Upper Middle Road, Imperial Way and Ironstone Drive are generally comfortable for fast walking or better year-round (**Figures 9a** and **9b**). Uncomfortable wind conditions exist at along some portions of the Appleby Line sidewalk (Locations 28 and 30), Ironstone Drive (Location 65) and Imperial Way (Location 77) during the winter months (**Figure 9b**). Wind conditions at the nearby transit stops along Appleby Line (Locations 27, 31 and 35) and Upper Middle Road (Locations 44 and 45) are generally comfortable for leisurely walking or better year-round. The only exception is the transit stop along Appleby Line to the southwest of the proposed development (Location 31), where wind conditions are uncomfortable in the winter months (**Figure 9b**).

In the Proposed Configuration, wind conditions along the surrounding sidewalks are generally similar to the existing wind conditions (**Figures 10a** and **10b**). These wind conditions are acceptable for the anticipated use.

One exception is an area immediately east of the proposed development (Location 15) which is marginally uncomfortable in the winter months (**Figure 10b**). There is a fence approximately 2m tall along the west perimeter of the existing 1940 Ironstone Drive development (to the west of Location 15). Although such details are typically not modelled in the initial wind tunnel test, we expect wind conditions at Location 15 to be comfortable for fast walking or better year-round. Wind conditions at the nearby transit stops are generally comfortable for fast walking or better throughout the year. Wind conditions the transit stop along Appleby Line to the southwest of the proposed development (Location 31) remains uncomfortable in the winter.

4.4 Wind Safety

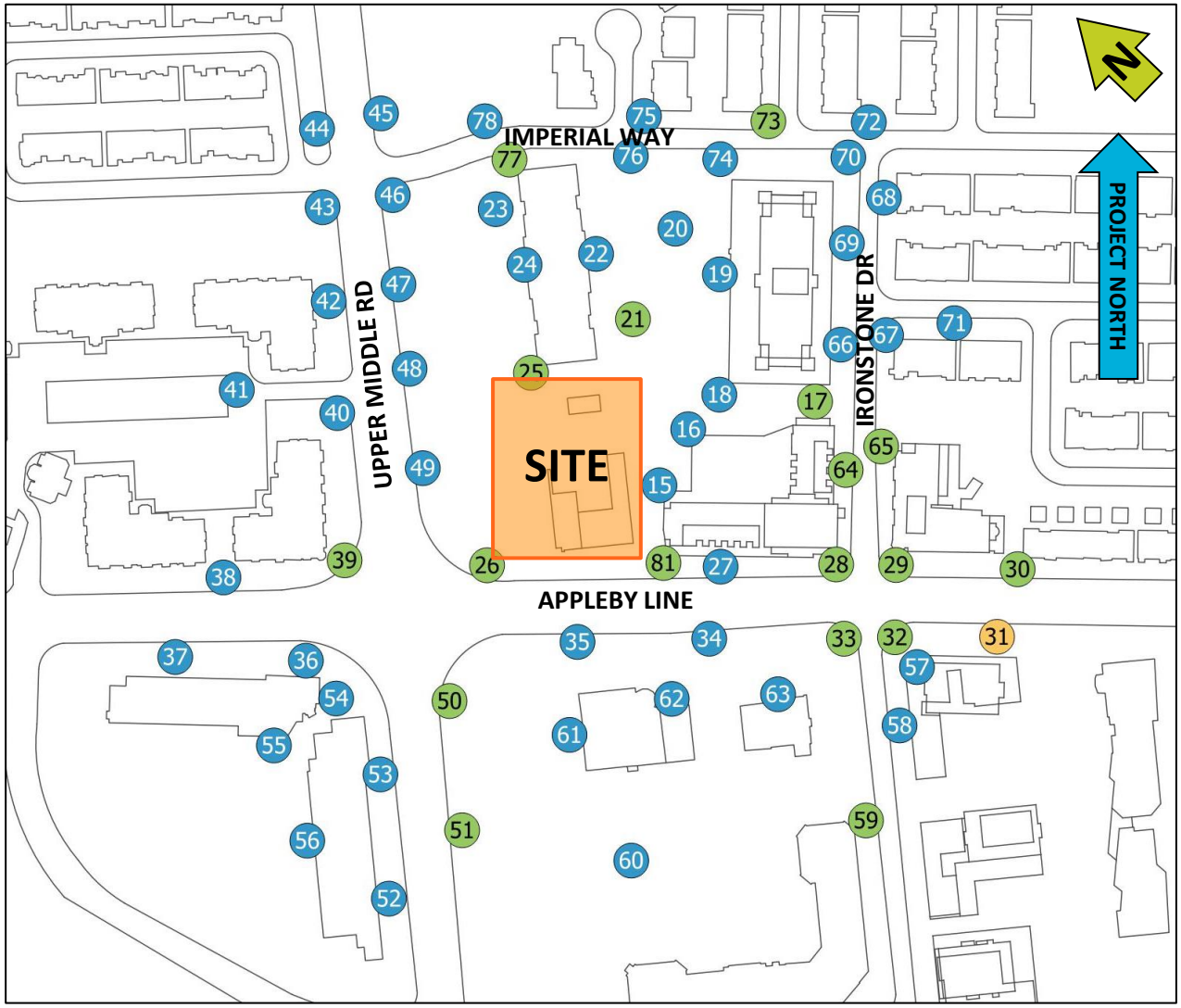
In the Existing Configuration, the wind safety criterion is generally met in all areas on and surrounding the existing site. The only exception is at the intersection of Apple Line and Ironstone Drive (Location 33) where the safety criterion is exceeded (**Figure 11a** and **Table 1**).

In the Proposed Configuration, the wind safety criterion is met in most areas on an annual basis, with the exception of the following on-site locations (**Figure 11b** and **Table 1**):

- At the northwest corner of the north tower (Location 7).
- At the southwest corner of 6th floor terrace (Location 13).

Wind control measures for these areas are discussed in **Section 5.0**.

Off-site, the wind safety criterion is exceeded at two locations along the sidewalks of Appleby Line (Locations 32 and 33). Of these, Location 33 marginally exceeded the criteria (**Table 1**) and the wind safety exceedance at Location 33 is an existing issue (**Figure 11a** and **Table 1**).



Sensor Location Description

Sidewalk	15 – 26, 28 – 30, 32 – 34, 36 – 53, 55 – 61, 63 -78
Transit Stop	27, 31, 35
Cafe	54, 62

Predicted Comfort Classes

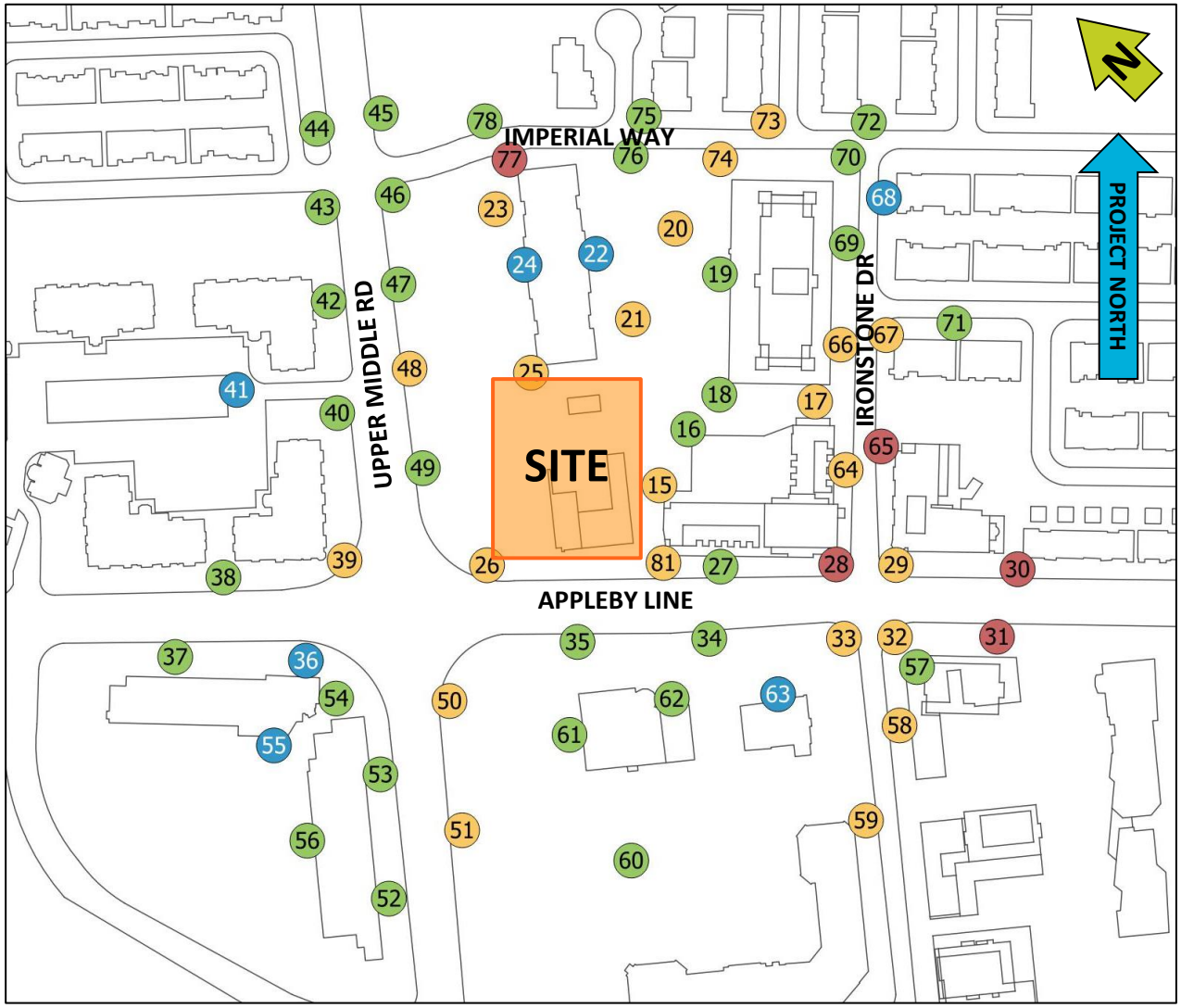
- (#) Sitting
- (#) Standing
- (#) Leisurely Walking
- (#) Fast walking
- (#) Uncomfortable

Notes:

1) Not to scale.

2) Pedestrian level wind sensor location (#)

Figure 9a: Existing Configuration – Pedestrian Wind Conditions – Surrounding Sidewalks – Summer



Sensor Location Description

Sidewalk	15 – 26, 28 – 30, 32 – 34, 36 – 53, 55 – 61, 63 -78
Transit Stop	27, 31, 35
Cafe	54, 62

Predicted Comfort Classes

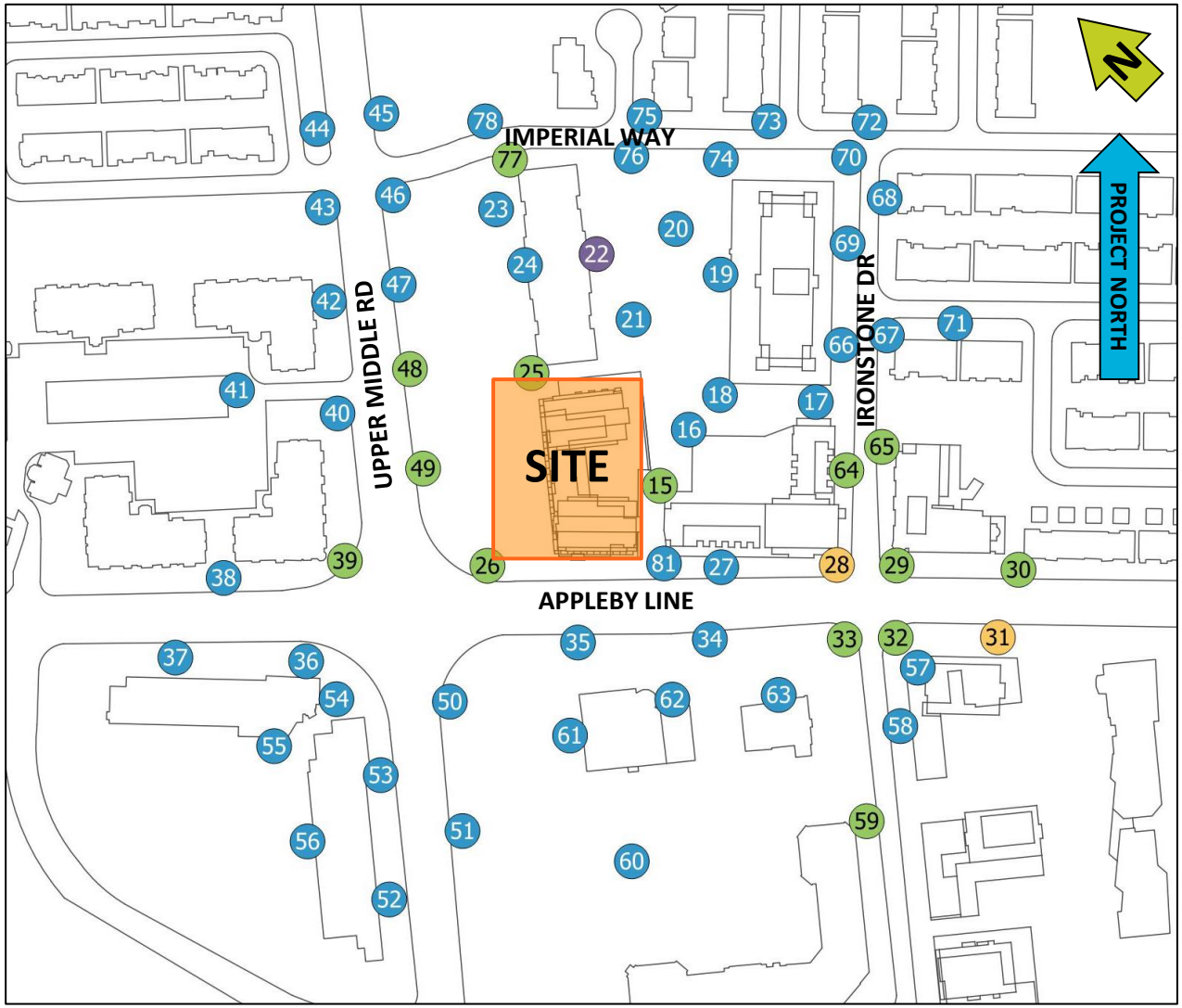
- (#) Sitting
- (#) Standing
- (#) Leisurely Walking
- (#) Fast walking
- (#) Uncomfortable

Notes:

1) Not to scale.

2) Pedestrian level wind sensor location (#)

Figure 9b: Existing Configuration – Pedestrian Wind Conditions – Surrounding Sidewalks – Winter



Sensor Location Description

Sidewalk	15 – 26, 28 – 30, 32 – 34, 36 – 53, 55 – 61, 63 -78
Transit Stop	27, 31, 35
Cafe	54, 62

Predicted Comfort Classes

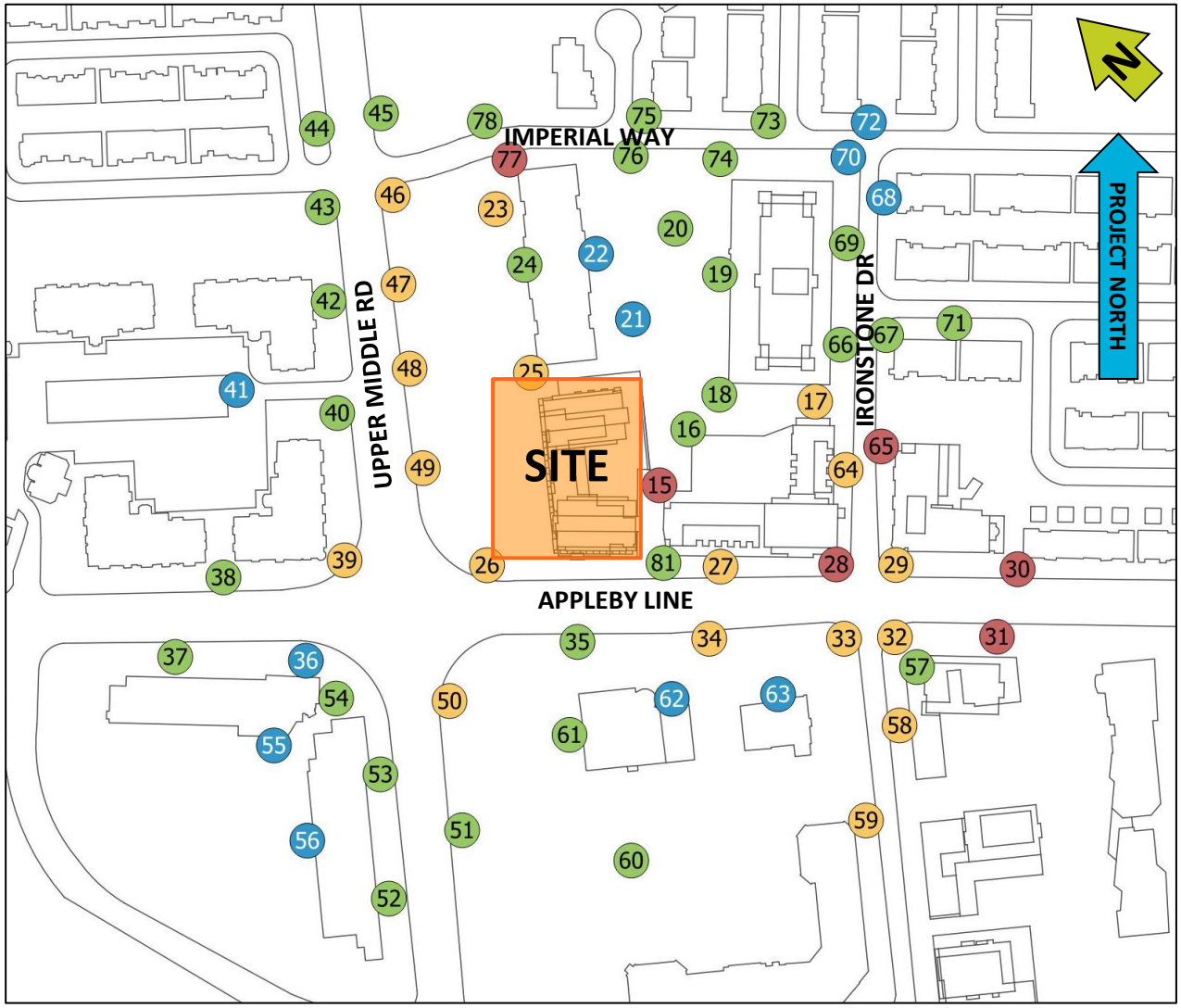
- (#) Sitting
- (#) Standing
- (#) Leisurely Walking
- (#) Fast walking
- (#) Uncomfortable

Notes:

1) Not to scale.

2) Pedestrian level wind sensor location (#)

Figure 10a: Proposed Configuration – Pedestrian Wind Conditions – Surrounding Sidewalks – Summer



Sensor Location Description

Sidewalk	15 – 26, 28 – 30, 32 – 34, 36 – 53, 55 – 61, 63 -78
Transit Stop	27, 31, 35
Cafe	54, 62

Predicted Comfort Classes

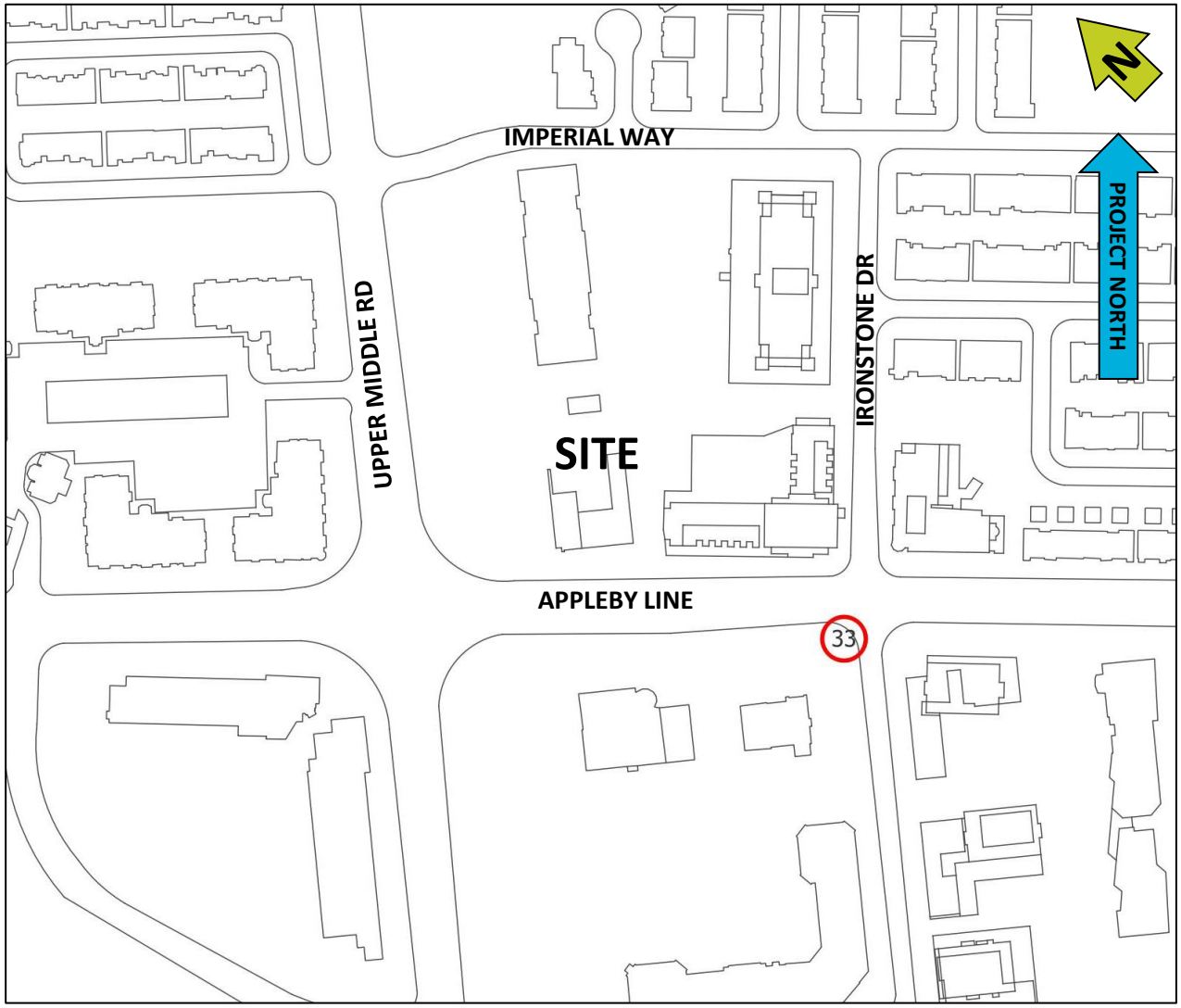
- (#) Sitting
- (#) Standing
- (#) Leisurely Walking
- (#) Fast walking
- (#) Uncomfortable

Notes:

1) Not to scale.

2) Pedestrian level wind sensor location (#)

Figure 10b: Proposed Configuration – Pedestrian Wind Conditions – Surrounding Sidewalks – Summer



Sensor Location Description

Sidewalk	15 – 26, 28 – 30, 32 – 34, 36 – 53, 55 – 61, 63 -78
Transit Stop	27, 31, 35
Cafe	54, 62

Safety:

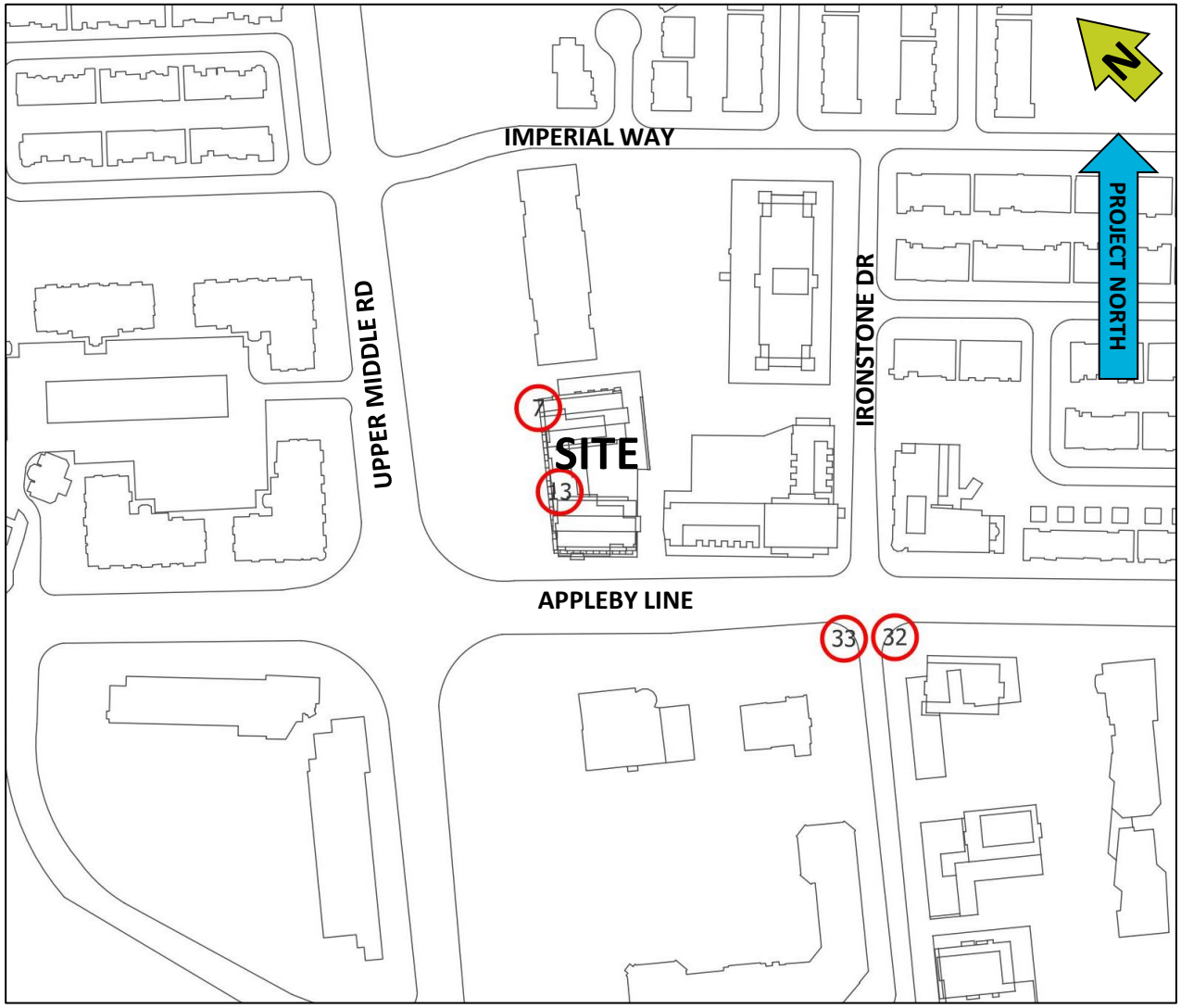
Fail

Notes:

1) Not to scale.

2) Pedestrian level wind sensor location (#)

Figure 11a: Existing Configuration – Pedestrian Wind Safety Conditions – Annual



Sensor Location Description

Sidewalk	15 – 26, 28 – 30, 32 – 34, 36 – 53, 55 – 61, 63 -78
Transit Stop	27, 31, 35
Cafe	54, 62

Safety:

○ Fail

Notes:

1) Not to scale.

2) Pedestrian level wind sensor location (#)

Figure 11b: Proposed Configuration – Pedestrian Wind Safety Conditions – Annual

5.0 RECOMMENDATIONS FOR WIND CONTROL MEASURES

Strong wind flows at the main entrance (Location 1) are caused by the downwashing of the northeasterly and southwesterly winds. To improve wind conditions at the main entrance, we recommend adding a vertical, porous (~70% solid) wind screen to the east of the entrance, filling in the opening beneath the overhang.

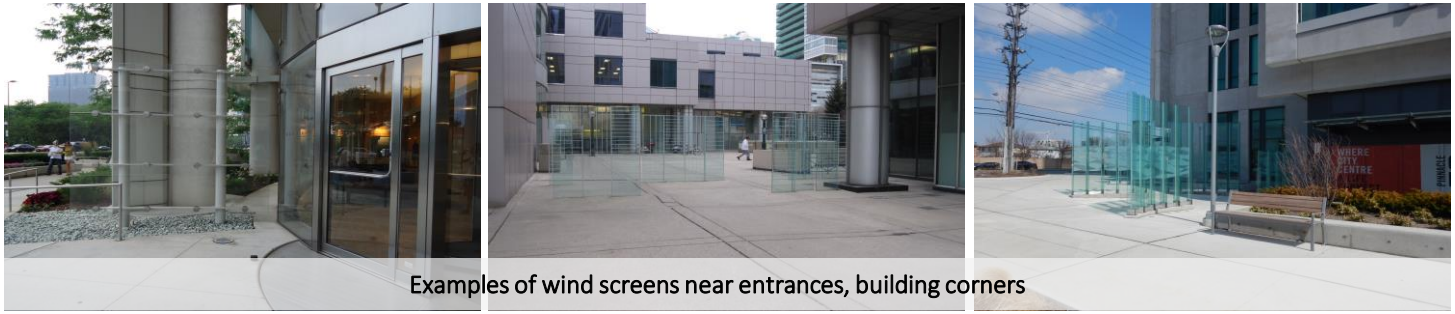
Uncomfortable wind conditions at the northwest corner of the building and in the parking lot are due to the overall exposure to the westerly and easterly winds. At the northwest corner driveway, we recommend adding a vertical, porous (approximately 70% solid) wind screen, minimum 2.2 m tall.

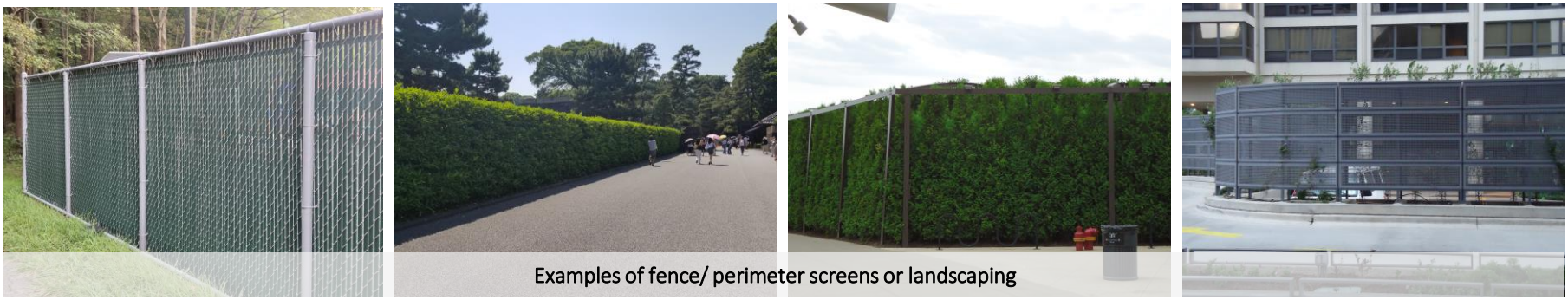
In the parking lot, we recommend adding a fence (approximately 70% solid) and/or coniferous landscaping along the north and west sides of the parking lot, to reduce the impact of the westerly winds in this area.

On the 6th floor, strong wind flows are primarily caused by the westerly and easterly winds that channel through the gap between the towers. We recommend adding vertical screens, a minimum 2.2 m tall, along the east and west edges of the terrace. Additional wind control features in the form of vertical screens, partitions, and/or dense landscaping can be strategically placed near seating areas for improved wind conditions.

Strong wind flows on the 2nd floor amenity space (Location 82) are due to the exposure to the winds channeled through the gap between the towers and redirected to the 2nd floor. To improve wind conditions, we recommend vertical screens along the perimeter of the terrace. In addition, horizontal features such as trellises or pergolas can be considered for seating areas for enhanced wind comfort conditions.

Examples of wind control measures are shown in **Figure 12**.





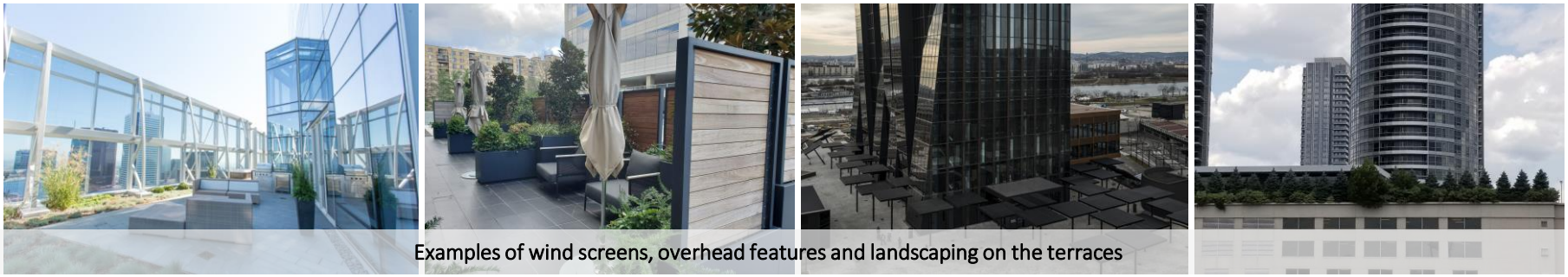


Figure 12: Examples of wind control measures

5.0 CONCLUSIONS & RECOMMENDATIONS

The pedestrian wind conditions predicted for the proposed development at 1989 Appleby Line have been assessed through wind tunnel modeling techniques. Based on the results of our study, the following conclusions have been reached:

- Wind conditions in most areas on-site and surroundings the proposed site meet the safety criterion in the Existing Configuration. The only exception is a sidewalk location along Appleby Line, where wind safety is exceeded.
- In the Proposed Configuration, the wind safety criterion is exceeded at the northwest corner of the proposed development, at two sidewalk locations along Appleby Line and on the 6th floor amenity terrace. Wind control measures are recommended for these areas.
- Wind conditions on-site, including the building entrances, are generally suitable for the intended use throughout the year. Wind control measures are recommended for the main entrance.
- Wind conditions on the proposed terraces are generally windier than desired for passive activities. Wind mitigation measures are suggested for the terraces.
- Wind conditions along the surrounding sidewalks are generally similar between the Existing and Proposed Configurations.
- SLR will work with the design team to refine these wind control measures as the design evolves.

6.0 ASSESSMENT APPLICABILITY

This assessment is based on computer modeling techniques and provides a quantitative analysis of the pedestrian wind comfort conditions on and surrounding the proposed development site. Any subsequent alterations to the design may influence these findings, possibly requiring further review by SLR. Should you have any questions or concerns, please do not hesitate to contact the undersigned.

Sincerely,

SLR Consulting (Canada) Ltd.



Nishat Nourin, M.Eng., P.Eng.
Microclimate Engineer



Tahrana Lovlin, MAES, P.Eng.
Principal, Microclimate

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Appendix A

Pedestrian Wind Comfort & Safety Tables

Table B1-1: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort		Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)		Gust Speed Exceeded 0.1% of the Time (km/h)
		Summer	Winter	
1	Existing	14.5	18.3	70.9
1	Proposed	15.7	20.1	73.4
2	Existing	13.5	16.9	61.1
2	Proposed	14.0	17.8	63.4
3	Existing	8.5	10.7	42.3
3	Proposed	8.0	9.5	45.0
4	Existing	12.4	15.3	53.6
4	Proposed	15.4	19.2	71.9
5	Existing			
5	Proposed	13.2	17.1	68.4
6	Existing	12.7	16.4	61.6
6	Proposed	12.6	16.3	63.2
7	Existing	12.9	16.1	56.4
7	Proposed	19.4	25.0	**91.3**
8	Existing			
8	Proposed	8.3	10.1	40.8
9	Existing	13.2	16.7	60.8
9	Proposed	11.6	14.6	53.4
10	Existing	11.6	14.7	53.7
10	Proposed	11.4	14.3	51.7

Table B1-2: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort		Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)		Gust Speed Exceeded 0.1% of the Time (km/h)
		Summer	Winter	
11	Existing	12.5	15.8	57.7
11	Proposed	8.3	10.5	36.2
12	Existing	15.0	19.0	69.5
12	Proposed	14.1	18.0	69.9
13	Existing			
13	Proposed	18.6	23.5	**93.3**
14	Existing			
14	Proposed	17.0	22.1	87.6
15	Existing	13.8	17.7	65.0
15	Proposed	15.6	20.2	79.6
16	Existing	12.3	15.6	56.1
16	Proposed	11.7	14.6	51.3
17	Existing	14.3	18.7	73.7
17	Proposed	13.9	18.4	78.4
18	Existing	12.3	15.3	55.3
18	Proposed	13.2	16.7	61.8
19	Existing	12.9	16.8	65.9
19	Proposed	12.0	15.3	57.3
20	Existing	13.9	17.6	65.1
20	Proposed	12.6	15.7	59.5

Table B1-3: Pedestrian Wind Conditions

Location Configuration	Wind Comfort		Wind Safety
	GEM Speed Exceeded 20% of the Time (km/h)		Gust Speed Exceeded 0.1% of the Time (km/h)
	Summer	Winter	
21 Existing	14.6	18.8	71.2
21 Proposed	10.5	12.9	47.0
22 Existing	10.9	13.5	53.4
22 Proposed	9.5	11.5	45.2
23 Existing	13.7	17.1	67.3
23 Proposed	13.9	17.8	65.1
24 Existing	10.5	13.3	47.2
24 Proposed	11.0	14.4	56.3
25 Existing	14.6	18.1	65.3
25 Proposed	14.9	18.9	68.2
26 Existing	14.5	18.0	66.2
26 Proposed	16.1	19.6	76.5
27 Existing	11.9	15.0	58.0
27 Proposed	13.0	17.0	68.3
28 Existing	16.9	21.7	81.2
28 Proposed	17.5	22.5	85.1
29 Existing	14.6	18.0	66.2
29 Proposed	14.5	18.0	67.3
30 Existing	16.0	20.9	82.4
30 Proposed	16.1	21.1	82.9

Table B1-4: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort		Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)		Gust Speed Exceeded 0.1% of the Time (km/h)
		Summer	Winter	
31	Existing	17.4	21.7	81.4
31	Proposed	17.2	21.5	80.7
32	Existing	15.8	19.5	87.8
32	Proposed	16.1	19.9	**90.1**
33	Existing	14.5	17.7	**91.7**
33	Proposed	15.0	18.4	**94.1**
34	Existing	11.8	14.4	53.6
34	Proposed	13.4	17.0	64.3
35	Existing	13.2	16.9	63.2
35	Proposed	13.4	16.7	59.2
36	Existing	10.9	13.3	48.0
36	Proposed	10.9	13.2	48.7
37	Existing	12.8	17.0	70.6
37	Proposed	12.8	16.8	68.3
38	Existing	13.3	16.7	60.8
38	Proposed	13.5	16.9	63.1
39	Existing	14.7	19.1	75.6
39	Proposed	14.7	19.1	74.3
40	Existing	12.6	15.7	54.4
40	Proposed	12.3	15.3	53.2

Table B1-5: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort		Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)		Gust Speed Exceeded 0.1% of the Time (km/h)
		Summer	Winter	
41	Existing	10.6	13.0	49.5
41	Proposed	10.3	12.7	49.2
42	Existing	12.3	15.5	58.2
42	Proposed	12.6	15.8	58.1
43	Existing	11.7	14.7	57.9
43	Proposed	11.9	15.0	58.0
44	Existing	11.8	14.5	55.8
44	Proposed	11.7	14.4	55.6
45	Existing	13.1	16.5	62.6
45	Proposed	13.0	16.6	62.4
46	Existing	13.1	16.6	62.8
46	Proposed	13.4	17.0	63.4
47	Existing	13.1	16.5	61.5
47	Proposed	13.7	17.3	65.1
48	Existing	13.9	17.3	63.8
48	Proposed	14.9	18.7	71.4
49	Existing	13.2	16.5	62.5
49	Proposed	14.2	17.6	66.9
50	Existing	14.1	17.6	65.4
50	Proposed	13.6	17.0	63.1

Table B1-6: Pedestrian Wind Conditions

Location Configuration	Wind Comfort		Wind Safety
	GEM Speed Exceeded 20% of the Time (km/h)		Gust Speed Exceeded 0.1% of the Time (km/h)
	Summer	Winter	
51 Existing	14.1	17.5	65.9
51 Proposed	13.4	16.5	60.2
52 Existing	12.2	15.3	57.9
52 Proposed	11.7	14.6	55.5
53 Existing	12.1	14.7	58.5
53 Proposed	11.9	14.5	57.4
54 Existing	11.7	14.6	52.3
54 Proposed	11.5	14.3	52.3
55 Existing	10.7	13.8	52.6
55 Proposed	10.4	13.4	51.1
56 Existing	11.5	14.4	51.3
56 Proposed	11.0	13.8	48.7
57 Existing	12.7	15.5	73.8
57 Proposed	12.6	15.4	73.1
58 Existing	14.0	17.9	69.1
58 Proposed	14.0	17.9	68.3
59 Existing	15.2	18.7	74.6
59 Proposed	15.3	18.8	75.4
60 Existing	12.8	15.9	56.3
60 Proposed	12.8	15.9	55.7

Table B1-7: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort		Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)		Gust Speed Exceeded 0.1% of the Time (km/h)
		Summer	Winter	
61	Existing	13.2	16.9	61.2
61	Proposed	12.8	16.4	60.4
62	Existing	12.2	14.7	53.2
62	Proposed	11.4	13.6	52.8
63	Existing	11.1	13.5	64.9
63	Proposed	11.2	13.7	63.1
64	Existing	14.4	18.8	81.5
64	Proposed	14.0	18.3	81.3
65	Existing	16.0	20.8	77.5
65	Proposed	16.1	21.0	80.7
66	Existing	13.1	17.2	70.5
66	Proposed	12.2	15.9	62.0
67	Existing	13.2	17.3	69.3
67	Proposed	12.2	16.4	72.8
68	Existing	10.8	13.6	52.3
68	Proposed	10.4	12.9	47.6
69	Existing	12.6	15.7	57.4
69	Proposed	11.8	14.3	55.5
70	Existing	11.2	14.1	53.1
70	Proposed	10.8	13.3	47.0

Table B1-8: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort		Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)		Gust Speed Exceeded 0.1% of the Time (km/h)
		Summer	Winter	
71	Existing	11.4	14.1	53.8
71	Proposed	11.7	14.4	56.7
72	Existing	11.8	14.9	65.6
72	Proposed	10.7	13.2	50.7
73	Existing	14.6	19.2	75.5
73	Proposed	12.1	15.3	57.0
74	Existing	13.8	17.4	65.8
74	Proposed	12.1	14.7	61.1
75	Existing	12.8	16.5	64.2
75	Proposed	11.6	14.4	52.4
76	Existing	13.2	16.9	66.6
76	Proposed	11.5	14.1	49.3
77	Existing	16.4	20.9	75.4
77	Proposed	16.7	21.4	77.8
78	Existing	11.7	15.0	54.8
78	Proposed	12.1	15.6	58.1
79	Existing	13.4	16.7	64.1
79	Proposed	17.6	21.5	83.7
80	Existing	14.1	17.6	67.0
80	Proposed	17.2	21.2	80.4

Table B1-9: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort		Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)		Gust Speed Exceeded 0.1% of the Time (km/h)
		Summer	Winter	
81	Existing	15.1	19.6	82.7
81	Proposed	12.5	16.0	62.8
82	Existing			
82	Proposed	12.2	14.5	68.5