REPORT

1062-1074 COOKE BOULEVARD

BURLINGTON, ON

PEDESTRIAN WIND STUDY
RWDI # 2205162
August 18, 2022

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI was retained to conduct a pedestrian wind assessment for the proposed development at 1062-1074 Cooke Boulevard in Burlington, ON. The assessment was based on the wind-tunnel testing conducted for the proposed development site under the Existing and Proposed configurations of the site and surroundings. The results were analysed using the regional wind climate records and evaluated against the RWDI Pedestrian Wind Criteria for pedestrian comfort (pertaining to common wind speeds conducive to different levels of human activity) and pedestrian safety (pertaining to infrequent but strong gusts that could affect a person's footing). The predicted wind conditions are presented in Figures 1A through 3C, and Table 1, and are summarized as follows:

- Wind conditions meet the safety criterion at all locations in the Existing configuration throughout the year.

- The proposed project is exposed to winds from the northeast and southwest directions, resulting in a number of exceedances of the wind safety criterion at and above grade level.

- In the summer, wind conditions are considered appropriate for the intended pedestrian use at all locations on and around the project site under the Existing configuration. Under the Proposed configuration, most locations have adequate wind conditions (including grade level and Level 4); however, the wind conditions at some above-grade areas are not suitable for passive activities.

- In the winter, wind conditions are also considered appropriate for the intended pedestrian use at all locations on and around the project site under the Existing configuration. Under the Proposed configuration, several uncomfortable areas are anticipated at and above grade level. It is our opinion that, with addition of the proposed landscaping elements, wind conditions at ground level are expected to improve on the sidewalk of Masonry Court (building side).

- Suitable wind conditions are predicted for main entrances to the proposed buildings throughout the year and excluding locations immediately across Cooke Boulevard and Masonry Court, wind conditions further away from the site are generally unaffected by the proposed development.

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1 INTRODUCTION

RWDI was retained to conduct a pedestrian wind assessment for the proposed development at 1062-1074 Cooke Boulevard in Burlington, ON. This report presents the project objectives, approach and the main results from RWDI's assessment and provides conceptual wind control measures, where necessary. Our Statement of Limitations as it pertains to this study can be found in Section 4 of this report.

1.1 Project Description

The project site is located on the south corner of the intersection between Cooke Boulevard and Masonry Court (Image 1). The development will consist of two residential towers (one 30 storeys and the other 32 storeys) with a shared 4-storey podium and outdoor amenity spaces proposed on Levels 4, 5 and 7.

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 building entrances and public sidewalks.

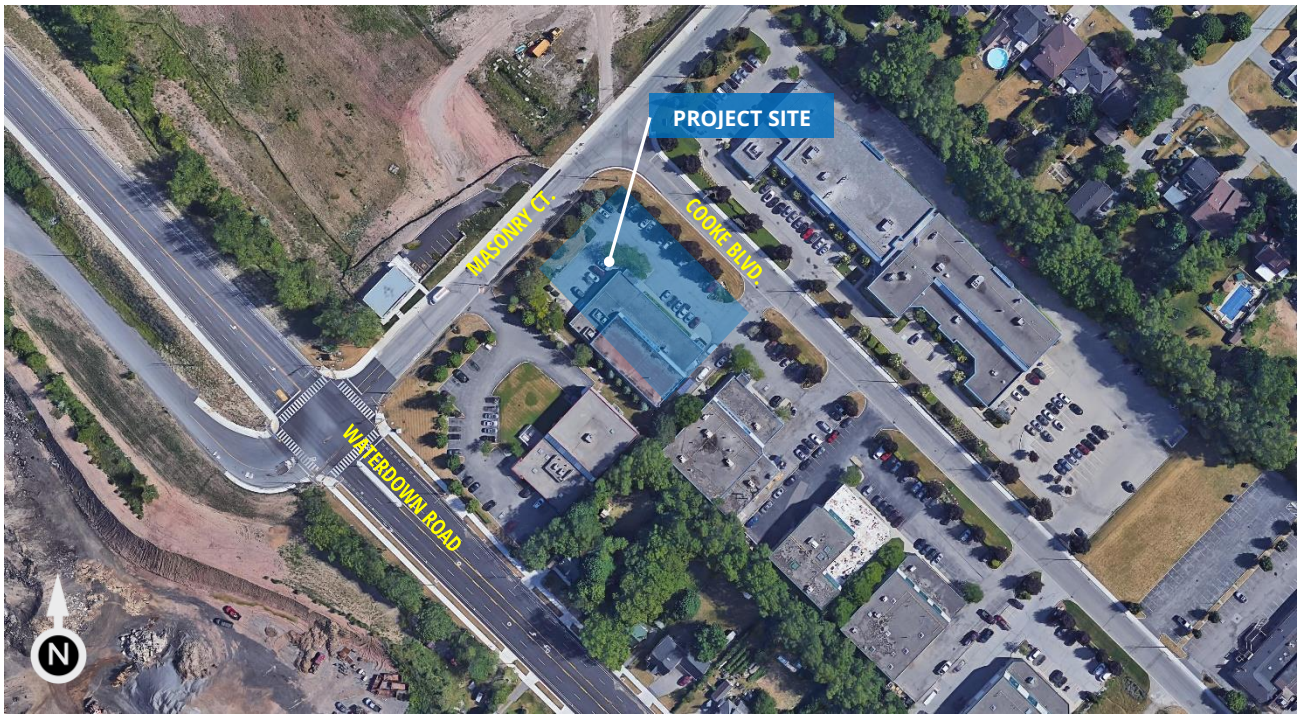


Image 1: Aerial View of Site and Surroundings (Photo Courtesy of Google™ Earth)

2 BACKGROUND AND APPROACH

2.1 Wind Tunnel Study Model

To assess the wind environment around the proposed project, a 1:300 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), and

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

The wind tunnel model included all relevant surrounding buildings and topography within an approximate 360m radius around 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 126 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. The placement of wind measurement locations was based on our experience and understanding of the pedestrian usage for this 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.

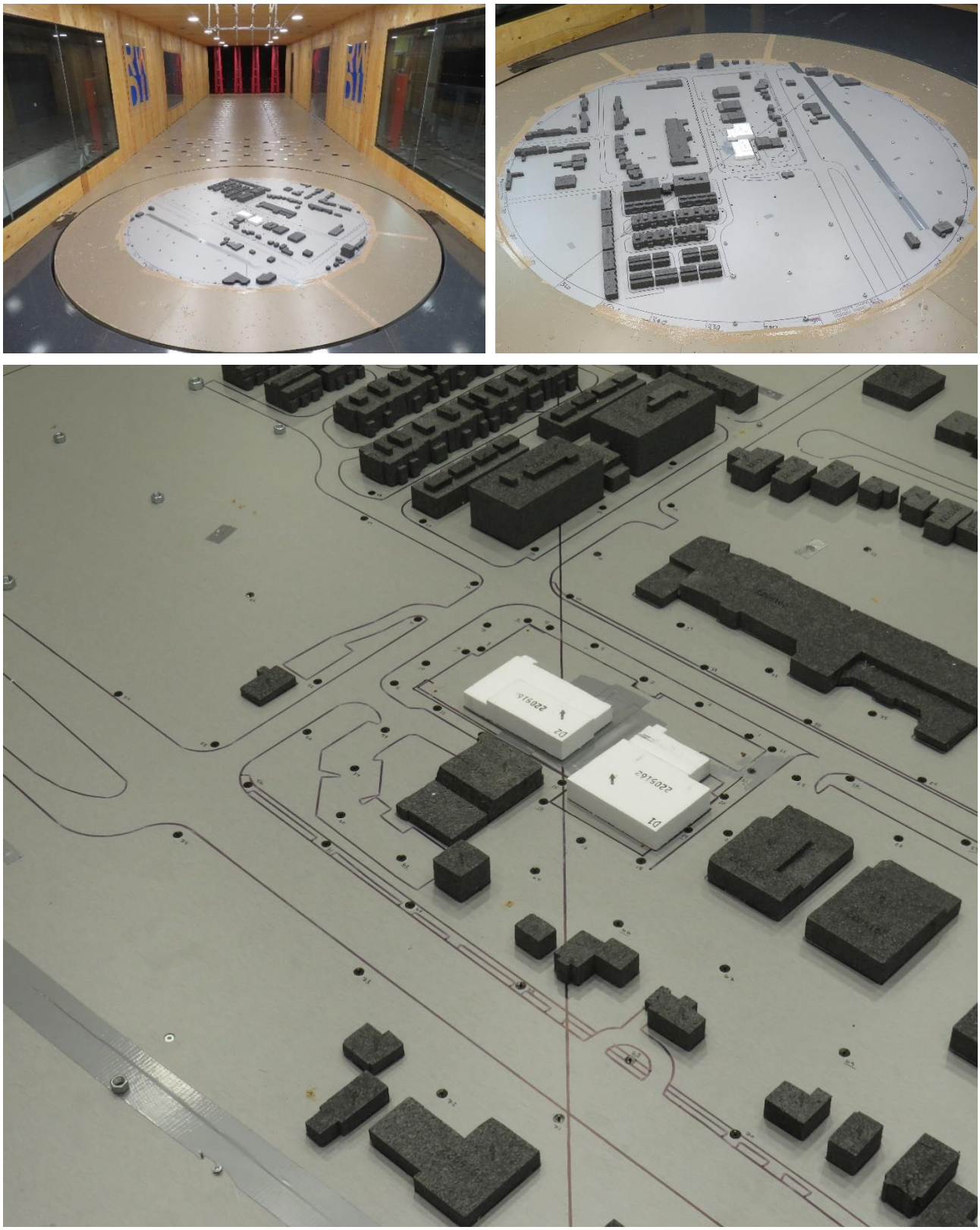
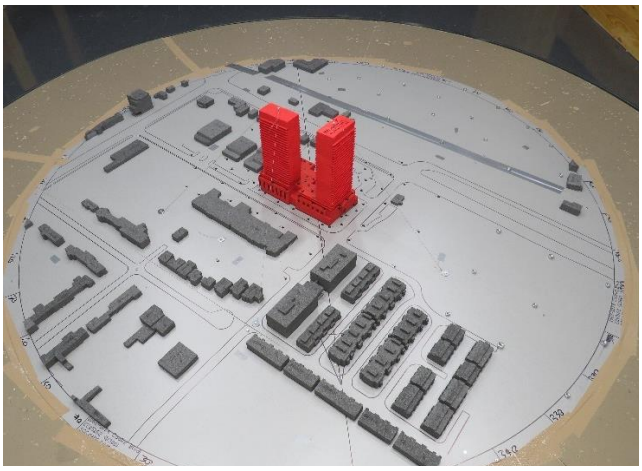


Image 2A: Wind Tunnel Study Model – Existing Configuration





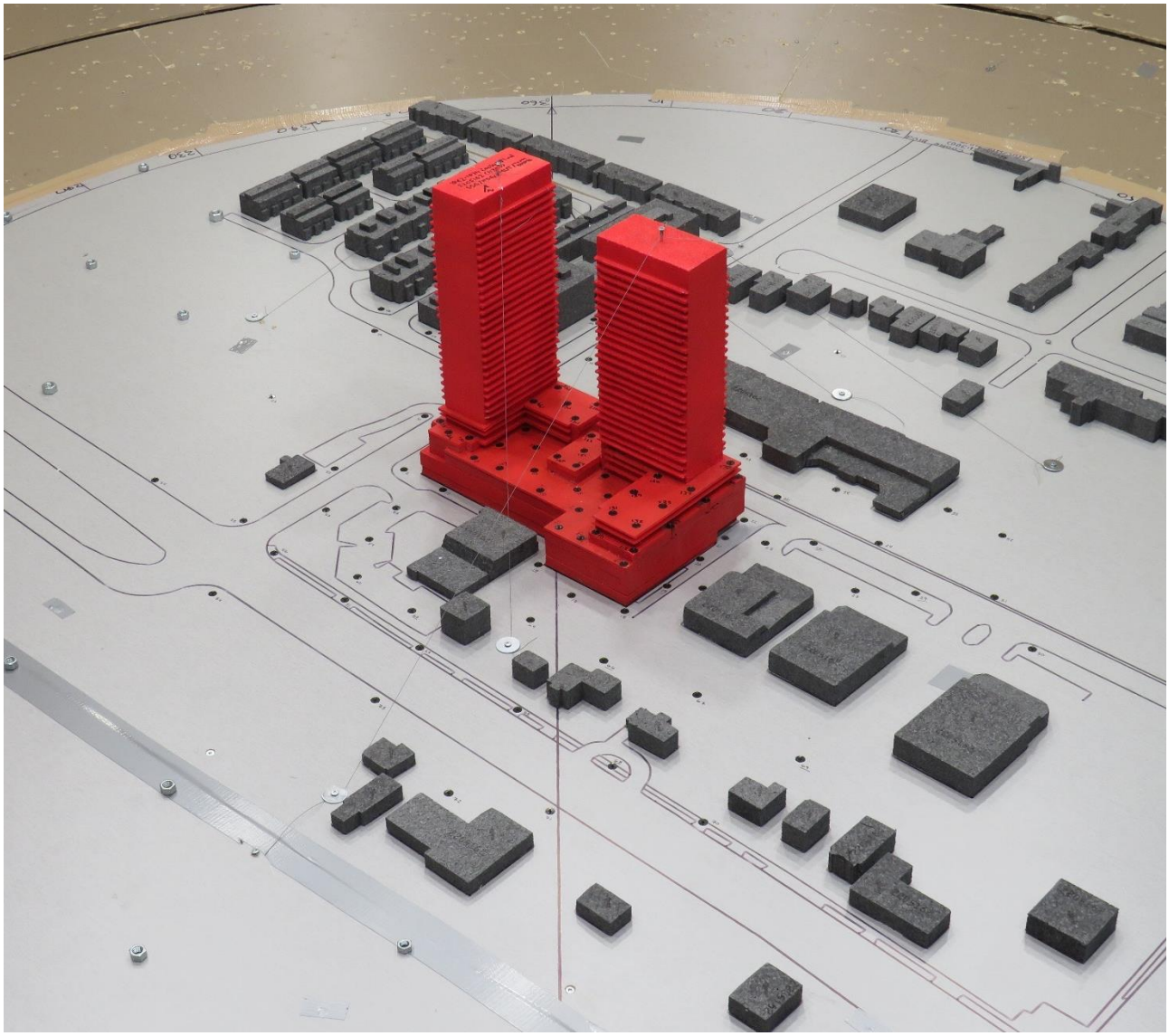
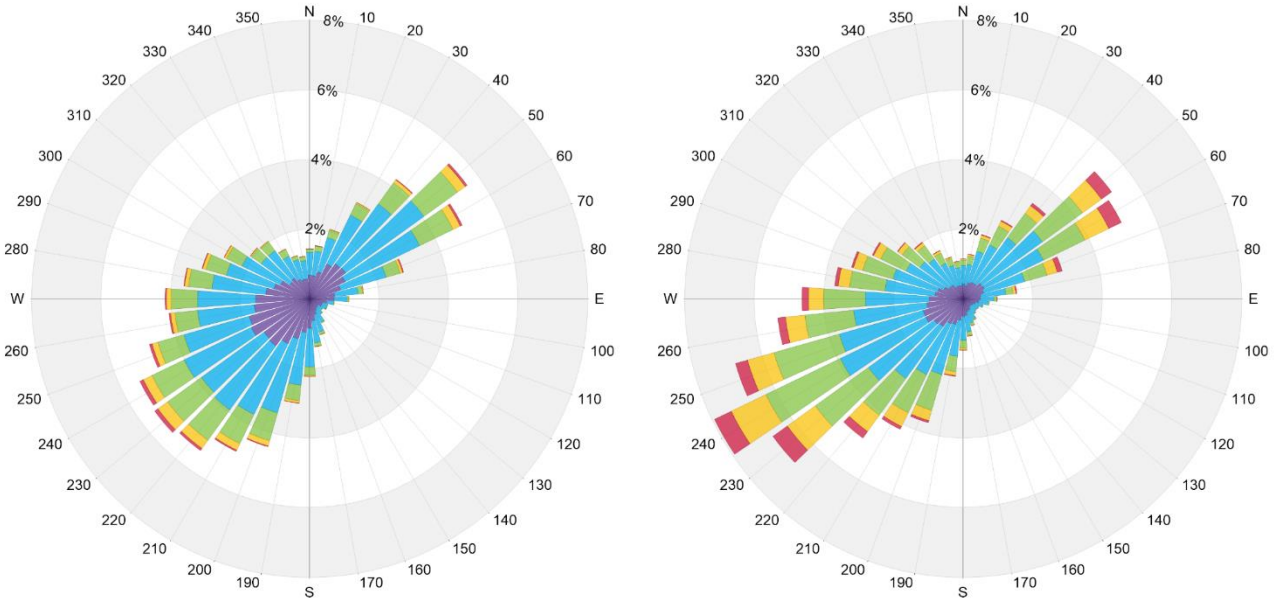


Image 2B: Wind Tunnel Study Model – Proposed Configuration

2.2 Wind Climate Data

Wind statistics recorded at the Hamilton International Airport between 1990 and 2020, 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 seasons 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 for 3.8% of the summer and 12.6% of winter.

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.



Wind Speed (km/h)	Probability (%) Summer	Winter
Calm	3.9	2.3
1-10	33.7	21.7
11-20	43.1	39.5
21-30	15.5	23.9
31-40	3.0	9.0
>40	0.8	3.6

Image 3: Directional Distribution of Winds Approaching the Hamilton International Airport between 1990 and 2020

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

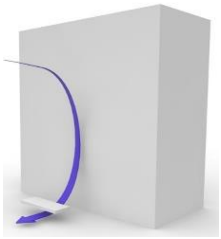
Notes:
(1) GEM is defined as the maximum mean wind speed or gust speed divided by 1.85 (whichever is larger). Gust speed can be directly measured in a wind tunnel or represented by mean wind speed + 3*RMS (Root Mean Square) wind speed.
(2) GEM speeds listed above are based on a seasonal exceedance of 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.

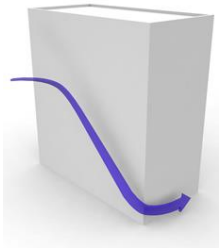
2.4 General Wind Flow Mechanisms

discussion of wind conditions, reference is made to the following wind flow mechanisms (Image 4):



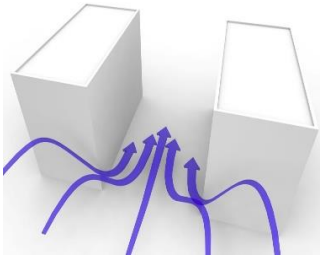
DOWNWASHING

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



CORNER ACCELERATION

When wind moves around the buildings a localized increase in the wind activity or corner acceleration can be expected around the exposed building corners at pedestrian level. The effect is intensified when the wind approaches at an oblique angle to a tall façade and are deflected down and around the exposed corners.



CHANNELLING EFFECT

Wind flow tends to accelerate through the space between buildings, under bridges or in passages through buildings due to channelling effect caused by the narrow gap. The effect is intensified if the channel is aligned with the predominant wind direction.

Image 4: General Wind Flow Mechanisms

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)

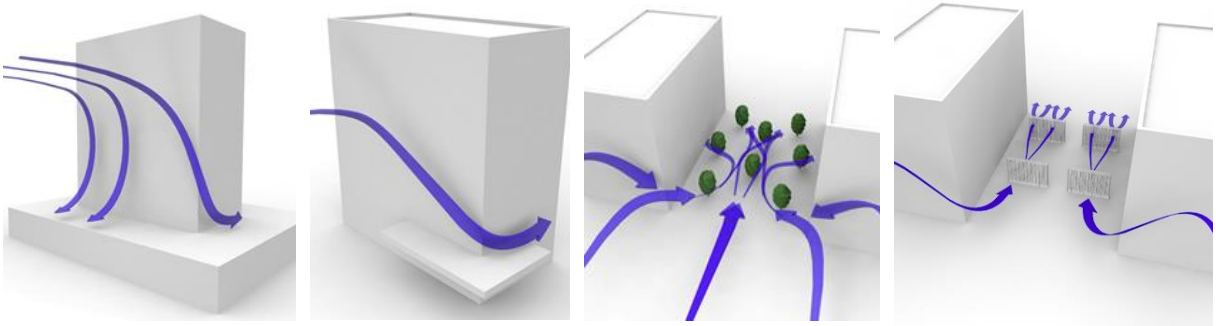


Image 5: Common Wind Control Measures

3 RESULTS AND DISCUSSION

The predicted wind conditions are shown on site plans in Figures 1A through 3B located in the "Figures" section of this report and the associated wind speeds are presented in Table 1, located in the "Tables" section of this report. The following is a detailed discussion of the suitability of the predicted wind conditions for the anticipated pedestrian use of each area of interest.

Wind conditions comfortable for leisurely or fast 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 comfortable for standing or sitting are preferred at main entrances where pedestrians are apt to linger. Wind speeds comfortable for sitting or standing are ideal during the summer for areas intended for passive activities, such as plaza spaces and outdoor dining areas.

3.1 Pedestrian Wind Safety

3.1.1 Existing Configuration

Wind conditions are considered safe on and off the project site throughout the year (Image 3A).

3.1.2 Proposed Configuration

The proposed buildings act as an obstacle to the winds coming from the southwest and northeast quadrants, forcing the local winds to downwash and accelerate around the building corners, on the podium and through the narrow space between the towers. This results in exceedances of the safety criterion near building corners at several areas at the grade level (Locations 6, 7, 10 22-24, 36, 40, 50, and 51 in Figure 3B) and at above-grade areas, especially on Level 7 (Locations 93, 96, 109, 114,118,119,121-123, 125, and 126 in Figure 3B). Pedestrian Wind Comfort

3.2 Pedestrian Wind Comfort

3.2.1 Existing Configuration

Wind conditions are appropriate for siting and standing at all test locations during the summer (Figure 1A). Higher wind speeds are expected in the winter due to seasonal wind climate, but the resultant wind conditions are considered appropriate for the intended uses (Figure 2A).

3.2.2 Proposed Configuration

In the summer, all locations on the site have wind conditions appropriate for Fast Walking or better (Figure 1B). Main entrances have calmer wind conditions adequate for sitting and standing throughout the year (Locations 1 and 8 in Figures 1B and 2B). Suitable wind conditions are also found on the Outdoor Amenity on Level 4 during the summer (Locations 75 through 91 in Figure 1B).

The same flow mechanisms that cause the exceedances of the safety criterion are also responsible for creating several uncomfortable locations in the Proposed configuration during the winter (Figure 2B).

Note that uncomfortable or unsafe conditions at the above-grade levels may not be a serious concern since limited use of these areas is expected during the colder months. However, wind mitigation solutions should be developed for the predicted windy conditions at the grade level through the building design process.

3.3 Landscaping plan

Based on the landscaping plan provided to RWDI on August 9, 2022 after the wind tunnel test (Image 6) and the Tree Inventory and Arborist Reports made available to us on the same date, it is our opinion that wind conditions at grade level are expected to improve on the sidewalk of Masonry Court (building side). However, the existing deciduous trees close to the south corner of the building would provide minimal wind protection during the winter, when they have shed their foliage. This may not be a major concern given the level of pedestrian activity in this area (vehicular unit paving driveway). Consider the use of coniferous or marcescent landscaping in this area if a reduction in wind speeds is desired.

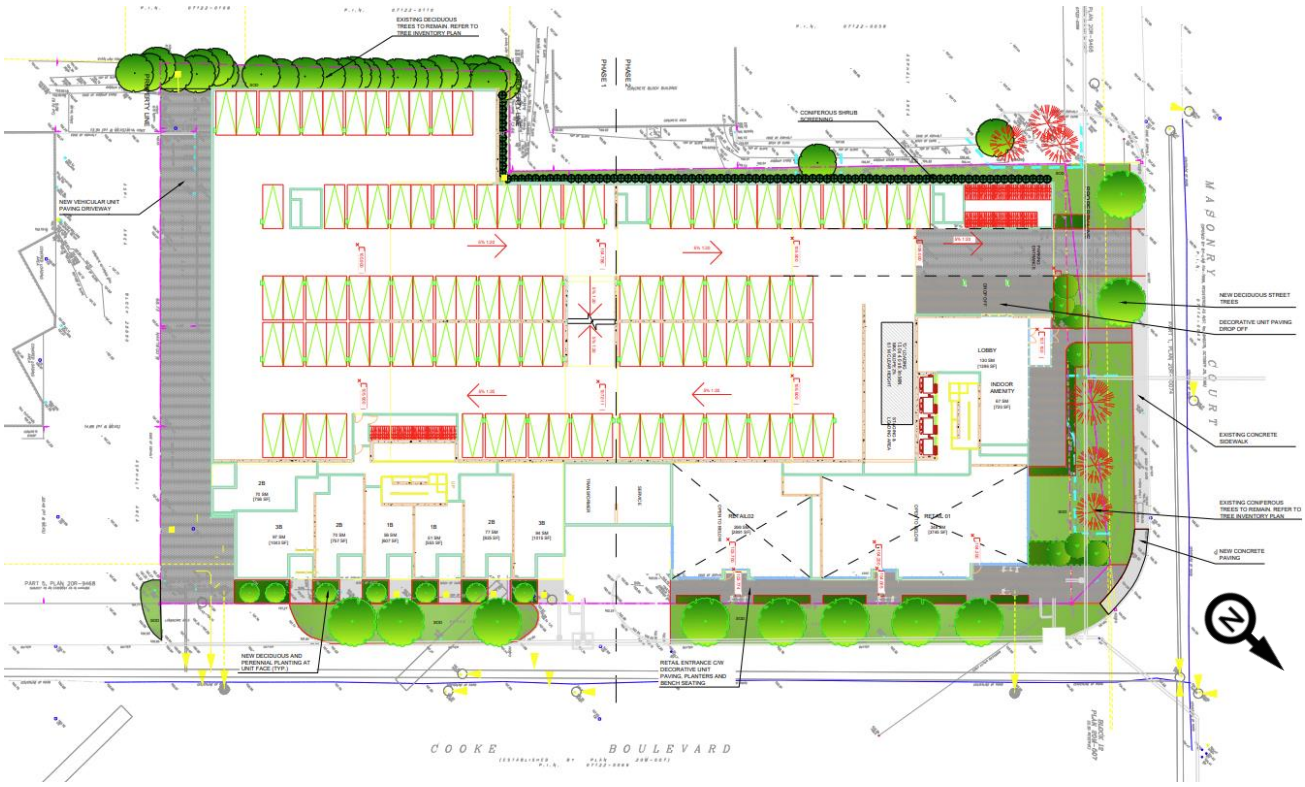


Image 6: Building landscaping plan

3.4 Mitigation Concepts

The most effective form of addressing windy conditions is through adjustments to the external building geometry, such as additional tower setbacks and tower corner articulations. If that is not possible, the use of wind screens and canopies can eliminate problematic wind conditions locally. Examples are shown in Image 6.



Image 7: Massing options, wind screens, and canopies

In addition, landscaping options can also be considered to improve local wind conditions at and above grade level, as shown in Image 7. Note that coniferous and marcescent trees are more effective wind barriers during the winter.



Image 8: Examples of landscaping options

4 STATEMENT OF LIMITATIONS

Limitations

This report was prepared by Rowan Williams Davies & Irwin, Inc. ("RWDI") for Camarro Group ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

Design Assumptions

RWDI confirms that the pedestrian wind assessment (the "**Assessment**") discussed herein was performed by RWDI in accordance with generally accepted professional standards at the time when the Assessment was performed and in the location of the Project. No other representations, warranties, or guarantees are made with respect to the accuracy or completeness of the information, findings, recommendations, or conclusions contained in this Report. This report is not a legal opinion regarding compliance with applicable laws.

The findings and recommendations set out in this report are based on the following information disclosed to RWDI. Drawings and information listed below were received from Camarro Group and used to construct the scale model of the proposed development at 1062-1074 Cooke Boulevard **("Project Data**")

File Name	File Type	Date Received (dd/mm/yyyy)
RAW-18072-1074Cookeblvd-A19	RVT	21/06/2022

The recommendations and conclusions are based on the assumption that the Project Data and Climate Data are accurate and complete. RWDI assumes no responsibility for any inaccuracy or deficiency in information it has received from others. In addition, the recommendations and conclusions in this report are partially based on historical data and can be affected by a number of external factors, including but not limited to Project design, quality of materials and construction, site conditions, meteorological events, and climate change. As such, the conclusions and recommendations contained in this report do not list every possible outcome.

The opinions in this report can only be relied up on to the extent that the Project Data and Project Specific Conditions have not changed. Any change in the Project Data or Project Specific Conditions not reflected in this report can impact and/or alter the recommendations and conclusions in this report. Therefore, it is incumbent upon the Client and/or any other third party reviewing the recommendations and conclusions in this report to contact RWDI in the event of any change in the Project Data and Project Specific Conditions in order to determine whether any such change(s) may impact the assumptions upon which the recommendations and conclusions were made.

5 REFERENCES

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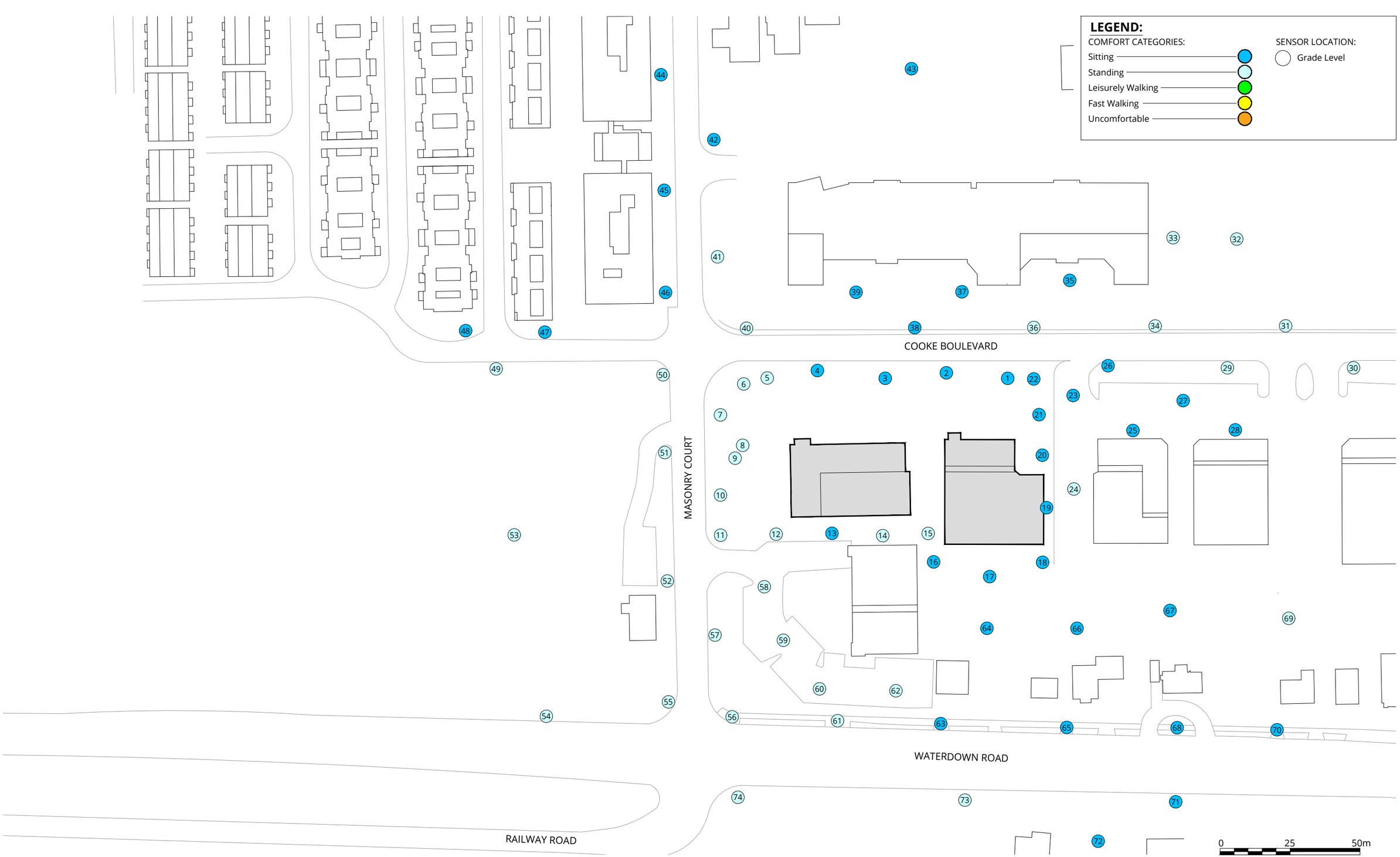
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FIGURES



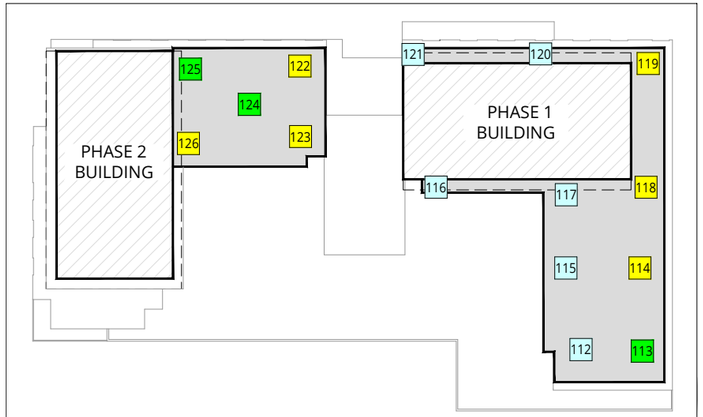
Pedestrian Wind Comfort Conditions
Existing Configuration
Summer (May to October, 6:00 to 23:00)

1062-1074 Cooke Boulevard - Burlington, ON

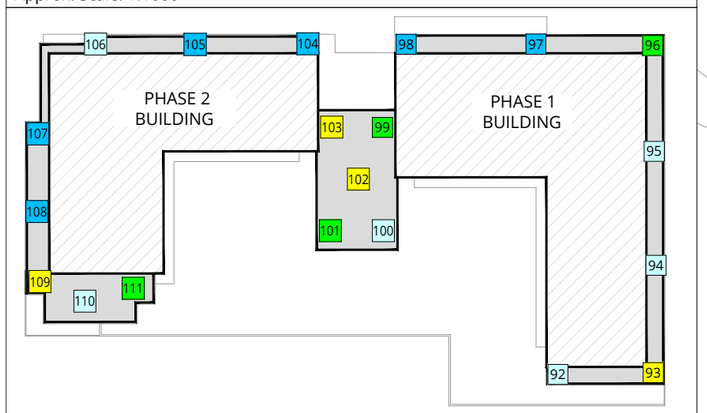
True North

Project #2205162

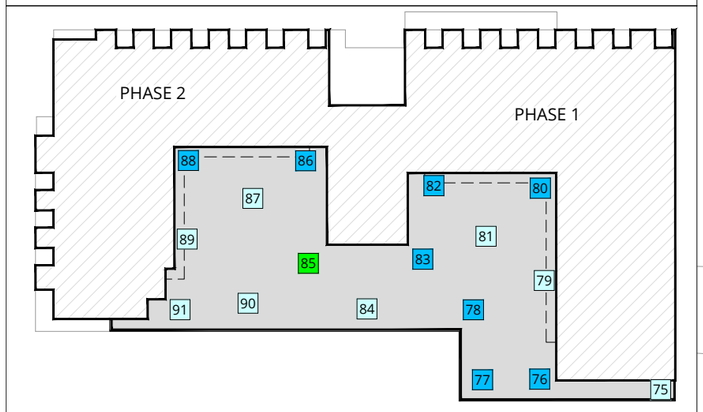
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7th Level Terrace
Approx. Scale: 1:1000



5th Level Terrace
Approx. Scale: 1:1000



4th Level Outdoor Amenity
Approx. Scale: 1:1000

LEGEND:

COMFORT CATEGORIES:
- Sitting
- Standing
- Leisurely Walking
- Fast Walking
- Uncomfortable

SENSOR LOCATION:
- Grade Level
- Terrace and Outdoor Amenity
- Main Entrance Location
- Build Above Removed for Clarity

COOKE BOULEVARD

MASONRY COURT

WATERDOWN ROAD

RAILWAY ROAD

0 25 50m

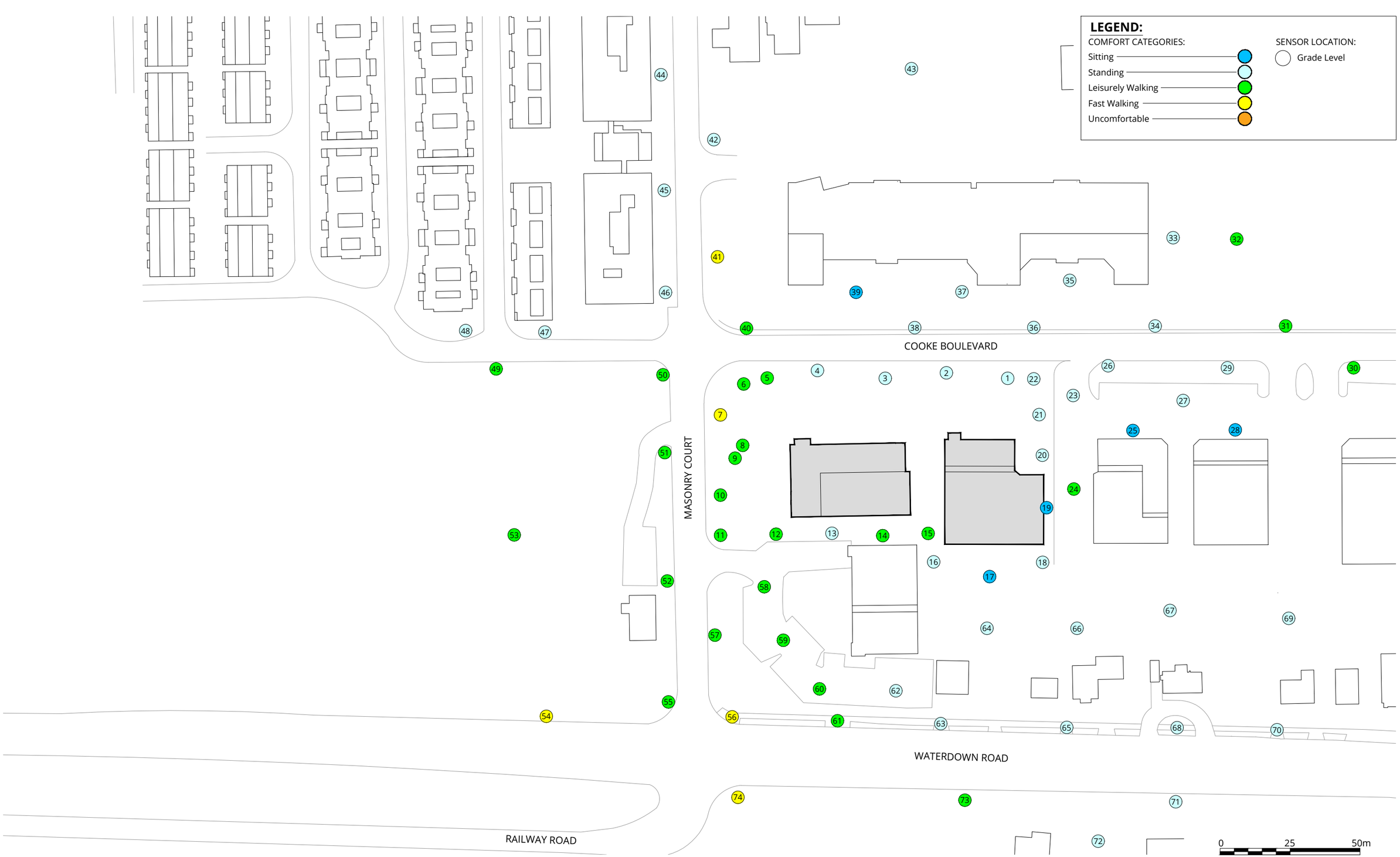
Pedestrian Wind Comfort Conditions
Proposed Configuration
Summer (May to October, 6:00 to 23:00)

1062-1074 Cooke Boulevard - Burlington, ON

True North

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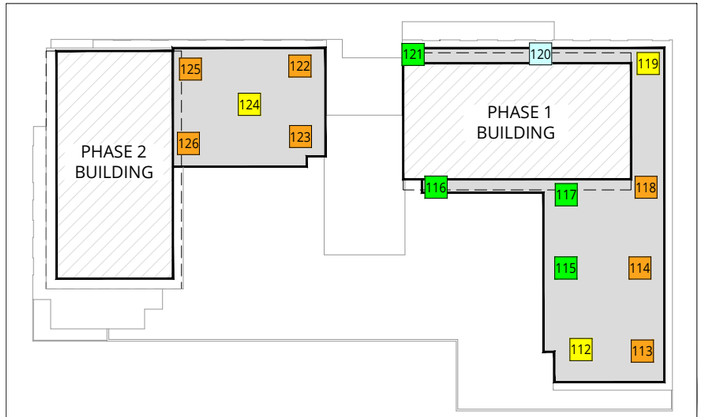
Pedestrian Wind Comfort Conditions
Existing Configuration
Winter (November to April, 6:00 to 23:00)

1062-1074 Cooke Boulevard - Burlington, ON

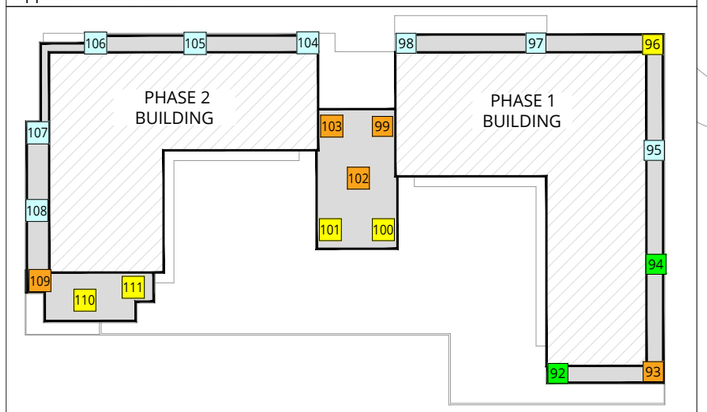
True North

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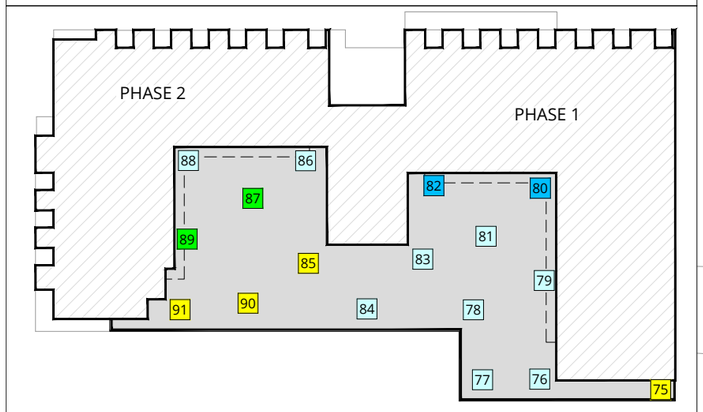
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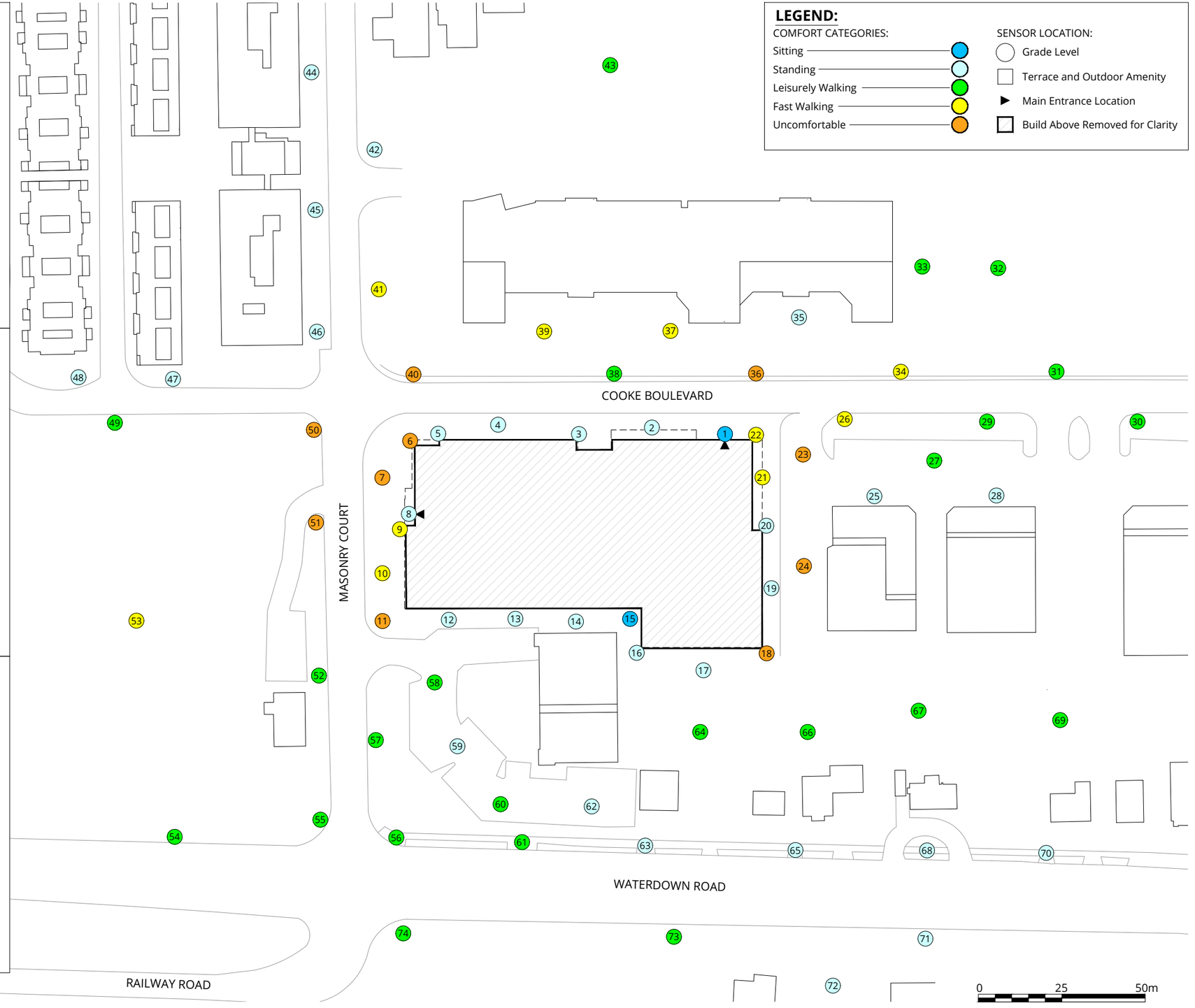
7th Level Terrace
Approx. Scale: 1:1000



5th Level Terrace
Approx. Scale: 1:1000



4th Level Outdoor Amenity
Approx. Scale: 1:1000



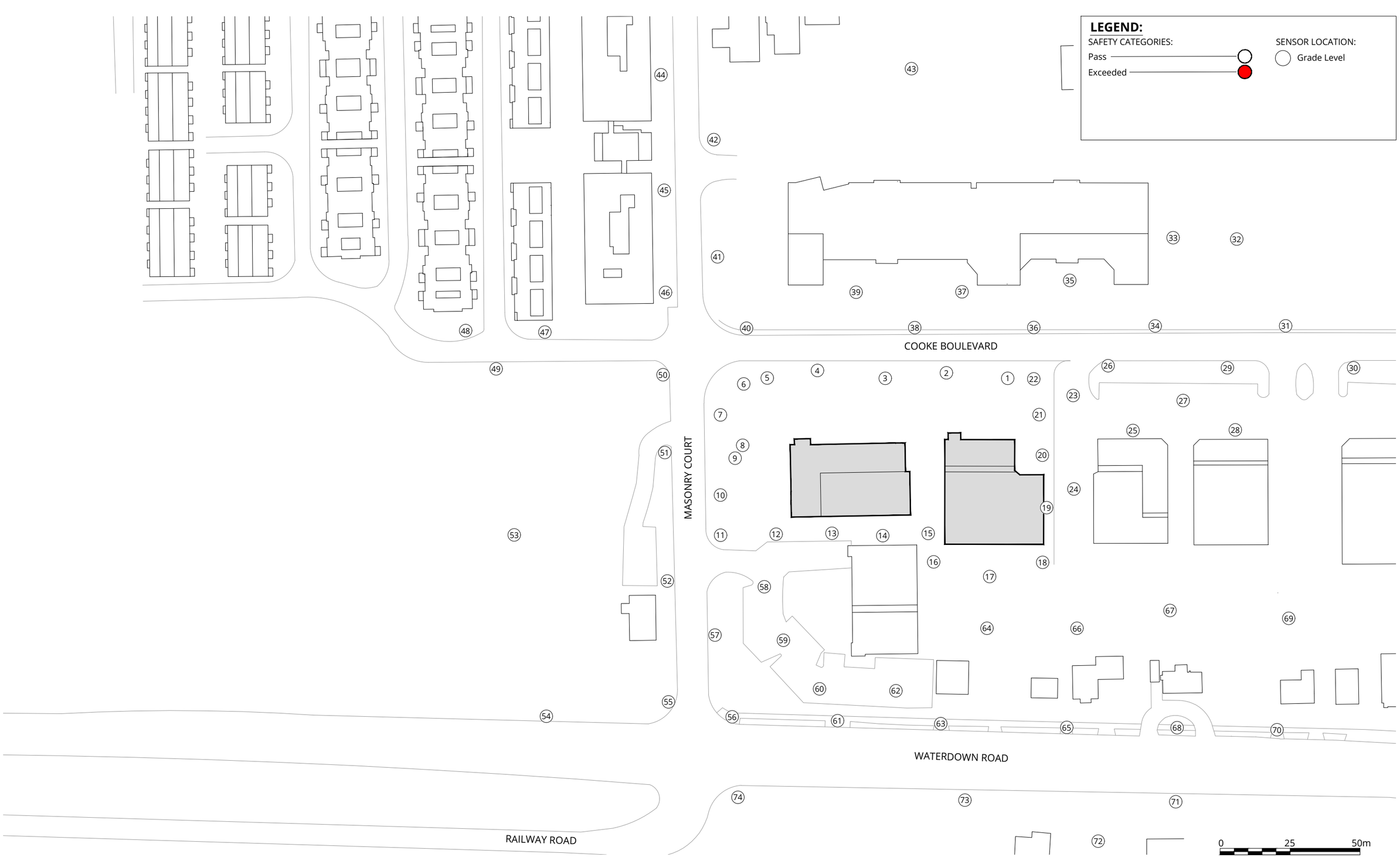
Pedestrian Wind Comfort Conditions
Proposed Configuration
Winter (November to April, 6:00 to 23:00)

1062-1074 Cooke Boulevard - Burlington, ON

True North

Project #2205162

Drawn by:	JD	Figure:	2B
Approx. Scale:	1:1250		
Date Revised:	Aug. 4, 2022		



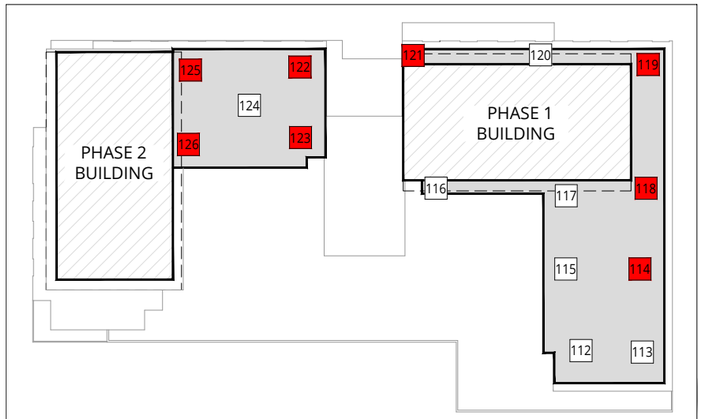
Pedestrian Wind Safety Conditions
Existing Configuration
Annual (January to December, 0:00 to 23:00)

1062-1074 Cooke Boulevard - Burlington, ON

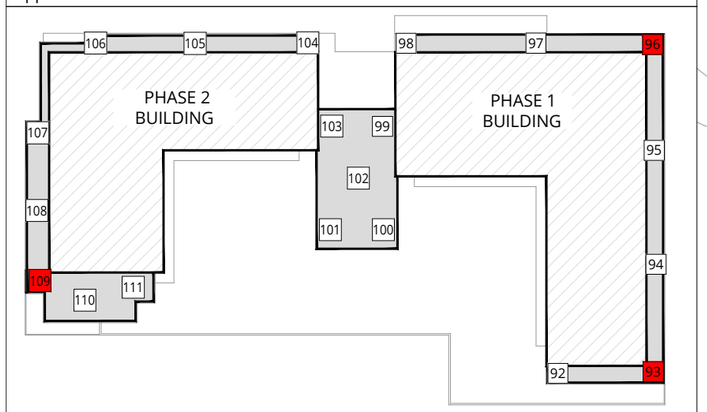
True North

Project #2205162

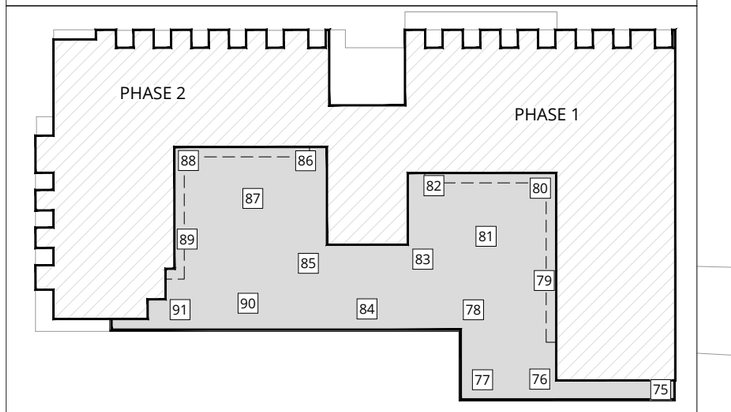
Drawn by:	JD	Figure:	3A
Approx. Scale:	1:1250		
Date Revised:	Aug. 4, 2022		



7th Level Terrace
Approx. Scale: 1:1000



5th Level Terrace
Approx. Scale: 1:1000



4th Level Outdoor Amenity
Approx. Scale: 1:1000

LEGEND:

SAFETY CATEGORIES:
- Pass
- Exceeded

SENSOR LOCATION:
- Grade Level
- Terrace and Outdoor Amenity
- Main Entrance Location
- Build Above Removed for Clarity

COOKE BOULEVARD

MASONRY COURT

WATERDOWN ROAD

RAILWAY ROAD

0 25 50m

Pedestrian Wind Safety Conditions
Proposed Configuration
Annual (January to December, 0:00 to 23:00)

1062-1074 Cooke Boulevard - Burlington, ON

True North

Project #2205162

Drawn by:	JD	Figure:	3B
Approx. Scale:	1:1250		
Date Revised:	Aug. 4, 2022		

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	9	Sitting	12	Standing	51	Pass
	Proposed	8	Sitting	10	Sitting	59	Pass
2	Existing	10	Sitting	12	Standing	50	Pass
	Proposed	9	Sitting	11	Standing	50	Pass
3	Existing	9	Sitting	11	Standing	46	Pass
	Proposed	9	Sitting	11	Standing	56	Pass
4	Existing	10	Sitting	13	Standing	51	Pass
	Proposed	10	Sitting	12	Standing	64	Pass
5	Existing	13	Standing	17	Leisurely Walking	58	Pass
	Proposed	10	Sitting	11	Standing	80	Pass
6	Existing	13	Standing	17	Leisurely Walking	58	Pass
	Proposed	20	Fast Walking	26	Uncomfortable	100	Exceeded
7	Existing	13	Standing	18	Fast Walking	60	Pass
	Proposed	19	Fast Walking	24	Uncomfortable	110	Exceeded
8	Existing	13	Standing	17	Leisurely Walking	59	Pass
	Proposed	11	Standing	14	Standing	60	Pass
9	Existing	12	Standing	16	Leisurely Walking	59	Pass
	Proposed	14	Standing	18	Fast Walking	87	Pass
10	Existing	13	Standing	17	Leisurely Walking	59	Pass
	Proposed	15	Leisurely Walking	19	Fast Walking	92	Exceeded
11	Existing	13	Standing	17	Leisurely Walking	58	Pass
	Proposed	19	Fast Walking	23	Uncomfortable	86	Pass
12	Existing	12	Standing	15	Leisurely Walking	56	Pass
	Proposed	9	Sitting	12	Standing	49	Pass
13	Existing	10	Sitting	13	Standing	62	Pass
	Proposed	9	Sitting	12	Standing	49	Pass
14	Existing	11	Standing	15	Leisurely Walking	61	Pass
	Proposed	9	Sitting	12	Standing	53	Pass
15	Existing	12	Standing	15	Leisurely Walking	58	Pass
	Proposed	7	Sitting	9	Sitting	36	Pass
16	Existing	10	Sitting	12	Standing	55	Pass
	Proposed	11	Standing	14	Standing	57	Pass
17	Existing	8	Sitting	10	Sitting	42	Pass
	Proposed	11	Standing	14	Standing	54	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
18	Existing	10	Sitting	14	Standing	52	Pass
	Proposed	17	Leisurely Walking	23	Uncomfortable	81	Pass
19	Existing	7	Sitting	9	Sitting	39	Pass
	Proposed	11	Standing	14	Standing	65	Pass
20	Existing	9	Sitting	11	Standing	50	Pass
	Proposed	11	Standing	14	Standing	61	Pass
21	Existing	9	Sitting	12	Standing	50	Pass
	Proposed	13	Standing	18	Fast Walking	67	Pass
22	Existing	9	Sitting	12	Standing	53	Pass
	Proposed	17	Leisurely Walking	20	Fast Walking	94	Exceeded
23	Existing	10	Sitting	13	Standing	52	Pass
	Proposed	20	Fast Walking	26	Uncomfortable	92	Exceeded
24	Existing	12	Standing	16	Leisurely Walking	60	Pass
	Proposed	18	Fast Walking	24	Uncomfortable	91	Exceeded
25	Existing	8	Sitting	9	Sitting	47	Pass
	Proposed	11	Standing	14	Standing	67	Pass
26	Existing	10	Sitting	13	Standing	51	Pass
	Proposed	15	Leisurely Walking	19	Fast Walking	82	Pass
27	Existing	10	Sitting	13	Standing	53	Pass
	Proposed	13	Standing	17	Leisurely Walking	70	Pass
28	Existing	8	Sitting	10	Sitting	46	Pass
	Proposed	9	Sitting	11	Standing	58	Pass
29	Existing	11	Standing	13	Standing	56	Pass
	Proposed	13	Standing	17	Leisurely Walking	69	Pass
30	Existing	12	Standing	15	Leisurely Walking	59	Pass
	Proposed	12	Standing	15	Leisurely Walking	61	Pass
31	Existing	12	Standing	15	Leisurely Walking	60	Pass
	Proposed	13	Standing	17	Leisurely Walking	69	Pass
32	Existing	12	Standing	15	Leisurely Walking	59	Pass
	Proposed	13	Standing	17	Leisurely Walking	74	Pass
33	Existing	11	Standing	14	Standing	60	Pass
	Proposed	12	Standing	17	Leisurely Walking	76	Pass
34	Existing	11	Standing	14	Standing	56	Pass
	Proposed	14	Standing	19	Fast Walking	76	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
35	Existing	8	Sitting	11	Standing	47	Pass
	Proposed	10	Sitting	13	Standing	56	Pass
36	Existing	11	Standing	14	Standing	53	Pass
	Proposed	18	Fast Walking	23	Uncomfortable	91	Exceeded
37	Existing	9	Sitting	11	Standing	46	Pass
	Proposed	16	Leisurely Walking	19	Fast Walking	78	Pass
38	Existing	9	Sitting	12	Standing	47	Pass
	Proposed	14	Standing	17	Leisurely Walking	69	Pass
39	Existing	8	Sitting	10	Sitting	41	Pass
	Proposed	14	Standing	18	Fast Walking	71	Pass
40	Existing	13	Standing	17	Leisurely Walking	60	Pass
	Proposed	20	Fast Walking	26	Uncomfortable	91	Exceeded
41	Existing	13	Standing	18	Fast Walking	70	Pass
	Proposed	14	Standing	20	Fast Walking	73	Pass
42	Existing	10	Sitting	13	Standing	54	Pass
	Proposed	10	Sitting	13	Standing	52	Pass
43	Existing	9	Sitting	11	Standing	48	Pass
	Proposed	11	Standing	16	Leisurely Walking	70	Pass
44	Existing	10	Sitting	13	Standing	66	Pass
	Proposed	9	Sitting	11	Standing	62	Pass
45	Existing	10	Sitting	12	Standing	59	Pass
	Proposed	9	Sitting	11	Standing	48	Pass
46	Existing	10	Sitting	13	Standing	63	Pass
	Proposed	11	Standing	14	Standing	60	Pass
47	Existing	10	Sitting	12	Standing	50	Pass
	Proposed	9	Sitting	11	Standing	47	Pass
48	Existing	9	Sitting	13	Standing	50	Pass
	Proposed	9	Sitting	12	Standing	45	Pass
49	Existing	12	Standing	15	Leisurely Walking	52	Pass
	Proposed	12	Standing	15	Leisurely Walking	57	Pass
50	Existing	12	Standing	16	Leisurely Walking	58	Pass
	Proposed	17	Leisurely Walking	22	Uncomfortable	92	Exceeded
51	Existing	13	Standing	17	Leisurely Walking	58	Pass
	Proposed	18	Fast Walking	22	Uncomfortable	95	Exceeded

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
52	Existing	12	Standing	15	Leisurely Walking	54	Pass
	Proposed	14	Standing	17	Leisurely Walking	84	Pass
53	Existing	13	Standing	17	Leisurely Walking	59	Pass
	Proposed	14	Standing	18	Fast Walking	70	Pass
54	Existing	14	Standing	18	Fast Walking	60	Pass
	Proposed	14	Standing	17	Leisurely Walking	68	Pass
55	Existing	13	Standing	17	Leisurely Walking	59	Pass
	Proposed	12	Standing	15	Leisurely Walking	60	Pass
56	Existing	14	Standing	18	Fast Walking	61	Pass
	Proposed	13	Standing	16	Leisurely Walking	63	Pass
57	Existing	13	Standing	17	Leisurely Walking	59	Pass
	Proposed	13	Standing	15	Leisurely Walking	73	Pass
58	Existing	12	Standing	16	Leisurely Walking	59	Pass
	Proposed	13	Standing	16	Leisurely Walking	66	Pass
59	Existing	13	Standing	16	Leisurely Walking	58	Pass
	Proposed	12	Standing	14	Standing	68	Pass
60	Existing	12	Standing	16	Leisurely Walking	54	Pass
	Proposed	12	Standing	15	Leisurely Walking	67	Pass
61	Existing	13	Standing	17	Leisurely Walking	55	Pass
	Proposed	12	Standing	15	Leisurely Walking	65	Pass
62	Existing	11	Standing	14	Standing	48	Pass
	Proposed	10	Sitting	13	Standing	54	Pass
63	Existing	10	Sitting	13	Standing	48	Pass
	Proposed	11	Standing	14	Standing	60	Pass
64	Existing	10	Sitting	12	Standing	48	Pass
	Proposed	12	Standing	16	Leisurely Walking	67	Pass
65	Existing	10	Sitting	13	Standing	49	Pass
	Proposed	11	Standing	14	Standing	57	Pass
66	Existing	9	Sitting	12	Standing	47	Pass
	Proposed	12	Standing	15	Leisurely Walking	66	Pass
67	Existing	9	Sitting	12	Standing	49	Pass
	Proposed	11	Standing	15	Leisurely Walking	61	Pass
68	Existing	10	Sitting	13	Standing	50	Pass
	Proposed	10	Sitting	13	Standing	51	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
69	Existing	11	Standing	14	Standing	60	Pass
	Proposed	13	Standing	16	Leisurely Walking	62	Pass
70	Existing	10	Sitting	13	Standing	48	Pass
	Proposed	10	Sitting	13	Standing	49	Pass
71	Existing	10	Sitting	13	Standing	53	Pass
	Proposed	11	Standing	14	Standing	55	Pass
72	Existing	9	Sitting	12	Standing	49	Pass
	Proposed	10	Sitting	12	Standing	51	Pass
73	Existing	12	Standing	16	Leisurely Walking	55	Pass
	Proposed	12	Standing	15	Leisurely Walking	58	Pass
74	Existing	14	Standing	18	Fast Walking	58	Pass
	Proposed	12	Standing	16	Leisurely Walking	56	Pass
75	Existing	-	-	-	-	-	-
	Proposed	13	Standing	19	Fast Walking	72	Pass
76	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	13	Standing	52	Pass
77	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	13	Standing	51	Pass
78	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	12	Standing	51	Pass
79	Existing	-	-	-	-	-	-
	Proposed	11	Standing	14	Standing	57	Pass
80	Existing	-	-	-	-	-	-
	Proposed	5	Sitting	6	Sitting	27	Pass
81	Existing	-	-	-	-	-	-
	Proposed	11	Standing	14	Standing	58	Pass
82	Existing	-	-	-	-	-	-
	Proposed	7	Sitting	9	Sitting	36	Pass
83	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	13	Standing	57	Pass
84	Existing	-	-	-	-	-	-
	Proposed	11	Standing	13	Standing	54	Pass
85	Existing	-	-	-	-	-	-
	Proposed	15	Leisurely Walking	18	Fast Walking	83	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
86	Existing	-	-	-	-	-	-
	Proposed	8	Sitting	11	Standing	49	Pass
87	Existing	-	-	-	-	-	-
	Proposed	12	Standing	16	Leisurely Walking	73	Pass
88	Existing	-	-	-	-	-	-
	Proposed	8	Sitting	12	Standing	55	Pass
89	Existing	-	-	-	-	-	-
	Proposed	11	Standing	16	Leisurely Walking	74	Pass
90	Existing	-	-	-	-	-	-
	Proposed	13	Standing	18	Fast Walking	75	Pass
91	Existing	-	-	-	-	-	-
	Proposed	14	Standing	19	Fast Walking	79	Pass
92	Existing	-	-	-	-	-	-
	Proposed	11	Standing	15	Leisurely Walking	62	Pass
93	Existing	-	-	-	-	-	-
	Proposed	18	Fast Walking	25	Uncomfortable	91	Exceeded
94	Existing	-	-	-	-	-	-
	Proposed	12	Standing	15	Leisurely Walking	86	Pass
95	Existing	-	-	-	-	-	-
	Proposed	11	Standing	13	Standing	73	Pass
96	Existing	-	-	-	-	-	-
	Proposed	17	Leisurely Walking	20	Fast Walking	103	Exceeded
97	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	12	Standing	63	Pass
98	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	12	Standing	75	Pass
99	Existing	-	-	-	-	-	-
	Proposed	17	Leisurely Walking	22	Uncomfortable	89	Pass
100	Existing	-	-	-	-	-	-
	Proposed	14	Standing	18	Fast Walking	85	Pass
101	Existing	-	-	-	-	-	-
	Proposed	16	Leisurely Walking	20	Fast Walking	80	Pass
102	Existing	-	-	-	-	-	-
	Proposed	18	Fast Walking	23	Uncomfortable	77	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
103	Existing	-	-	-	-	-	-
	Proposed	20	Fast Walking	26	Uncomfortable	88	Pass
104	Existing	-	-	-	-	-	-
	Proposed	9	Sitting	11	Standing	60	Pass
105	Existing	-	-	-	-	-	-
	Proposed	9	Sitting	11	Standing	59	Pass
106	Existing	-	-	-	-	-	-
	Proposed	12	Standing	14	Standing	87	Pass
107	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	13	Standing	62	Pass
108	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	13	Standing	63	Pass
109	Existing	-	-	-	-	-	-
	Proposed	19	Fast Walking	23	Uncomfortable	92	Exceeded
110	Existing	-	-	-	-	-	-
	Proposed	14	Standing	18	Fast Walking	75	Pass
111	Existing	-	-	-	-	-	-
	Proposed	15	Leisurely Walking	19	Fast Walking	80	Pass
112	Existing	-	-	-	-	-	-
	Proposed	14	Standing	18	Fast Walking	89	Pass
113	Existing	-	-	-	-	-	-
	Proposed	17	Leisurely Walking	22	Uncomfortable	90	Pass
114	Existing	-	-	-	-	-	-
	Proposed	18	Fast Walking	24	Uncomfortable	97	Exceeded
115	Existing	-	-	-	-	-	-
	Proposed	12	Standing	15	Leisurely Walking	63	Pass
116	Existing	-	-	-	-	-	-
	Proposed	11	Standing	15	Leisurely Walking	60	Pass
117	Existing	-	-	-	-	-	-
	Proposed	11	Standing	15	Leisurely Walking	65	Pass
118	Existing	-	-	-	-	-	-
	Proposed	19	Fast Walking	26	Uncomfortable	98	Exceeded
119	Existing	-	-	-	-	-	-
	Proposed	18	Fast Walking	20	Fast Walking	114	Exceeded

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
120	Existing	-	-	-	-	-	-
	Proposed	11	Standing	13	Standing	77	Pass
121	Existing	-	-	-	-	-	-
	Proposed	13	Standing	15	Leisurely Walking	113	Exceeded
122	Existing	-	-	-	-	-	-
	Proposed	20	Fast Walking	25	Uncomfortable	110	Exceeded
123	Existing	-	-	-	-	-	-
	Proposed	18	Fast Walking	23	Uncomfortable	92	Exceeded
124	Existing	-	-	-	-	-	-
	Proposed	16	Leisurely Walking	19	Fast Walking	83	Pass
125	Existing	-	-	-	-	-	-
	Proposed	17	Leisurely Walking	21	Uncomfortable	96	Exceeded
126	Existing	-	-	-	-	-	-
	Proposed	18	Fast Walking	22	Uncomfortable	102	Exceeded

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

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