REPORT

2083 OLD LAKESHORE ROAD

BURLINGTON, ONTARIO

PEDESTRIAN WIND STUDY

RWDI # 2304294

December 17, 2024

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI was retained to conduct a pedestrian wind assessment for the proposed 2083 Old Lakeshore Road in Burlington, ON (Image 1). The assessment was based on our wind tunnel testing for the proposed development under the Existing, Proposed and Future Configurations (Images 2A through 2C). In accordance with the *Pedestrian Level Wind Study Guidelines and Terms of References* (March 2020) (the Guidelines) published by the City of Burlington, the wind tunnel test results were analyzed using wind climate records from Hamilton International Airport (Image 3) and evaluated against the Wind Comfort and Safety Criteria specified in the Guidelines. The potential wind conditions are presented in Figures 1A through 2C, while the associated wind speeds are listed in Table 1. These results can be summarized as follows:

- Wind speeds that meet the Wind Safety Criterion are anticipated at all assessed locations in the Existing, Proposed and Future Configurations.
- The overall wind conditions in the Existing Configuration are comfortable for the intended pedestrian usage year-round. Slightly elevated wind conditions in the winter result in uncomfortable wind conditions at an isolated area to the south of the intersection of Lakeshore Road and Martha Street.
- With the proposed building in place, wind conditions at all assessed locations on and around the proposed site are expected to be similar to those in the Existing Configuration throughout the year, with reduced wind activity in the area previously identified with uncomfortable wind conditions.
- Wind conditions at the main entrances are predicted to be suitable for pedestrians to linger year-round.
- Wind speeds in outdoor amenity areas on Levels 3 and 6 are expected to be generally comfortable for passive and relaxing activities, especially in the summer.
- The addition of the known future developments around the site is expected to create similar or slightly improved wind conditions on and around the proposed development at grade, and slightly increased speeds in outdoor amenity areas on Levels 3 and 6.
- The recently proposed colonnade along Lakeshore Road is expected to maintain comfortable wind conditions in the nearby pedestrian areas.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

1 INTRODUCTION 1

1.1 Project Description 1

1.2 Objectives 1

2 BACKGROUND AND APPROACH 2

2.1 Wind Tunnel Study Model 2

2.2 Meteorological Data 6

2.3 Burlington Pedestrian Wind Criteria 7

2.4 Generalized Wind Flows 8

3 RESULTS AND DISCUSSION 9

3.1 Existing Configuration 9

3.2 Proposed Configuration 9

3.2.1 Grade Level (Locations 1 through 65) 9

3.2.2 Outdoor amenity areas on Levels 3 and 6 (Locations 66 through 76) 10

3.3 Future Configuration 10

3.4 Updated Drawings 10

4 APPLICABILITY OF RESULTS 11

5 REFERENCES 11

LIST OF FIGURES

Figure 1A: Pedestrian Wind Comfort Conditions – Existing – Summer
Figure 1B: Pedestrian Wind Comfort Conditions – Proposed – Summer
Figure 1C: Pedestrian Wind Comfort Conditions – Future – Summer

Figure 2A: Pedestrian Wind Comfort Conditions – Existing – Winter
Figure 2B: Pedestrian Wind Comfort Conditions – Proposed – Winter
Figure 2C: Pedestrian Wind Comfort Conditions – Future – Winter

LIST OF TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

1 INTRODUCTION

RWDI was retained to conduct a pedestrian wind assessment for the proposed 2083 Old Lakeshore Road in Burlington, ON. This report presents the project objectives, approach, and main results of RWDI's assessment.

1.1 Project Description

The project (site shown in Image 1) is located on the southwest corner of Martha Street and Lakeshore Road, north of old Lakeshore Road. The proposed building will be approximately 93 m tall, consisting of a 27-storey mixed-use tower with a two-storey podium. Outdoor amenity areas are proposed on Levels 3 and 6.

1.2 Objectives

The objective of the study was to assess the effect of the proposed development on local conditions in pedestrian areas on and around the study site and provide recommendations for minimizing adverse effects if needed. This quantitative assessment was based on wind speed measurements on a scale model of the project and its surroundings in one of RWDI's boundary-layer wind tunnels. These measurements were combined with the local wind records and compared to appropriate criteria for gauging wind comfort and safety in pedestrian areas. The assessment focused on critical pedestrian areas, including two building entrances, nearby public sidewalks, above grade amenity areas.



Image 1: Aerial View of Site and Surroundings (Photo Courtesy of Google™ Earth)

2 BACKGROUND AND APPROACH

2.1 Wind Tunnel Study Model

To assess the wind environment around the proposed project, a 1:400 scale model of the project site and surroundings was constructed for the wind tunnel tests of the following configurations:

A - Existing: Existing site with existing surroundings (Image 2A),

B - Proposed: Proposed project with existing surroundings (Image 2B), and,

C - Future: Proposed project with existing and future surroundings (Image 2C).

The wind tunnel model included all relevant surrounding buildings and topography within an approximately 480 M radius of the study site. The wind and turbulence profiles in the atmospheric boundary layer beyond the modelled area were also simulated in RWDI's wind tunnel. The wind tunnel model was instrumented with 76 specially designed wind speed sensors to measure mean and gust speeds at a full-scale height of approximately 1.5 m above local grade in pedestrian areas throughout the study site. Wind speeds were measured for 36 directions in 10-degree increments. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the mean wind speed at a reference height above the model. The placement of wind measurement locations was based on our experience and understanding of the pedestrian usage for this site, and reviewed by Rosseau Development Corp.

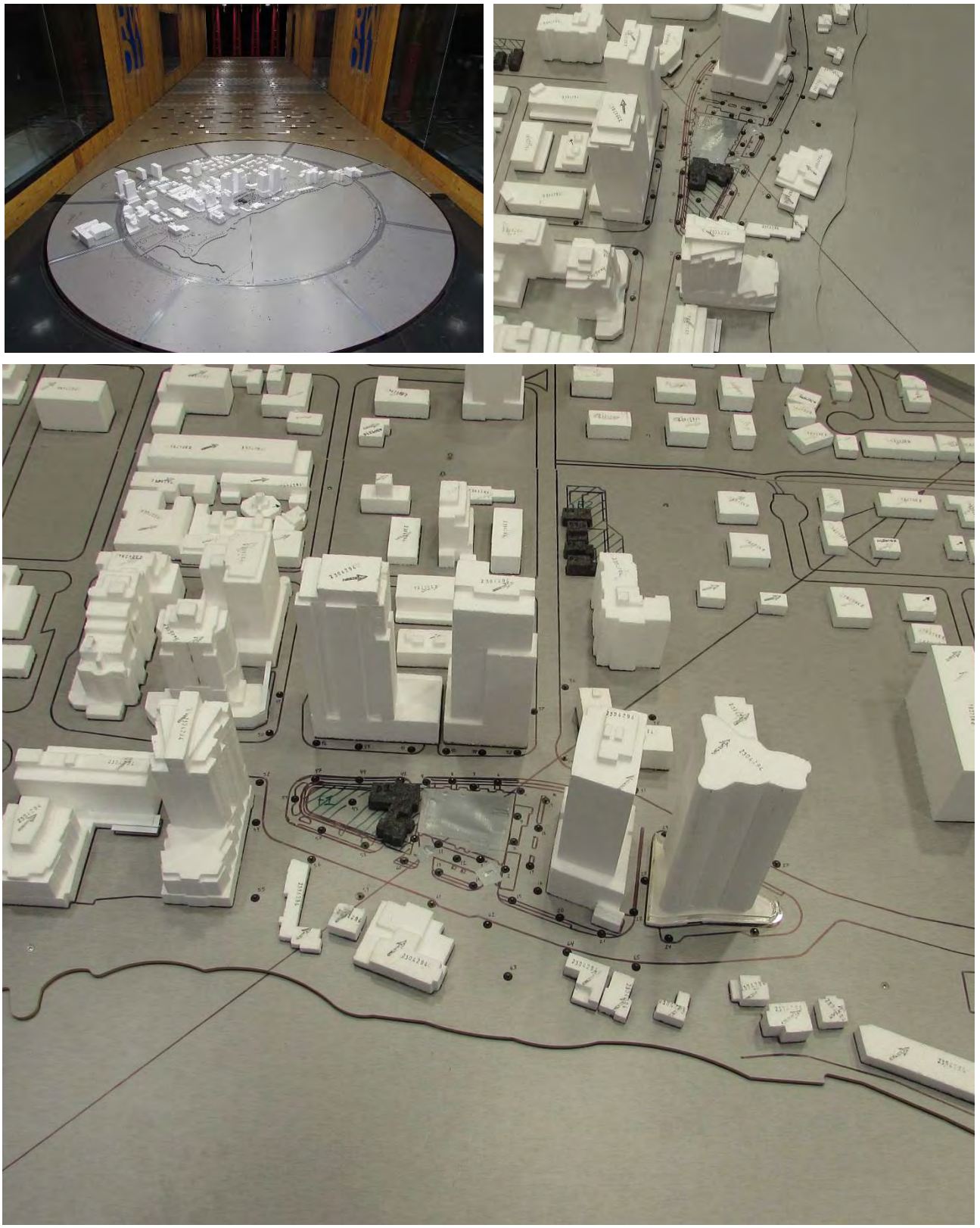


Image 2A: Wind Tunnel Study Model – Existing Configuration

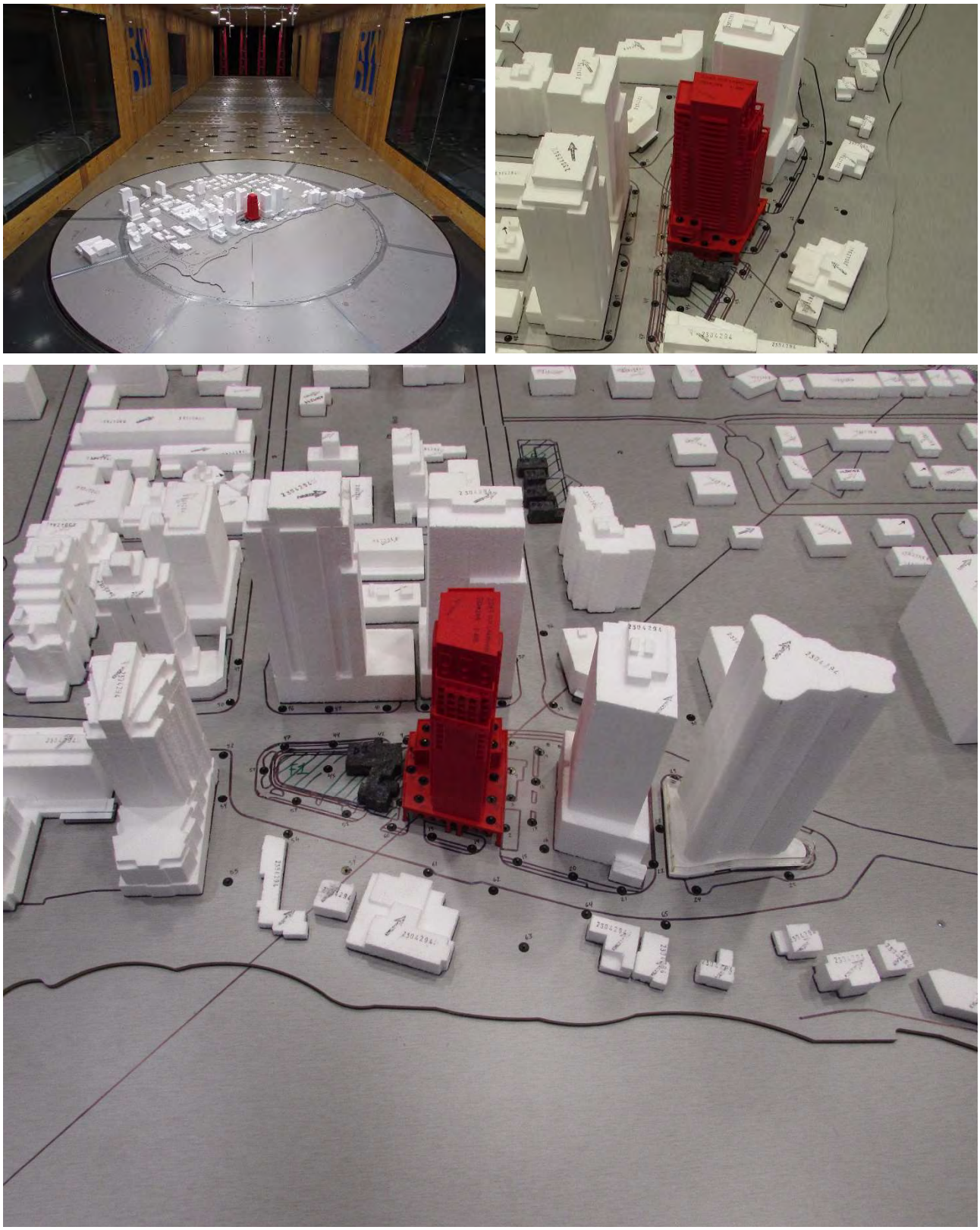


Image 2B: Wind Tunnel Study Model – Proposed Configuration

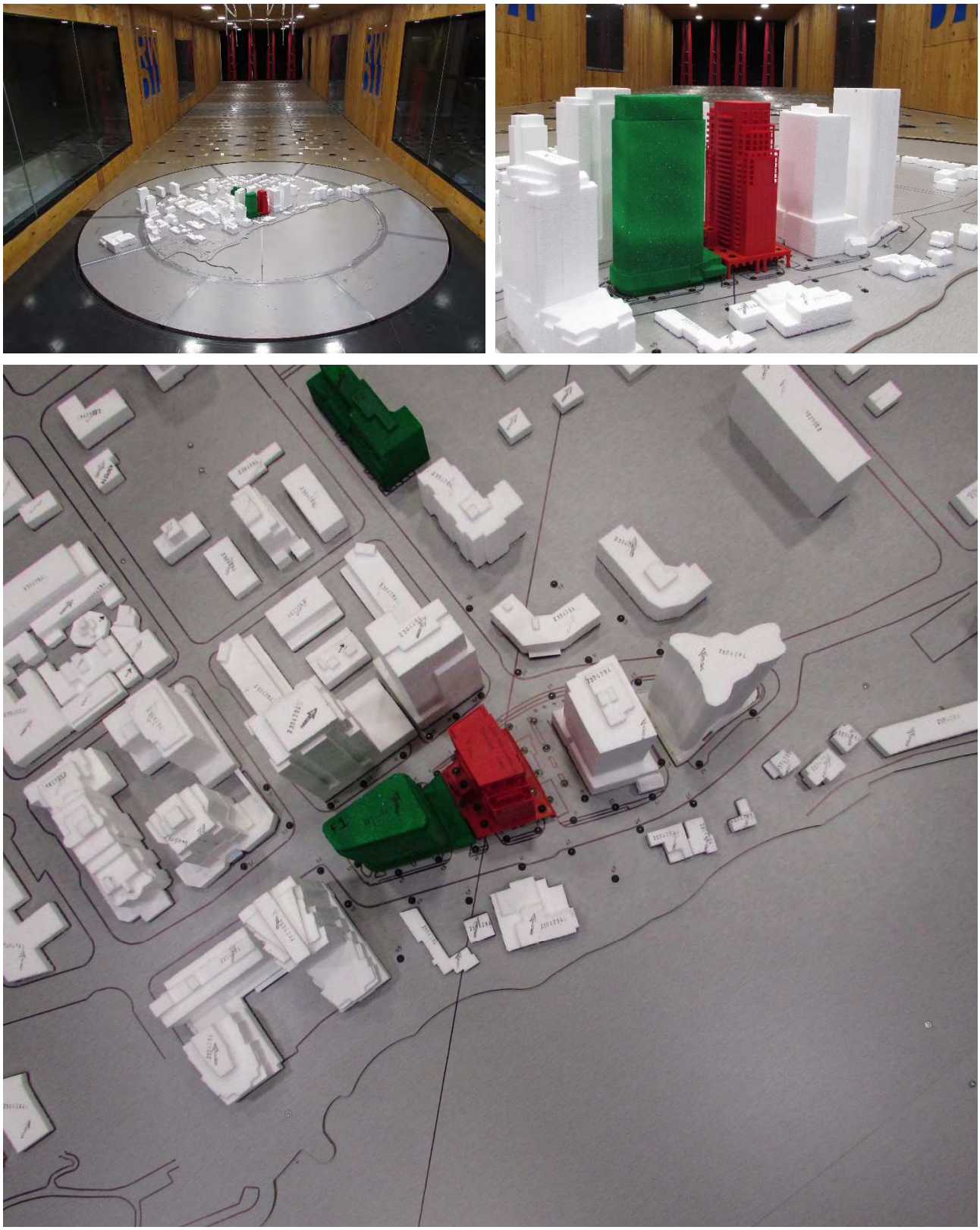
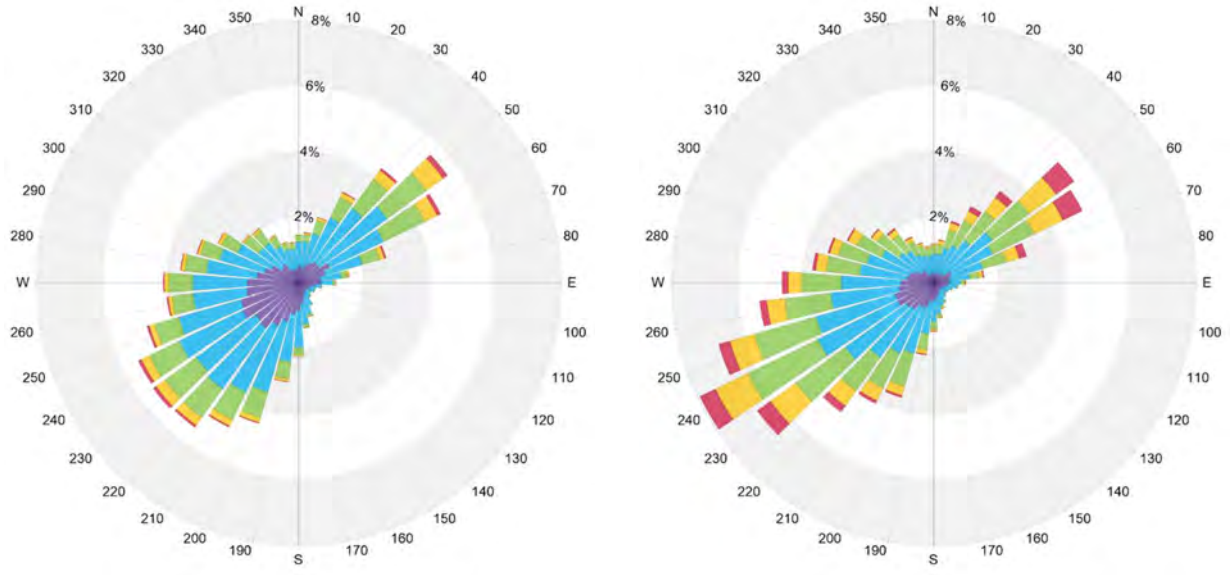


Image 2C: Wind Tunnel Study Model – Future Configuration

2.2 Meteorological Data

Wind statistics recorded at Hamilton International Airport between 1991 and 2021, inclusive, were analyzed for the summer (May through October) and winter (November through April) seasons. Image 3 graphically depicts the directional distributions of wind frequencies and speeds for these two seasons. Winds from the northeast and southwest directions are predominant in both summer and winter, as indicated by the wind roses. Strong winds of a mean speed greater than 30 km/h, measured at the airport (at an anemometer height of 10 m), occur 5.3% and 15.2% of the time during the summer and winter seasons, respectively.

Wind statistics were combined with the wind tunnel data to predict the frequency of occurrence of full-scale wind speeds. The full-scale wind predictions were then compared with the wind criteria for pedestrian comfort and safety.



Summer (May – October) **Winter (November – April)**

Wind Speed (km/h)	Probability (%) Summer	Winter
Calm	3.9	2.5
1-10	30.8	20.0
11-20	41.9	36.8
21-30	18.1	25.6
31-40	4.3	10.6
>40	1.0	4.6

Image 3: Directional Distribution of Winds Approaching Hamilton International Airport between 1991 and 2021

2.3 Burlington Pedestrian Wind Criteria

The Burlington pedestrian wind criteria, developed in March 2020, are specified in the Guidelines and Terms of Reference, "Pedestrian Level Wind Study". The following defines the criterion in detail.

Comfort Category	GEM Speed (km/h)	Description
Sitting	≤ 10	Calm or light breezes • Appropriate for dedicated seating areas such as cafés, patios, and outdoor amenity areas
Standing	≤ 14	Gentle breezes • Appropriate for main building entrances, bus stops, and other places where pedestrians may linger
Leisurely Walking	≤ 17	Moderate winds • Appropriate for shopping and strolling along retail streets and parks
Fast Walking	≤ 20	Relative higher speed winds • Appropriate for areas where pedestrians are walking, running, or cycling without lingering
Uncomfortable	> 20	Strong winds • Inappropriate due to nuisance for all pedestrian activities • Wind mitigation measures required

Notes:

(1) GEM is defined as the maximum mean wind speed or gust speed divided by 1.85 (whichever is larger). Gust speed can be directly measured in a wind tunnel or represented by mean wind speed + 3*RMS (Root Mean Square) wind speed.

(2) GEM speeds listed above are based on a seasonal exceedance of 20% of the time between 06:00 and 23:00. The criterion has been met if the wind speeds occur at least four out of five days.

Safety Criterion	Gust Speed (km/h)	Description
Exceeded	> 90	• Excessive gust speeds • Adverse effect on pedestrian's balance and footing • Wind mitigation is required

Notes:

(1) Based on an annual exceedance of 9 hours or 0.1% of the time for 24 hours a day.

(2) Gust speed can be directly measured in a wind tunnel or represented by mean wind speed + 3*RMS wind speed.

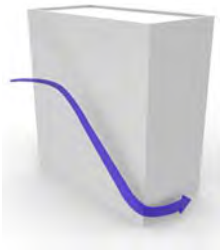
2.4 Generalized Wind Flows

In our discussion of wind conditions, reference may be made to the following generalized wind flows (Image 4):



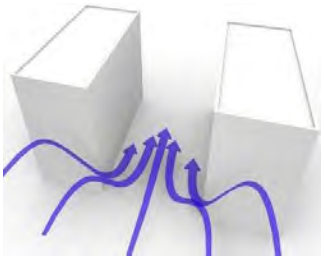
DOWNWASHING

Tall buildings tend to intercept the stronger winds at higher elevations and redirect them to the ground level. This is often the main cause of wind accelerations around large buildings at the pedestrian level.



CORNER ACCELERATION

When winds approach at an oblique angle to a tall façade and are deflected down, a localized increase in the wind activity or corner acceleration can be expected around the exposed building corners at the pedestrian level.



CHANNELLING EFFECT

When two buildings are situated side by side, wind flow tends to accelerate through the space between the buildings due to the channelling effect caused by the narrow gap.

Image 4: Generalized Wind Flows

If these building/wind combinations occur for prevailing winds, there is a greater potential for increased wind activity. Design details such as setting back a tall tower from the edges of a podium, deep canopies close to ground level, wind screens, tall trees with dense landscaping, etc. (Image 5) can help reduce wind speeds. The choice and effectiveness of these measures would depend on the exposure and orientation of the site with respect to the prevailing wind directions and the size and massing of the proposed buildings.

Podium/tower setback, canopy, landscaping and wind screens (left to right)

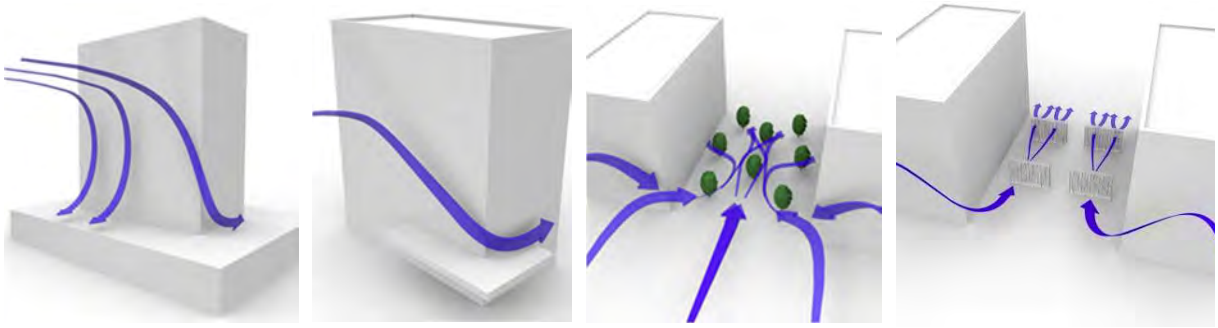


Image 5: Common Wind Control Measures

3 RESULTS AND DISCUSSION

The predicted wind conditions are shown on site plans in Figures 1A through 2C located in the "Figures" section of this report. These conditions and the associated wind speeds are also represented in Table 1, located in the "Tables" section of this report.

Wind conditions that meet the Wind Safety Criterion are predicted at all locations for all configurations assessed.

Generally, wind conditions comfortable for fast or leisurely walking are appropriate for sidewalks and walkways as pedestrians will be active and less likely to remain in one area for prolonged periods of time. Lower wind speeds conducive to standing are preferred at main entrances where pedestrians are apt to linger. Wind speeds comfortable for sitting are preferred for areas intended for prolonged passive activities, such as dining areas in outdoor amenities, especially in the summer when these areas would be more frequented. The following is a detailed discussion of the suitability of the predicted wind conditions for the anticipated pedestrian use of each area of interest.

3.1 Existing Configuration

Wind conditions at all assessed locations on and around the existing site are comfortable for the intended pedestrian use, with most areas experiencing standing wind conditions during the summer (Figure 1A). In the winter (Figure 2A), due to the seasonal wind climate in Burlington, higher wind speeds are expected across the site. The resulting conditions are generally comfortable for fast walking or leisurely walking or better at most locations. An exception is noted at Location 19, at the south side of the intersection of Lakeshore Road and Martha Street, where borderline uncomfortable wind conditions are anticipated (Figure 2A).

3.2 Proposed Configuration

3.2.1 Grade Level (Locations 1 through 65)

The proposed development is expected to maintain comparable wind conditions to the Existing Configuration for both the summer and winter seasons (Figures 1B and 2B). Additionally, reduced wind activity is anticipated in certain areas, including the drop-off zone under the canopy structure (Locations 1, 12 and 13) and the existing uncomfortable Location 19, as shown in Figures 1B and 2B.

The main entrances of the proposed building are situated near Locations 1 and 7 in Figures 1B and 2B. Wind conditions at these entrances are anticipated to be comfortable for sitting and standing, respectively, throughout the year, making them suitable for pedestrians to linger.

3.2.2 Outdoor amenity areas on Levels 3 and 6 (Locations 66 through 76)

It is generally desirable for wind conditions on terraces intended for passive activities to be comfortable for sitting or standing more than 80% of the time in the summer.

During the summer, wind conditions on Level 3 and Level 6 outdoor amenities are anticipated to be comfortable for sitting or standing, aligning with the intended pedestrian use of the area (Figure 1B). Similar conditions are also expected at most locations on Level 3 and Level 6 during the winter, with the exception of the northwest area on Level 6 and the southeast corner on Level 3, where slightly elevated wind speeds suitable for leisurely walking are predicted (Locations 70 and 73 in Figure 2B). These areas are not expected to be frequently used during the winter, and the increased wind activity is considered appropriate.

3.3 Future Configuration

The addition of future developments in the area, particularly the one adjacent to the proposed building, is expected to create a sheltering effect along the sidewalk on Old Lakeshore Road, leading to improved wind conditions on the sidewalk year-round (Figures 1C and 2C). The remaining locations on and around the proposed site are expected to experience wind conditions similar to those in the Proposed Configuration. Wind conditions on Levels 3 and 6 of the proposed development are not expected to be significantly altered by future constructions, but some additional areas with conditions suitable for leisurely walking are anticipated, particularly during the winter.

3.4 Updated Drawings

RWDI received updated drawings on December 17, 2024 (Images 6). The modified massing will include a recessed ground floor and slightly expanded floors above to create a 2m wide colonnade along the entire street front of Lakeshore Road on the northwest side of the façade. The proposed design feature is a positive addition and is expected to improve wind conditions at the north entrance while having no significant impact on wind conditions in the surrounding areas, even after the construction of future developments (Image 6).

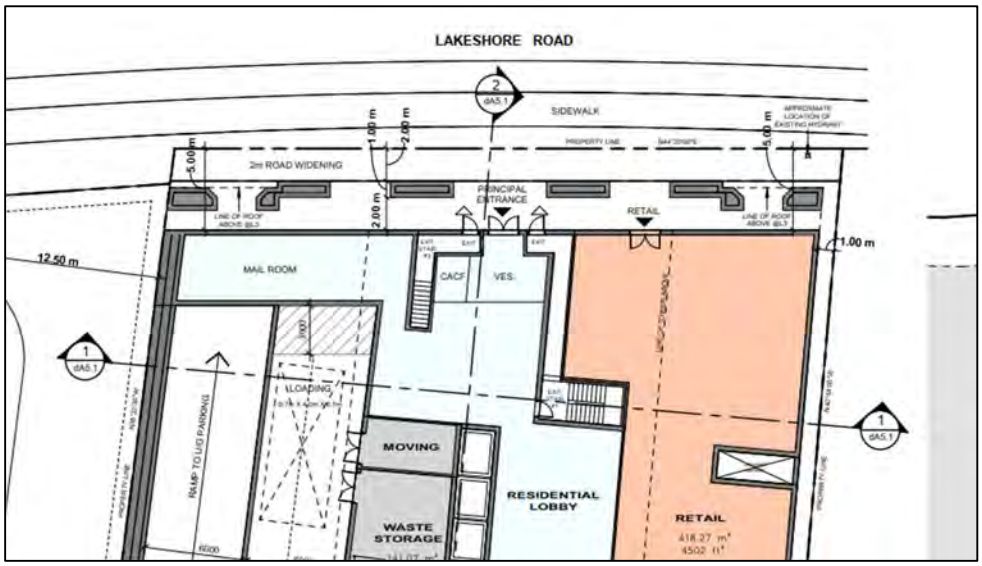


Image 6: Proposed Colonnade along Lakeshore Road

4 APPLICABILITY OF RESULTS

The wind conditions presented in this report pertain to the model of the 2083 Old Lakeshore Road constructed using the drawings and information listed below. Should there be any design changes that deviate from this list of drawings, the wind condition predictions presented may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

File Name	File Type	Date Received (dd/mm/yyyy)
22047 - 2083 Old Lakeshore - Coordination Package (2024-11-20)	PDF	20/11/2024
20241120_22047 3D cad export	CAD	20/11/2024
22047 - 2083 Old Lakeshore - Updated Ground Floor Plan and Site Plan (2024-12-16)	PDF	17/12/2024

5 REFERENCES

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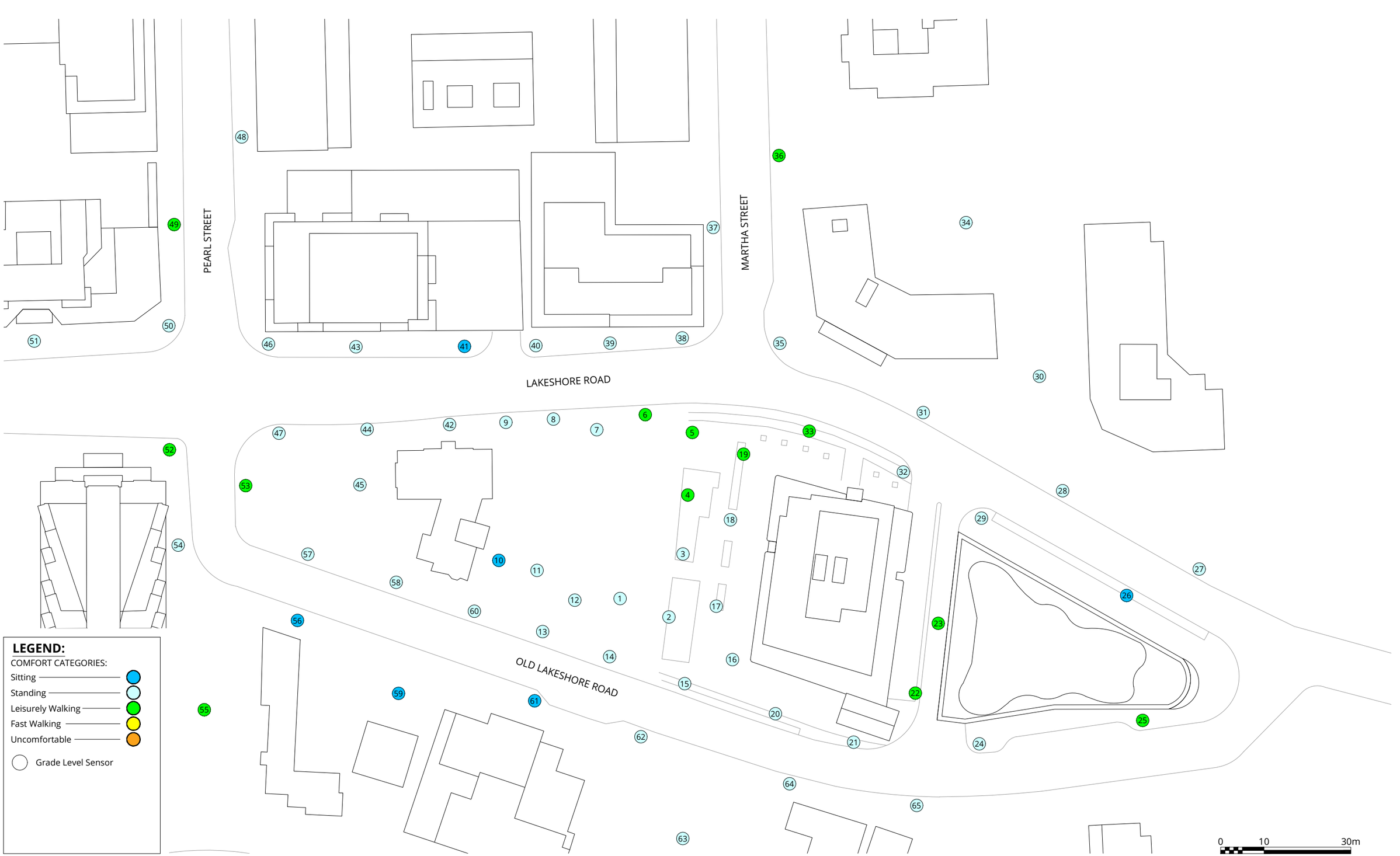
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FIGURES



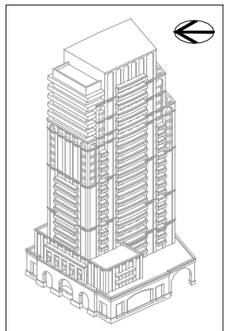
Pedestrian Wind Comfort Conditions
Existing Configuration
Summer (May to October, 6:00 to 23:00)

2083 Old Lakeshore Road - Burlington, ON

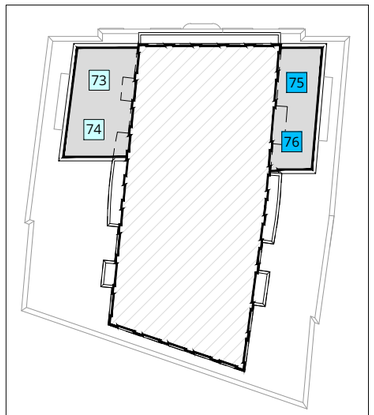
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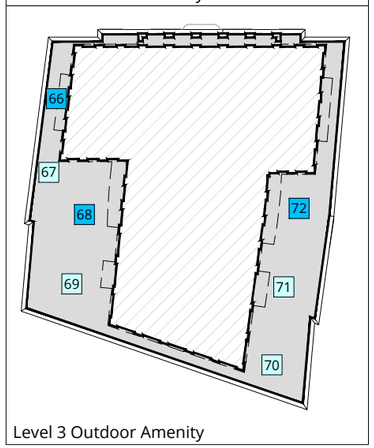
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Date Revised:			Dec. 2, 2024



Isometric View of Building



Level 6 Outdoor Amenity



Level 3 Outdoor Amenity

PEARL STREET

MARTHA STREET

LAKESHORE ROAD

OLD LAKESHORE ROAD

LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Leisurely Walking
- Fast Walking
- Uncomfortable

- Grade Level Sensor
- Above Grade Amenity Sensor
- Building Above Removed for Clarity
- Main Entrance Location

0 10 30m

Pedestrian Wind Comfort Conditions

Proposed Configuration

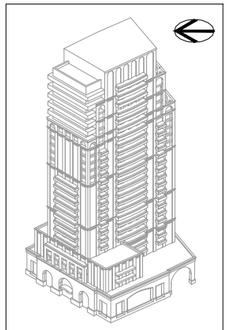
Summer (May to October, 6:00 to 23:00)

2083 Old Lakeshore Road - Burlington, ON

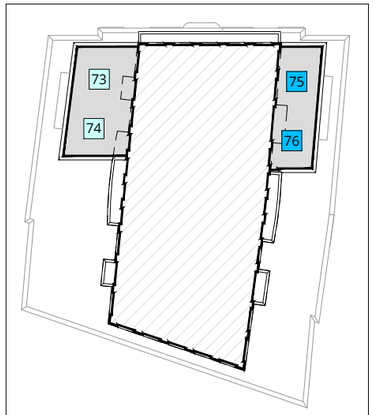
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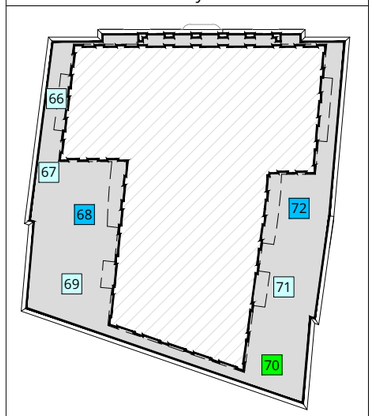
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Date Revised:		Dec. 2, 2024	



Isometric View of Building



Level 6 Outdoor Amenity



Level 3 Outdoor Amenity

PEARL STREET

MARTHA STREET

LAKESHORE ROAD

OLD LAKESHORE ROAD

FUTURE BUILDING

LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Leisurely Walking
- Fast Walking
- Uncomfortable

- Grade Level Sensor
- Above Grade Amenity Sensor
- Building Above Removed for Clarity
- Main Entrance Location

0 10 30m

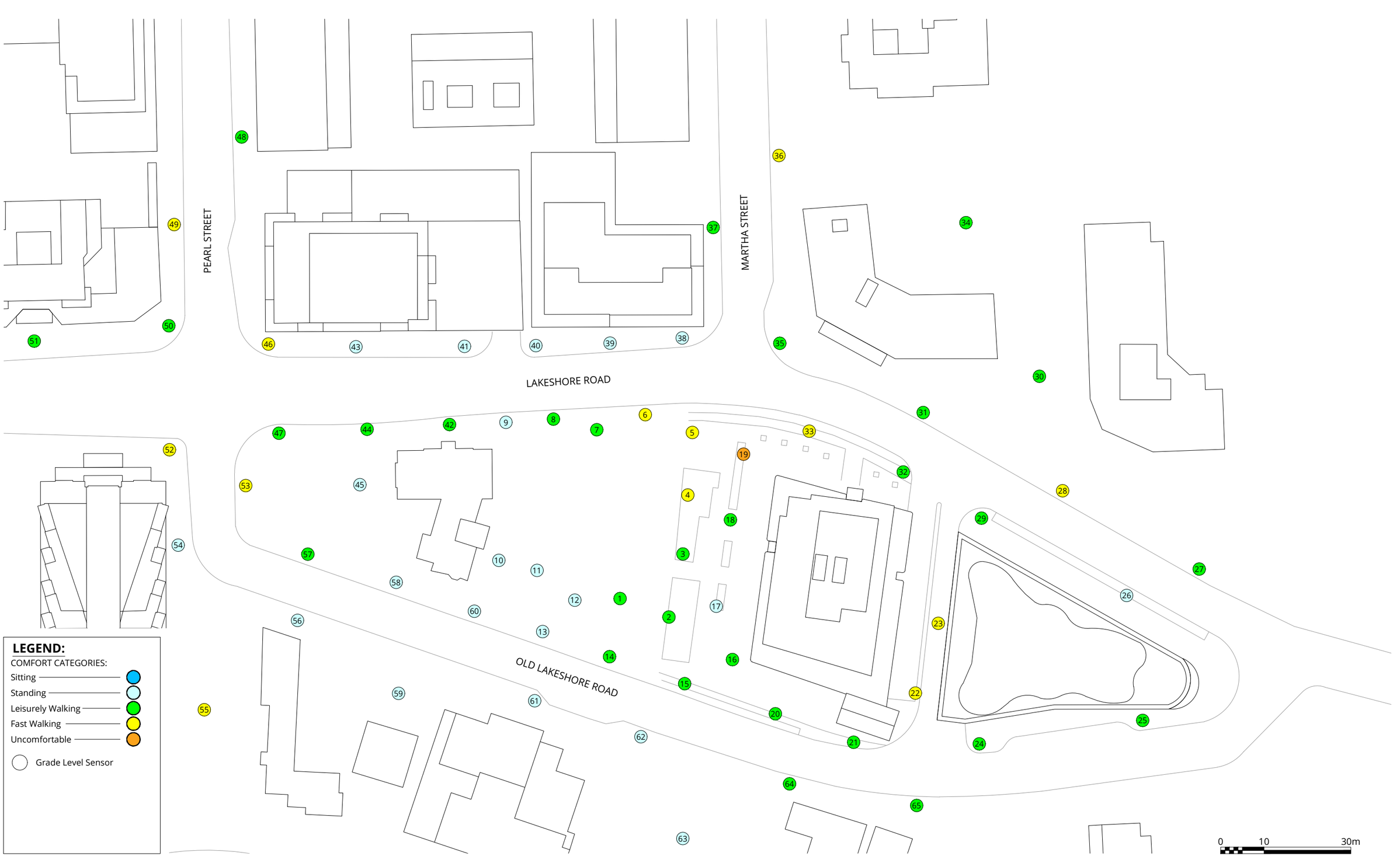
Pedestrian Wind Comfort Conditions
Future Configuration
Summer (May to October, 6:00 to 23:00)

2083 Old Lakeshore Road - Burlington, ON

True North

Project #2304294

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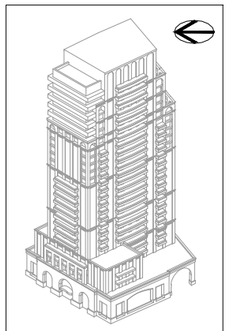
Pedestrian Wind Comfort Conditions
Existing Configuration
Winter (November to April, 6:00 to 23:00)

2083 Old Lakeshore Road - Burlington, ON

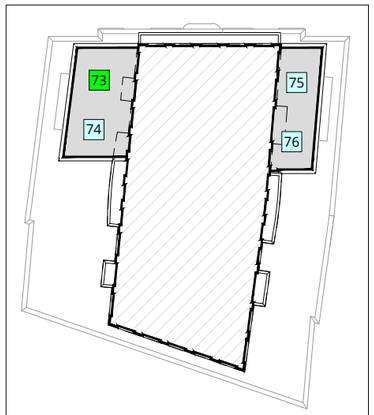
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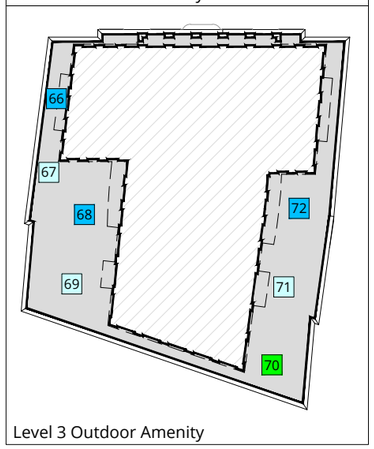
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Isometric View of Building



Level 6 Outdoor Amenity



Level 3 Outdoor Amenity

PEARL STREET

MARTHA STREET

LAKESHORE ROAD

OLD LAKESHORE ROAD

LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Leisurely Walking
- Fast Walking
- Uncomfortable

- Grade Level Sensor
- Above Grade Amenity Sensor
- Building Above Removed for Clarity
- Main Entrance Location

0 10 30m

Pedestrian Wind Comfort Conditions

Proposed Configuration

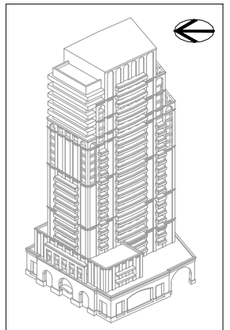
Winter (November to April, 6:00 to 23:00)

2083 Old Lakeshore Road - Burlington, ON

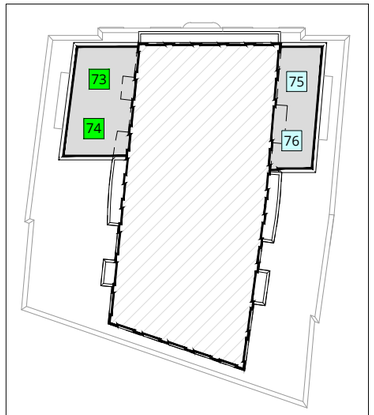
True North

Project #2304294

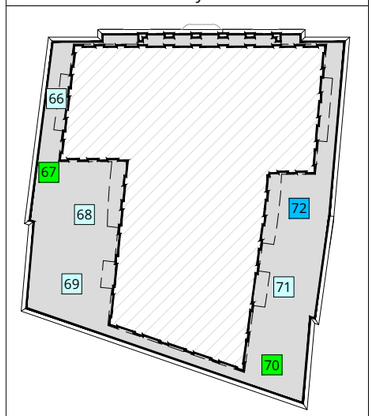
Drawn by:	GRE	Figure:	2B
Approx. Scale:	1:800		
Date Revised:	Dec. 2, 2024		



Isometric View of Building



Level 6 Outdoor Amenity



Level 3 Outdoor Amenity

PEARL STREET

MARTHA STREET

LAKESHORE ROAD

OLD LAKESHORE ROAD

FUTURE BUILDING

LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Leisurely Walking
- Fast Walking
- Uncomfortable

- Grade Level Sensor
- Above Grade Amenity Sensor
- Building Above Removed for Clarity
- Main Entrance Location

0 10 30m

Pedestrian Wind Comfort Conditions
Future Configuration
Winter (November to April, 6:00 to 23:00)

2083 Old Lakeshore Road - Burlington, ON

True North

Project #2304294

Drawn by:	GRE	Figure:	2C
Approx. Scale:	1:800		
Date Revised:	Dec. 2, 2024		

TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
1	Existing	13	Standing	16	Leisurely Walking	69	Pass
	Proposed	8	Sitting	9	Sitting	52	Pass
	Future	7	Sitting	8	Sitting	50	Pass
2	Existing	13	Standing	16	Leisurely Walking	69	Pass
	Proposed	15	Leisurely Walking	17	Leisurely Walking	76	Pass
	Future	14	Standing	16	Leisurely Walking	75	Pass
3	Existing	14	Standing	17	Leisurely Walking	74	Pass
	Proposed	14	Standing	17	Leisurely Walking	82	Pass
	Future	14	Standing	17	Leisurely Walking	83	Pass
4	Existing	15	Leisurely Walking	19	Fast Walking	76	Pass
	Proposed	13	Standing	16	Leisurely Walking	69	Pass
	Future	13	Standing	15	Leisurely Walking	71	Pass
5	Existing	17	Leisurely Walking	20	Fast Walking	80	Pass
	Proposed	13	Standing	16	Leisurely Walking	73	Pass
	Future	13	Standing	15	Leisurely Walking	75	Pass
6	Existing	15	Leisurely Walking	18	Fast Walking	78	Pass
	Proposed	16	Leisurely Walking	19	Fast Walking	76	Pass
	Future	14	Standing	17	Leisurely Walking	78	Pass
7	Existing	13	Standing	16	Leisurely Walking	75	Pass
	Proposed	11	Standing	14	Standing	60	Pass
	Future	11	Standing	13	Standing	59	Pass
8	Existing	12	Standing	15	Leisurely Walking	70	Pass
	Proposed	14	Standing	17	Leisurely Walking	73	Pass
	Future	13	Standing	16	Leisurely Walking	69	Pass
9	Existing	12	Standing	14	Standing	68	Pass
	Proposed	14	Standing	17	Leisurely Walking	69	Pass
	Future	11	Standing	14	Standing	58	Pass
10	Existing	10	Sitting	12	Standing	60	Pass
	Proposed	9	Sitting	11	Standing	52	Pass
	Future	4	Sitting	5	Sitting	21	Pass
11	Existing	11	Standing	13	Standing	64	Pass
	Proposed	9	Sitting	12	Standing	61	Pass
	Future	5	Sitting	6	Sitting	33	Pass
12	Existing	12	Standing	14	Standing	67	Pass
	Proposed	10	Sitting	11	Standing	56	Pass
	Future	8	Sitting	9	Sitting	50	Pass

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Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
13	Existing	11	Standing	14	Standing	62	Pass
	Proposed	12	Standing	15	Leisurely Walking	71	Pass
	Future	9	Sitting	11	Standing	60	Pass
14	Existing	12	Standing	15	Leisurely Walking	65	Pass
	Proposed	13	Standing	16	Leisurely Walking	74	Pass
	Future	10	Sitting	12	Standing	67	Pass
15	Existing	13	Standing	17	Leisurely Walking	69	Pass
	Proposed	14	Standing	18	Fast Walking	75	Pass
	Future	13	Standing	15	Leisurely Walking	73	Pass
16	Existing	12	Standing	15	Leisurely Walking	63	Pass
	Proposed	12	Standing	15	Leisurely Walking	68	Pass
	Future	12	Standing	14	Standing	68	Pass
17	Existing	11	Standing	14	Standing	60	Pass
	Proposed	15	Leisurely Walking	17	Leisurely Walking	73	Pass
	Future	15	Leisurely Walking	17	Leisurely Walking	73	Pass
18	Existing	13	Standing	16	Leisurely Walking	67	Pass
	Proposed	15	Leisurely Walking	18	Fast Walking	79	Pass
	Future	16	Leisurely Walking	18	Fast Walking	79	Pass
19	Existing	17	Leisurely Walking	21	Uncomfortable	77	Pass
	Proposed	15	Leisurely Walking	18	Fast Walking	70	Pass
	Future	15	Leisurely Walking	18	Fast Walking	70	Pass
20	Existing	12	Standing	15	Leisurely Walking	63	Pass
	Proposed	11	Standing	13	Standing	57	Pass
	Future	10	Sitting	12	Standing	55	Pass
21	Existing	12	Standing	15	Leisurely Walking	71	Pass
	Proposed	12	Standing	14	Standing	69	Pass
	Future	11	Standing	13	Standing	67	Pass
22	Existing	17	Leisurely Walking	19	Fast Walking	87	Pass
	Proposed	16	Leisurely Walking	18	Fast Walking	85	Pass
	Future	16	Leisurely Walking	19	Fast Walking	85	Pass
23	Existing	16	Leisurely Walking	18	Fast Walking	78	Pass
	Proposed	15	Leisurely Walking	18	Fast Walking	76	Pass
	Future	15	Leisurely Walking	18	Fast Walking	76	Pass
24	Existing	13	Standing	16	Leisurely Walking	66	Pass
	Proposed	12	Standing	15	Leisurely Walking	63	Pass
	Future	12	Standing	14	Standing	63	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
25	Existing	15	Leisurely Walking	17	Leisurely Walking	81	Pass
	Proposed	14	Standing	16	Leisurely Walking	78	Pass
	Future	15	Leisurely Walking	16	Leisurely Walking	81	Pass
26	Existing	10	Sitting	13	Standing	63	Pass
	Proposed	11	Standing	13	Standing	62	Pass
	Future	10	Sitting	13	Standing	61	Pass
27	Existing	12	Standing	15	Leisurely Walking	69	Pass
	Proposed	12	Standing	15	Leisurely Walking	67	Pass
	Future	12	Standing	14	Standing	68	Pass
28	Existing	14	Standing	18	Fast Walking	72	Pass
	Proposed	13	Standing	17	Leisurely Walking	69	Pass
	Future	14	Standing	17	Leisurely Walking	71	Pass
29	Existing	13	Standing	16	Leisurely Walking	70	Pass
	Proposed	12	Standing	14	Standing	67	Pass
	Future	12	Standing	15	Leisurely Walking	70	Pass
30	Existing	13	Standing	16	Leisurely Walking	65	Pass
	Proposed	13	Standing	15	Leisurely Walking	62	Pass
	Future	12	Standing	15	Leisurely Walking	62	Pass
31	Existing	14	Standing	17	Leisurely Walking	71	Pass
	Proposed	13	Standing	15	Leisurely Walking	65	Pass
	Future	13	Standing	15	Leisurely Walking	65	Pass
32	Existing	14	Standing	17	Leisurely Walking	80	Pass
	Proposed	13	Standing	15	Leisurely Walking	75	Pass
	Future	13	Standing	16	Leisurely Walking	76	Pass
33	Existing	15	Leisurely Walking	18	Fast Walking	74	Pass
	Proposed	14	Standing	17	Leisurely Walking	70	Pass
	Future	13	Standing	16	Leisurely Walking	70	Pass
34	Existing	12	Standing	15	Leisurely Walking	63	Pass
	Proposed	12	Standing	15	Leisurely Walking	61	Pass
	Future	12	Standing	16	Leisurely Walking	62	Pass
35	Existing	14	Standing	17	Leisurely Walking	68	Pass
	Proposed	13	Standing	16	Leisurely Walking	63	Pass
	Future	13	Standing	15	Leisurely Walking	63	Pass
36	Existing	16	Leisurely Walking	20	Fast Walking	81	Pass
	Proposed	15	Leisurely Walking	19	Fast Walking	79	Pass
	Future	15	Leisurely Walking	19	Fast Walking	78	Pass

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Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
37	Existing	12	Standing	15	Leisurely Walking	68	Pass
	Proposed	12	Standing	15	Leisurely Walking	72	Pass
	Future	13	Standing	15	Leisurely Walking	75	Pass
38	Existing	12	Standing	14	Standing	79	Pass
	Proposed	14	Standing	17	Leisurely Walking	76	Pass
	Future	13	Standing	15	Leisurely Walking	72	Pass
39	Existing	11	Standing	13	Standing	70	Pass
	Proposed	14	Standing	17	Leisurely Walking	74	Pass
	Future	14	Standing	16	Leisurely Walking	73	Pass
40	Existing	12	Standing	14	Standing	64	Pass
	Proposed	13	Standing	16	Leisurely Walking	76	Pass
	Future	13	Standing	16	Leisurely Walking	74	Pass
41	Existing	10	Sitting	12	Standing	59	Pass
	Proposed	12	Standing	14	Standing	74	Pass
	Future	13	Standing	15	Leisurely Walking	72	Pass
42	Existing	12	Standing	15	Leisurely Walking	68	Pass
	Proposed	13	Standing	16	Leisurely Walking	73	Pass
	Future	13	Standing	16	Leisurely Walking	64	Pass
43	Existing	11	Standing	14	Standing	62	Pass
	Proposed	12	Standing	15	Leisurely Walking	72	Pass
	Future	14	Standing	17	Leisurely Walking	73	Pass
44	Existing	12	Standing	15	Leisurely Walking	60	Pass
	Proposed	13	Standing	16	Leisurely Walking	74	Pass
	Future	13	Standing	16	Leisurely Walking	62	Pass
45	Existing	11	Standing	14	Standing	53	Pass
	Proposed	11	Standing	14	Standing	56	Pass
	Future	-	-	-	-	-	-
46	Existing	14	Standing	18	Fast Walking	73	Pass
	Proposed	14	Standing	18	Fast Walking	73	Pass
	Future	13	Standing	16	Leisurely Walking	69	Pass
47	Existing	14	Standing	17	Leisurely Walking	65	Pass
	Proposed	15	Leisurely Walking	18	Fast Walking	76	Pass
	Future	12	Standing	15	Leisurely Walking	65	Pass
48	Existing	14	Standing	17	Leisurely Walking	75	Pass
	Proposed	14	Standing	17	Leisurely Walking	75	Pass
	Future	14	Standing	17	Leisurely Walking	75	Pass

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Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
49	Existing	16	Leisurely Walking	19	Fast Walking	81	Pass
	Proposed	16	Leisurely Walking	19	Fast Walking	80	Pass
	Future	15	Leisurely Walking	18	Fast Walking	79	Pass
50	Existing	14	Standing	17	Leisurely Walking	71	Pass
	Proposed	14	Standing	17	Leisurely Walking	73	Pass
	Future	14	Standing	17	Leisurely Walking	76	Pass
51	Existing	14	Standing	17	Leisurely Walking	71	Pass
	Proposed	13	Standing	16	Leisurely Walking	76	Pass
	Future	13	Standing	17	Leisurely Walking	76	Pass
52	Existing	15	Leisurely Walking	19	Fast Walking	79	Pass
	Proposed	14	Standing	18	Fast Walking	79	Pass
	Future	14	Standing	17	Leisurely Walking	76	Pass
53	Existing	15	Leisurely Walking	19	Fast Walking	77	Pass
	Proposed	15	Leisurely Walking	19	Fast Walking	78	Pass
	Future	14	Standing	17	Leisurely Walking	68	Pass
54	Existing	11	Standing	13	Standing	53	Pass
	Proposed	12	Standing	14	Standing	61	Pass
	Future	13	Standing	16	Leisurely Walking	64	Pass
55	Existing	15	Leisurely Walking	19	Fast Walking	85	Pass
	Proposed	14	Standing	18	Fast Walking	81	Pass
	Future	13	Standing	15	Leisurely Walking	74	Pass
56	Existing	10	Sitting	13	Standing	52	Pass
	Proposed	10	Sitting	13	Standing	52	Pass
	Future	12	Standing	16	Leisurely Walking	68	Pass
57	Existing	12	Standing	16	Leisurely Walking	64	Pass
	Proposed	13	Standing	16	Leisurely Walking	63	Pass
	Future	10	Sitting	13	Standing	64	Pass
58	Existing	11	Standing	14	Standing	58	Pass
	Proposed	12	Standing	15	Leisurely Walking	63	Pass
	Future	8	Sitting	10	Sitting	40	Pass
59	Existing	10	Sitting	12	Standing	53	Pass
	Proposed	9	Sitting	12	Standing	49	Pass
	Future	10	Sitting	13	Standing	53	Pass
60	Existing	11	Standing	14	Standing	62	Pass
	Proposed	11	Standing	13	Standing	64	Pass
	Future	8	Sitting	10	Sitting	52	Pass

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Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
61	Existing	10	Sitting	13	Standing	52	Pass
	Proposed	13	Standing	16	Leisurely Walking	69	Pass
	Future	11	Standing	13	Standing	67	Pass
62	Existing	11	Standing	14	Standing	59	Pass
	Proposed	13	Standing	16	Leisurely Walking	67	Pass
	Future	11	Standing	13	Standing	63	Pass
63	Existing	11	Standing	14	Standing	59	Pass
	Proposed	12	Standing	15	Leisurely Walking	61	Pass
	Future	11	Standing	13	Standing	60	Pass
64	Existing	13	Standing	17	Leisurely Walking	71	Pass
	Proposed	13	Standing	17	Leisurely Walking	69	Pass
	Future	13	Standing	15	Leisurely Walking	67	Pass
65	Existing	14	Standing	17	Leisurely Walking	67	Pass
	Proposed	13	Standing	15	Leisurely Walking	63	Pass
	Future	12	Standing	15	Leisurely Walking	60	Pass
66	Existing	-	-	-	-	-	-
	Proposed	8	Sitting	10	Sitting	41	Pass
	Future	11	Standing	14	Standing	67	Pass
67	Existing	-	-	-	-	-	-
	Proposed	12	Standing	14	Standing	56	Pass
	Future	14	Standing	17	Leisurely Walking	65	Pass
68	Existing	-	-	-	-	-	-
	Proposed	8	Sitting	10	Sitting	42	Pass
	Future	9	Sitting	11	Standing	42	Pass
69	Existing	-	-	-	-	-	-
	Proposed	11	Standing	13	Standing	60	Pass
	Future	11	Standing	13	Standing	59	Pass
70	Existing	-	-	-	-	-	-
	Proposed	14	Standing	16	Leisurely Walking	79	Pass
	Future	15	Leisurely Walking	16	Leisurely Walking	78	Pass
71	Existing	-	-	-	-	-	-
	Proposed	11	Standing	13	Standing	74	Pass
	Future	11	Standing	13	Standing	74	Pass
72	Existing	-	-	-	-	-	-
	Proposed	9	Sitting	10	Sitting	57	Pass
	Future	9	Sitting	10	Sitting	57	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
73	Existing	-	-	-	-	-	-
	Proposed	12	Standing	16	Leisurely Walking	68	Pass
	Future	12	Standing	16	Leisurely Walking	70	Pass
74	Existing	-	-	-	-	-	-
	Proposed	11	Standing	14	Standing	59	Pass
	Future	13	Standing	17	Leisurely Walking	70	Pass
75	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	12	Standing	70	Pass
	Future	10	Sitting	12	Standing	71	Pass
76	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	12	Standing	60	Pass
	Future	10	Sitting	12	Standing	61	Pass

Season	Months	Hours
Summer	May - October	6:00 - 23:00 for comfort
Winter	November - April	6:00 - 23:00 for comfort
Annual	January - December	0:00 - 23:00 for safety
Configurations		
Existing	Existing site and surroundings	
Proposed	Project with existing surroundings	
Future	Project with future surroundings	

Comfort Speed (km/h)	
(20% Seasonal Exceedance)	
≤ 10	Sitting
11 - 14	Standing
15 - 17	Leisurely Walking
18 - 20	Fast Walking
> 20	Uncomfortable

Safety Speed (km/h)	
(0.1% Annual Exceedance)	
≤ 90	Pass
> 90	Exceeded